Cyber Security in IoT

Module name	**Cyber Security in IoT**		
Module level	Undergraduate		
Code	COMP6655031		
Courses	Cyber Security in IoT		
Semester	Odd		
Contact person	Johan Muliadi Kerta		
Lecturer	Johan Muliadi Kerta		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS Case Studies, Lecture, Individual Work, Presentation,100 minutes		
Workload	1. Class Hour: 2 x 50 =100 minutes (1.7 hours) per week 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe basic cyber security in internet of things.	-
	CLO-2	explain basic attack, resolve technique, and platform in internet of things.	-
	CLO-3	explain concepts of security implementation in internet of things.	2.1
Content	This course presents cybersecurity on the internet of things which includes an overview of IoT applications, standard and networking protocols, Privacy and Security on IoT Architecture followed by analysis and attack patterns in IoT, integration between IoT and various platforms, and finally the application of cybersecurity technology. examples of applying cybersecurity to IoT in various fields in the real world.		
Study and examination requirements and forms of examination	The final grade in the module is composed of [30% mid] performance on midterm exams, [30% fin] final exam, [40% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments		

Reading List	Souvik Pal, Vicente García Díaz, and Dac-Nhuong Le. (2020). IoT: Security and Privacy Paradigm. (01th).CRC Press. Boca Raton. ISBN: 9780367253844.

IoT Development and Architecture

Module name	**IoT Development and Architecture**		
Module level	Undergraduate		
Code	COMP6882031		
Courses	IoT Development and Architecture		
Semester	Odd		
Contact person	Mochammad Haldi Widianto		
Lecturer	Mochammad Haldi Widianto		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (In this course, the lecturers might deploy several teaching learning strategis, including Lecture, Reading, Independent Learning, Demonstrate application of rules/laws/theories through case studies, Problem Solving), 200 minutes		
Workload	1. Class Hour: 2/2x 50 = 200 minutes (3.3 hours) per week 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Describe knowledge and understanding of Internet of Things (IoT) concepts and techniques	-
	CLO-2	Define problems design and development Internet of Things (IoT) principles for specific problems	-
	CLO-3	Select Internet of Things (IoT) techniques criteria and specifications appropriate to solving problems	2.1
Content	This course presents a basic IoT knowledge that allows the company's Internet of Things (IoT) to be created and distributed which starts with basic and common IoT introductions and continues with the IoT architecture, from simple applications with raspberry pi to the final layer of implementation of Raspberry pi to industry. This gives students knowledge about how to build a company and make sensors for the needs of smart home to smart city. This course is related to all IoT concentrations		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of [21% mid] performance on midterm exams, [35% fin] final exam, [14% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of [30% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	• Perry Lea. (2018). Internet of Things for Architects. 01st. e. Packt. UK. ISBN: 978-1-788470599 . • Tim Cox, Dr. Steven Lawrence Fernandes, Sai Yamanoor. (2019). Getting Started with Python for the Internet of Things. 1. Packt Publishing. -. ISBN: 9781838555795 .

Embedded System

Module name	**Embedded System**		
Module level	Undergraduate		
Code	COMP6849031		
Courses	Embedded System		
Semester	Even		
Contact person	Mochammad Haldi Widianto		
Lecturer	Mochammad Haldi Widianto		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, Brainstroming,Lecture, Reading, Tutorial, Wacthing Video, VCD, Film, multimedia, Explore Web Information, Group Discussion, Group Presentation,Demonstrate application of rules/laws/theories through case studies,Problem Solving, Project Work, 200 minutes		
Workload	1. Class Hour: 2/2x 50 = 200 minutes (3.3 hours) per week 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Describe Trend in IoT, microprocessors and microcontrollers, especially in the scope of Embedded Systems	-
	CLO-2	Classify Microprocessors, microcontrollers ,IoT in Embedded Systems principles for specific problems	-
	CLO-3	construct Microprocessors, microcontrollers, Internet of Things criteria and specifications appropriate to solving problems	2.1

Content	This course presents Microcontroller Design and Application is Embedded System fundamental course that combine programming language and electronics knowledge. The main goal in this subject is to equip the students with the knowledge to design Embedded System based on microcontroller and peripherals using programming language. This course also covers learning built IoT industry
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of [21% mid] performance on midterm exams, [35% fin] final exam, [14% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of [30% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	• Daniele Lacamera. (2018). Embedded Systems Architecture: Explore architectural concepts, pragmatic design patterns, and best practices to produce robust systems. (1st).Packt Publishing Ltd.. Birmingham. ISBN: 9781788832502. • James K. Peckol, Ph.D. (2019). Embedded Systems A Contemporary Design Tool. (-th).John Wiley & Sons Ltd. . ISBN: 978-0-471-72180. • Peter Marwedel. (2018). Embedded System Design Embedded Systems, Foundations of Cyber-Physical Systems, and the Internet of Things. (1st).Springer Nature. . ISBN: 978-3-319-56043. • Rajesh Singh, Anita Gehlot, Bhupendra Singh, Sushabhan Choudhury. (2019). Arduino-Based Embedded Systems Interfacing, Simulation, and LabVIEW GUI. (-th).CRC Press Taylor & Francis Group. . ISBN: 9781315162881.

Multimedia & Mixed Reality

Module name	**Multimedia & Mixed Reality**		
Module level	Undergraduate		
Code	COMP6850031		
Courses	Multimedia & Mixed Reality		
Semester	Even		
Contact person	Muhammad Maulana Ramadhan		
Lecturer	Muhammad Maulana Ramadhan		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, Lecture, Discussion Group Work Independent Learning Guided, Practice Exercising the method for some cases, Problem Solving, 150 minutes		
Workload	1. Class Hour: 2/1x 50 = 150 minutes (2.5 hours) per week 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe the theories about designing Mixed Reality and multimedia in Unity Software	3.1, 3.2
	CLO-2	list the input and output of mixed reality	2.1,3.2
	CLO-3	analyze all interactions with 3D tangible and intangible in mixed reality and gamification	2.2,6.1,6.2
	CLO-4	analyze all methods to design mixed reality application	2.3, 3.2
	CLO-5	Create the virtual reality or mixed reality application	
Content	Implementation in various industrial fields. Topic include a introduction to mixed reality and gamification, introduction Unity software, user experience for virtual and mixed reality, visualization of 3D content, gamified AR/VR character, interaction between human and virtual or mixed reality application, and the high value area of mixed reality. After completing this course students are able to develop some virtual and mixed reality with Unity Software and explore the enabling technologies and applications of mixed reality and gamification in creative industries further.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of [15% mid] performance on midterm exams, [25% fin] final exam, [10% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of [50% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	• Ioannides, M. Thalmann, Nadia M. Papagiannakis. (2017). Mixed Reality and Gamification for Cultural Heritage. (1st). Springer. Berlin. ISBN: 9783319496078. • Linowes, J. (2015). Unity Virtual Reality Projects. (3th). PACKT Publishing. Birmingham. ISBN: 978178398855.

Mobile Programming

Module name	**Mobile Programming**		
Module level	Undergraduate		
Code	MOBI6072031		
Courses	Mobile Programming		
Semester	Even		
Contact person	Muhammad Maulana Ramadhan		
Lecturer	Muhammad Maulana Ramadhan		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs Lecture, Discussion,Case Studies 150 minutes		
Workload	1. Class Hour: 2/1x 50 = 150 minutes (2.5 hours) per week 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the Object Oriented Concept	4.1, 4.2
	CLO-2	recognize Fundamental Knowledge of Java and Mobile Technology and Development	4.1, 4.2, 4.3
	CLO-3	Give examples Simple Java Application using Java	4.3, 6.1
	CLO-4	build a simple application based on Java Android	6.2
Content	Mobile Programming is a subject in Computer Science that gives the student knowledge about the basic concept of object-oriented, and mobile technology. This course discusses basics algorithm and demonstrate it by using Java programming language. It enables the students to have strong fundamental of algorithm to build a basic application of problem solving by using algorithm and strong understanding concept and structure in Java. And student can implement it using simple Android programming and bring the solution for a simple problems.		
Study and examination requirements and forms of examination	Theory:		

	The final grade in the module is composed of [20% mid] performance on midterm exams, [30% fin] final exam, [10% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of [40% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	Y. Daniel Liang. (2019). Introduction to Java Programming and Data Structures, Global Edition. (11th). Pearson Education. Essex. ISBN: 9781292221892.

Computer vision in IoT

Module name	**Computer vision in IoT**		
Module level	Undergraduate		
Code	COMP6757031		
Courses	Computer vision in IoT		
Semester	Odd		
Contact person	Abdul Haris Rangkuti		
Lecturer	Abdul Haris Rangkuti		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs TLS, Class discussion, Group Presentation, Experiment, Project Work, Case Study, 200 minutes		
Workload	1. Class Hour: 2/2x 50 = 200 minutes (3.3 hours) per week 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya): 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe various computational principles and standard image processing operators in computer vision	3.1, 3.2
	CLO-2	explain the local features with their detectors and descriptors in computer vision	3.1, 3.2
	CLO-3	Employ various features to find the correspondence between images and perform recognition in computer vision	4.2, 5.1, 5.2, 6.1, 6.2
	CLO-4	build various image identification and recognition system in computer vision	4.2, 5.1, 5.2, 6.1, 6.2
Content	Computer Vision is related to how computers could understand the information in images or videos as what human do through their eyes. Throughout the course, we will study the basic understanding of computer vision until the advance application in computer vision, such as object recognition and object detection. At the beginning of the course, we will discuss the image formation and standard image processing algorithms that are useful for many computer vision algorithms. Then, local feature is introduced through edge and corner detector algorithms. Using the local features, we will study how different images could be matched. Finally,		

	we will discuss various recognition algorithms from instance to category recognition. In addition, the standard object detection method is introduced.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of [21% mid] performance on midterm exams, [28% fin] final exam, [21% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of [30% asg] take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	• Richard Szeliski. (2011). Computer vision: algorithms and applications. (00th). Springer. New York. ISBN: 9781848829343. • David A. Forsyth and Jean Ponce. (2015). Computer Vision: A Modern Approach: A Modern Approach. (2nd). Pearson Education Limited. London. ISBN: 9781292014081. • Richard Szeliski. (2011). Computer vision: algorithms and applications. (00th). Springer. New York. ISBN: 9781848829343.

Web Programming

Module name	**Web Programming**		
Module level	Undergraduate		
Code	COMP6679004		
Courses	Web Programming		
Semester	Odd		
Contact person	Gusti Pangestu		
Lecturer	Frihandika Permana		
Language	Bahasa		
Relation to curriculum	Stream course, 4th semester		
Type of teaching, contact hours	Undergraduate programs, TLS (Group Work-Based Activities, Lecture, Practice Activities, Brainstorming), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3.2 hours) per week. 2. Structured activities, e.g. Exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya): 2 times/semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain concept of web programming	3.1
	CLO-2	choose a proper web programming technic to build web based application	2.1
	CLO-3	build a web based application that complies with the requirements	6.2
Content	Web Programming course gives a guidance how the way to design and develop a Static and dynamic website. This subject explains the concept of web programming with PHP (Hypertext Preprocessor - is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML.) in general and guides student to create dynamic web applications. This subject is also an embedded- entrepreneurship Business Project II subject. It also explains the concept of entrepreneurship and business related to Computer Science field.		
Study and examination requirements and forms of examination	The final grade in the module is composed of midterm exam 20%, final exam 30%, take-home assignments 20%, and 50% take-home assignments. Students must have a final grade of D to pass.		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Matt Stauffer. (2019). Laravel: Up & Running. (Seconth).O'Reilly. Sebastopol. ISBN: 9781492041214. - Alfred Nutile. (2016). Laravel 5.x cookbook : a receipe-based book to help you efficienctly create amazing PHP-based application with Laravel 5.x. (00th).Packt Publishing. Birmingham. ISBN: 9781786462084.

Multimedia Systems

Module name	**Multimedia Systems**		
Module level	Undergraduate		
Code	COMP6677004		
Courses	Multimedia Systems		
Semester	Odd		
Contact person	Gusti Pangestu		
Lecturer	Fairuz Iqbal Maulana, Frihandhika Permana		
Language	Bahasa		
Relation to curriculum	Stream course, 4th semester		
Type of teaching, contact hours	Undergraduate programs, TLS (lecture, demonstration, case studies, presentation), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3.2 hours) per week. 2. Structured activities, e.g. Exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya): 2 times/semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Explain interactive multimedia and multimedia elements	3.1
	CLO-2	Choose suitable multimedia elements for multimedia applications	6.1
	CLO-3	Create simple multimedia application	6.2
	CLO-4	Choose the multimedia delivery methods for multimedia applications	2.1
Content	This course consists of interactive multimedia principles, multimedia elements, design processes, augmented reality-virtual reality, making simple applications, and matters related to the latest multimedia developments and technologies. By completing this course students will have basic knowledge related to multimedia and be able to develop simple multimedia. This course is a prerequisite for the Interactive Multimedia concentration.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 18% performance on midterm exams, 24%final exam, 18%take-home assignments. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of 40% performance on laboratory. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Erin Pangilinan. (2019). Creating augmented and virtual realities : theory and practice for next-generation spatial computing. (01th).O'Reilly. Sebastopol. ISBN: 9781492044192.

Popular Programming Technology

Module name	**Popular Programming Technology**		
Module level	Undergraduate		
Code	COMP6713004		
Courses	Popular Programming Technology		
Semester	Odd		
Contact person	Gusti Pangestu		
Lecturer	M. Aldiki Febriantono, Gusti Pangestu		
Language	Bahasa		
Relation to curriculum	Stream course, 4th semester		
Type of teaching, contact hours	Undergraduate programs, TLS (lecture, demonstration, group work, presentation, role play, case study), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1.6 hours) per week. 2. Structured activities, e.g. Exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya): 2 times/semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Explain fundamental concept of GO Programming Language	(LObj 3.1) Able to identify information required in a variety of professional context
	CLO-2	Apply GO programming language techniques and libraries	(LObj 6.2) Able apply software development fundamentals to produce computing-based solutions
	CLO-3	Solve problem using GO programming language	(LObj 2.1) Able to design a computing-based solution to meet a given set of computing requirements in the context of computer science
Content	Popular Programming Technology is a Course that lead a student to understand the new programming language, framework or any tools that already needed by the industry. In this course, student will learn and implements their knowledge and skill to solve a problem using the popular programming and framework technique.		

Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 40%final exam, 30%take-home assignments. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites (LMS Binusmaya).
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Alan A. A. Donovan, Brian W. Kernighan. (2015). The Go Programming Language. (1st).Addison-Wesley Professional Computing Series. Indiana. ISBN: 9780134190440.

Big Data Analytics for Business

Module name	**Big Data Analytics for Business**		
Module level	Undergraduate		
Code	COMP6678004		
Courses	Big Data Analytics for Business		
Semester	Odd		
Contact person	Yulianto		
Lecturer	Dian Sano		
Language	Bahasa		
Relation to curriculum	Stream course, 5th semester		
Type of teaching, contact hours	Undergraduate programs TLS (Lecture, Case, Studies, Demonstration), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3.2 hours) per week. 2. Structured activities, e.g. Exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya): 2 times/semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define big data analytics concepts and the use for business	-
	CLO-2	describe the collection of data and techniques for pre-processing the data before applying analytics	-
	CLO-3	apply big data analytics and visualization	1.2
	CLO-4	analyze trends related to big data analytics and big data case studies	1.1
Content	This course consists of big data analytics concepts and techniques for extracting knowledge from big data sources. Topics and related analytical methods discussed in this class include: big data introduction, classification and prediction analysis, association and correlations analysis, cluster analysis and outlier detection analysis. This course gives student competency to apply and solve problems by applying data analytics concepts and techniques (how to apply them and when they are applicable).		

Study and examination requirements and forms of examination	The final grade in the module is composed of 20% performance on midterm exams, 20% final exam, 35% take-home assignments. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- EMC Education Services (Editor). (2015). Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data. (1st).John Wiley & Sons, Inc.. Indianapolis, IN 46256. ISBN: 9781118876138. - Han, J., Kamber, M., & Pei, Y. (2012). Data Mining: Concepts and Techniques. (3th).MOKA. San Fracisco. ISBN: 978-0123814791

Mobile Application Programming

Module name	**Mobile Application Programming**		
Module level	Undergraduate		
Code	MOBI6063004		
Courses	Mobile Application Programming		
Semester	Odd		
Contact person	Gusti Pangestu		
Lecturer	Gusti Pangestu		
Language	Bahasa		
Relation to curriculum	Stream course, 5th semester		
Type of teaching, contact hours	Undergraduate programs, TLS (lecture, case study, presentation), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3.2 hours) per week. 2. Structured activities, e.g. Exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya): 2 times/semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Explain the concepts to build Mobile Application	2.1
	CLO-2	Choose the proper technique and mechanism to build mobile application	3.1
	CLO-3	Demonstrate the integrating of database and mobile application as client side	6.2
Content	Mobile Application Programming course gives a guidance on the way to design and develop a mobile application. This course explains the concept of mobile design and programming using Kotlin for android and Dart for iOS and android (hybrid). In general, students able to develop a mobile application (android / iOS) with native like performance, able to determine the best framework, able to determine the best language based on the needs and opportunity.		
Study and examination requirements and forms of examination	The final grade in the module is composed of midterm exam 20%, final exam 30%, take-home assignments 20%, and 30% take-home assignments. Students must have a final grade of D to pass.		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		

Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Rap Payne. (2019). Beginning App Development with Flutter: Create Cross-Platform Mobile Apps. (1st Eth).Apress; 1st ed. edition (December 5, 2019). Dallas, USA. ISBN: 978-1484251805. - Antonio Leiva. (2016). 2. Kotlin for Android Developers. (2nd).Leanpub. . ISBN: 9781530075614.

Data Visualization

Module name	**Data Visualization**		
Module level	Undergraduate		
Code	COMP6680004		
Courses	Data Visualization		
Semester	Odd		
Contact person	Yulianto		
Lecturer	Dian Sano		
Language	English		
Relation to curriculum	Stream course, 5th semester		
Type of teaching, contact hours	Undergraduate programs, TLS (lecture, case study, presentation), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1.6 hours) per week. 2. Structured activities, e.g. Exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya): 3 times/semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Courese Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe the basics of writing research paper and the research lifecycle	-
	CLO-2	select the research topic, literature and writing strategies used in the project	-
	CLO-3	analyze the results from the research study	1.1
	CLO-4	write a research paper with the appropriate format	-
Content	This course consists of basic concepts of data visualization in the context of building Performance Dashboard and how to design and build a dashboard using appropriate technologies. The course gives students basic knowledge related to performance dashboard, data visualization, and skill how to design and buid data visualization applied on dashboards.		
Study and examination requirements and forms of examination	The final grade in the module is composed of midterm exam 20%, final exam 20%, take-home assignments 60%. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		

Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Joshua N. Milligan. (2020). Learning Tableau 2020: Create effective data visualizations, build interactive visual analytics, and transform your organization. (4th).Packt Publishing. Birmingham. ISBN: 978-1800200364. - Jen Stirrup. (2014). 2. Tableau Dashboard Cookbook. (1st).Packt Publishing Ltd. Birmingham. ISBN: 978-1-78217-790. - Wayne W. Eckerson. (2011). Performance Dashboards: Measuring, Monitoring, and Managing Your Business. (2nd).John Wiley & Sons, Inc. New Jersey. ISBN: 978-0-470-58983.

Algorithm and Programming

Module name	**Algorithm and Programming**		
Module level	Undergraduate		
Code	COMP6047001		
Courses	Algorithm and Programming		
Semester	Odd		
Contact person	Fidelson Tanzil		
Lecturer	Reina, Alvin Chandra, Josef Bernadi Gautama, Dennise Adrianto, Dion Darmawan, Diana, Gredion Prajena., David, Violitta Yesmaya, Ferdinand Ariandy Luwinda, Indra Dwi Rianto, Rulyna, Mayliana, Rini Wongso, Yovita Tunardi, Alexander, Julian Wesley, Gradiyanto Sanjaya, Harvianto Kanyadian Idananta, Fidelson Tanzil, Indrabudhi Lokaadinugroho, Irene Anindaputri Iswanto, Dewi Suryani, Vini Indriasari, Ajeng Wulandari, Yesun Utomo, Ivan Halim		
Language	Bahasa		
Relation to curriculum	compulsory, 1st semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Discussion, Exercise and solve problem with students, Guided Practice, Lecture, Problem Solving), 300 minutes		
Workload	1. Class Hour: 4 x 50 = 300 minutes (5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 360 minutes (6 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain kind of algorithms in problem solving	1.2
	CLO-2	apply syntax and functions in C language in problem solving	2.2
	CLO-3	constructa program using C language in problem solving	2.2
	CLO-4	designa program with file processing using C language in problem solving	1.2
	CLO-5	choose the best sorting and searching algorithm in problem solving	1.2

Content	This course comprises algorithm definition, basic principles of programming with C, how to make a program using C programming language, problem solving in C, and learning about many functions and features in C which can be used. By completing this course, students will have basic knowledge related with C and able to develop program using C programming language. This course is prerequisite for Data Structure course.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 28% final exam, 21% take-home assignments, 10% in-class participation. Students must have a final grade of C to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of C to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Paul J. Deitel. (2016). C how to program : with an introduction to C++ . (08th). Pearson Education . Hoboken . ISBN: 9780133976892. - Jeri R. Hanly & Elliot B. Koffman. (2019). Problem Solving and Program Design in C. (06th). Addison-Wesley. Boston. ISBN: 978-0321535429.

Data Structures

Module name	**Data Structures**		
Module level	Undergraduate		
Code	COMP6048001		
Courses	Data Structures		
Semester	Even		
Contact person	Rini Wongso		
Lecturer	Afdhal Kurniawan, Ajeng Wulandari, Alexander, Alif Tri, Alvin Chandra, Alvin Chandra, Dewi Suryani, Diana, Fanny, Franz Adeta, Gredion Prajena, Harvianto, Henry Chong, Henry Lucky, Ika Dyah Agustia, Rachmawati, Indra Dwi Rianto, Irene Anindaputri Iswanto, Islam Nur, Jeklin Harefa, Kartika Purwandari, Lie Maximilianus Maria Kolbe, Mayliana Mayliana, Muhammad Fadlan Hidayat, Muhammad Fikri Hasani, Muhammad Taufiq Zulfikar, Pandu Wicaksono, Puti Andam, Rhio Sutoyo, Rita Layona, Rulyna Rulyna, Yovita Tunardi, Yudy Purnama		
Language	Bahasa		
Relation to curriculum	compulsory, 2nd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Discussion, Individual Exercises, Lecture, Practice in Laboratory, Tutorial), 300 minutes		
Workload	1. Class Hour: 4/2 x 50 = 300 minutes (5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4/2 x 60 = 360 minutes (6 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the concept of data structures and its usage in Computer Science	1.1
	CLO-2	illustrateany learned data structures and its usage in application	2.2
	CLO-3	apply data structures using C	2.2

Content	This course provides students with data structure basic concept in which will be frequently used in software engineering and programming practices, concept of array, structure, linked list, stack, queue, graph, and trees. By completing this course, students can do the implementation of data structure concept in C programming language and estimates its complexity in the usage.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 35% final exam, 15% take-home assignments, 10% in-class participation. Students must have a final grade of C to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, 12% final exam, 8% take-home assignments, 10% in-class participation. Students must have a final grade of C to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- S. Sridhar. (2015). Design and Analysis of Algorithms. (01th). Oxford University Press. New Delhi. ISBN: 9780198093695. - Reema Thareja. (2014). Data structures using C. (2nd). Oxford University Press. New Delhi. ISBN: 9780198099307. - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, & Clifford Stein. (2009). Introduction to Algorithms. (3th). The MIT Press. London. ISBN: 9780262033848.

Algorithm Design and Analysis

Module name	**Algorithm Design and Analysis**		
Module level	Undergraduate		
Code	COMP6049001		
Courses	Algorithm Design and Analysis		
Semester	Odd		
Contact person	Lie Maximilianus Maria Kolbe		
Lecturer	Andika Elok, Putri Sanggabuana		
Language	Bahasa		
Relation to curriculum	compulsory, 3rd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Class discussion, Exercise and solve problem with students, Lecture), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain fundamental concept of analysis algorithms.	1.1
	CLO-2	apply algorithm techniques and methods.	2.1
	CLO-3	solvea problem using specific algorithm.	2.1, 2.3, 6.1, 6.2
	CLO-4	compare several algorithm design methods.	2.1, 2.3,
Content	The course describes fundamental concept of design and analysis of algorithms in order to calculate time and space computation, complexity, and compare design algorithm methods. It gives the students knowledge of several algorithms that enable students for designing good algorithms.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 30% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- S. Sridhar . (2015). Design and analysis of algorithms . (01th). Oxford University Press . New Delhi . ISBN: 9780198093695.

Compilation Techniques

Module name	**Compilation Techniques**		
Module level	Undergraduate		
Code	COMP6062001		
Courses	Compilation Techniques		
Semester	Odd		
Contact person	Ayuliana		
Lecturer	Sablin Yusuf, Yeni Nuraeni, Karto Iskandar, Ayuliana, Johannes Simatupang, Alvina Aulia, Eka Cahyadi, Siti Safariana Rahmawati, Nadia Kenny Jingga, Ivan Sebastian Edbert, Muhammad Fadlan, Amalia Zahra.		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Class Presentation, Combine Tutorial, exercise and solve problem with students), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe the basic concepts of compilation techniques that include the functions, stages of compilation, the components of the compilation and compiler tool-making, the theory of automata and grammar in a formal Language.	1.1
	CLO-2	apply the theory of automata, formal language, and the grammar, the concept of compilation techniques to translate a programming language into grammar that recognize input strings.	1.1
	CLO-3	constructApply the theoretical of regular expression, and grammar to construct simple compiler types of compiler in the market	2.1

Content	Compilation technique is a technique that translates the source program into a final program for a particular computer language. This course also discussing the theory of automata and formal languages, Finite Automata and Grammar particularly useful in designing the lexical analyzer and parser syntactic as a part of compiler. Moreover automata theory can also be used for text editor, pattern matching, text processing and file searching. After learning this course, students should be able to make or practice a simple compiler. This course has same connections with subjects such as: operating systems, computer organization and architecture, also other computer languages
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 50% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Alfred V. Aho . (2007). Compilers : principles, techniques and tools . (02th). Addison-Wesley . Boston . ISBN: 0321491696. - Hopcroft, John E.; Motwani, Rajeev; Ullman, Jeffrey D.. (2013). Introduction to Automata Theory, Languages, and Computation . (Thirdth). Pearson. London. ISBN: 9781292039053.

Artificial Intelligence

Module name	**Artificial Intelligence**		
Module level	Undergraduate		
Code	COMP6065001		
Courses	Artificial Intelligence		
Semester	Odd		
Contact person	Felix Indra Kurniadi		
Lecturer	Ajeng Wulandari, Andry Chowanda,Antoni Wibowo, Aurelia Michele, Bakti Amirul Jabar, Derwin Suhartono, Ford Lumban Gaol, Henry Lucky Hidayaturrahman Hidayaturrahman, I Gede Putra Kusuma Negara, Irene Anindaputri Iswanto, Irvan Santoso, Ivan Halim Parmonangan, Maria Susan, Muhammad Amien Ibrahim, Muhammad Edo Syahputra, Nur Afny Catur Andryani, Puti Andam, Risma Yulistiani, Silviya Hasana, Yaya Heryadi		
Language	Bahasa		
Relation to curriculum	compulsory, 3rd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Discussion, Individual Exercises, Lecture, Project Based Learning), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe the concept of the intelligent agent and Artificial Intelligence	3.1
	CLO-2	explain various intelligent search algorithms to solve the problems	3.2
	CLO-3	explain the knowledge representation in reasoning purpose	3.2
	CLO-4	apply various techniques to an agent when acting under certainty	4.2, 5.1, 5.2, 6.1, 6.2
	CLO-5	apply various learning algorithms to solve the problems	4.2, 5.1, 5.2, 6.1, 6.2
	CLO-6	analyze the role of Ethical in Artificial Intelligence	4.2, 5.1, 5.2, 6.1, 6.2

Content	This course provides students with the foundation of Artificial Intelligence, understanding of representations and external constraints with the idea of improving students to think creatively. By completing this course, students can explain many kinds of Artificial Intelligence algorithms, and implement those algorithms to make an application
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 30% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Peter Norvig, Stuart Russel. (2021). Artificial Intelligence: A Modern Approach. (4th). Pearson. London. ISBN: 978-1292401133. - David L. Poole, Alan K. Mackworth. (2017). Artificial Intelligence: Foundations of Computational Agents. (2nd). Cambridge University Press. Cambridge. ISBN: 9781107195394. - David Lay, Steven Lay and Judi McDonald. (2014). Linear Algebra and Its Application. (5th). Pearson. New York. ISBN: 9780321982384. - Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani. (2021). An Introduction to Statistical Learning: with Applications in R. (2nd). Springer. New York. ISBN: 1071614177. - Kwang Hyung Lee. (2005). First Course on Fuzzy Theory and Applications. (1st). Springer. New York. ISBN: 3540229884. - Sheldon M. Ross. (2021). Introduction to Probability and Statistics for Engineers and Scientists. (6th). Academic Press. London. ISBN: 978-0-12-824346.

Software Engineering

Module name	**Software Engineering**		
Module level	Undergraduate		
Code	COMP6100001		
Courses	Software Engineering		
Semester	Even		
Contact person	Kenny Jingga		
Lecturer	Gintoro, Yasri, Karto Iskandar, Zulfany Erlisa Rasjid, Ayuliana, Rubil, Irma Irawati Ibrahim, Bayu Kanigoro, Aditya Kurniawan, Dion Darmawan, Alvina Aulia, Meiliana, Azani Cempaka Sari, Kanyadian Idananta, Indrabudhi Lokaadinugroho, Noprianto, Dwi Nurmelly Handayani, , Maria Susan, Kenny Jingga, Risma Yulistiani		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Demonstration, Group Presentation, Lecture, Role Play), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define Explain the software engineering practices and the potential business environment	3.1
	CLO-2	describe the concepts of software process models and software development life cycle	4.1, 5.1, 5.2
	CLO-3	explain Understand the software project management concepts and the proposed potential business project	3.2, 4.2, 5.1, 5.2
	CLO-4	analyze the software based on the quality assurances and testing concepts	4.2, 6.1, 6.2
	CLO-5	recognize the use of tools for software engineering process to build software	5.1, 6.1, 6.2

	CLO-6	apply the software engineering concepts to present the constructive breakthrough of business ideas	3.1, 5.1, 5.2, 6.1, 6.2
Content	This course comprises software process models, engineering practices, software quality assurance, software metrics, project management concept and utilizing tools in software development. The course gives students basic knowledge of how to develop software effectively and efficiently and also how to develop software using tools or technology used in recent industries. This course is related to Object Oriented Software Engineering and Advance Topics in Software Engineering.		
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 25% performance on midterm exams, 30% final exam, 45% take-home assignments, 10% in-class participation. Students must have a final grade of C to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments		
Reading List	- Titus Winters, Tom Manshreck, Hyrum Wright. (2020). Software Engineering at Google: Lessons Learned from Programming Over Time. (1st). O'Reilly Media. California. ISBN: 978-1492082798. - Ian Sommerville. (2016). Software Engineering. (10th). Pearson. London. ISBN: 978-1-292-09613. - Roger Pressman and Bruce Maxim. (2020). Software Engineering: A Practitioner's Approach. (9th). McGraw- Hill. New York. ISBN: 9781259872976.		

Code Reengineering

Module name	**Code Reengineering**		
Module level	Undergraduate		
Code	COMP6106001		
Courses	Code Reengineering		
Semester	Even		
Contact person	Maria Susan Anggreainy		
Lecturer	Bakti Amirul		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Demonstrate problem-solving through case studies, Exercise and solve problem with students, Group Exercises, Teaching Learning in The Class), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	evaluate Basic refactoring and its application	3.1, 3.2, 4.1, 4.2
	CLO-2	apply Advanced refactoring and its application	5.1, 5.2, 6.1, 6.2
	CLO-3	formulate suitable refactoring for code environment	6.1, 6.2
Content	This course introduces the concepts and practice related to code reengineering with smell code detection and refactoring. This topics include Introduction to Refactoring, Bad Code Smell: The Bloater, Bad Code Smell: The Object Orientation Abuser, The Change Preventer, The Dispensable, The Couplers, Object Oriented Design Smell, Abstraction Smell, Encapsulation Smell, Modularization Smell, Hierarchy Smell, The Smell Ecosystem, Repaying Technical Debt in practice		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 50% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Martin Fowler. (2018). Refactoring: Improving the Design of Existing Code. (2nd Eth). Addison-Wesley Professional. -. ISBN: 978-0134757599. - Steve Halladay. (2012). Principle - based refactoring : Learning software design principles by applying refactoring rules. (-th). Principle Publishing. -. ISBN: 978-0615690223.

Agile Software Development

Module name	**Agile Software Development**		
Module level	Undergraduate		
Code	COMP6107001		
Courses	Agile Software Development		
Semester	Even		
Contact person	H. Mohammad Subekti		
Lecturer	Kenny Jingga, Muhammad Ihsan Arief Nurhakim		
Language	English		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Group Discussion, Lecture, Project Work), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe - The students able to describe the Agile principles in general, especially the using of Scrum Methodologies to develop the software systems for business applications	3.1, 3.2
	CLO-2	Create- The students able to create an holistic activities planning in accordance to the software development based on the using Scrum methodologies	4.1, 4.2, 5.1, 5.2
	CLO-3	use - The students able to use the development tools in modeling through implementation phases within the software development processes using Scrum	6.1, 6.2

Content	This course introduces the concept and practice in Agile Software Development Methodology, especially in Scrum Methodology Field. This topics include introduction to agile approach, agile principles, Sprint, Product Backlog, Estimation and Velocity, Technical Debt, Scrum Roles, Planning, Sprint Execution, Sprint Review, Sprint Retrospective, Scrum Path Forward
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 40% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- James Edge. (2018). Agile: An Essential Guide to Agile Project Management, The Kanban Process and Lean Thinking + A Comprehensive Guide to Scrum. (00th). CreateSpace Independent Publishing Platform. -. ISBN: 978-1729754931. - Kenneth S. Rubin. (2013). Essential Scrum: A Practical Guide to the Most Popular Agile Process. (00th). PE. New Jersey. ISBN: 007-6092046028. - Roger S. Pressman. (2010). Software Engineering, A Practitioner's Approach. (Alt.th). Mc Graw Hill - International Edition. Singapore. ISBN: 978-007-126782-.

Pattern Software Design

Module name	**Pattern Software Design**		
Module level	Undergraduate		
Code	COMP6114001		
Courses	Pattern Software Design		
Semester	Even		
Contact person	Maria Susan Anggreainy		
Lecturer	Surya Sujarwo, Arden Sagiterry Setiawan, Pualam Dipa Nusantara		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class Presentation, Group Assignments, Group Discussion, Individual and Group Presentation), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya): 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the problem to be solved.	3.1, 3.2, 4.1, 4.2
	CLO-2	explain the business problem domain	3.1, 3.2, 4.1, 4.2
	CLO-3	constructsolution for business problem domain.	3.1, 3.2, 4.1, 4.2
	CLO-4	formulate knowledge solution according to the business problem domain	5.1, 5.2, 6.1, 6.2
	CLO-5	Breakdownlarge domains into smaller subdomains	5.1, 5.2
Content	This course provides a thorough understanding of how we can apply the patterns and practices of DDD on our own projects, but before delving into the details, it's good to take a bird's-eye view of the philosophy so you can get a sense of what DDD is really all about.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 21% final exam, 28% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Matt Zandstra. (2021). PHP 8 Objects, Patterns, and Practice: Mastering OO Enhancements, Design Patterns, and Essential Development Tools. (6th eth). Apress . -. ISBN: 978-1484267905. - Scott Millett. (2018). Patterns, Principles, and Practices of Domain-Driven Design. (-th). John Wiley & Sons, Inc. Indianapolis. -. ISBN: -.

Object Oriented Analysis & Design

Module name	**Object Oriented Analysis & Design**		
Module level	Undergraduate		
Code	COMP6115001		
Courses	Object Oriented Analysis & Design		
Semester	Odd		
Contact person	H. Mohammad Subekti		
Lecturer	Rezki Yunanda, Spits Warnars Harco Leslie Hendric		
Language	English		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Discussion, Lecture, Observation, Presentation), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	conceivethe basics concepts of object oriented analysis and design.	6.1, 6.2
	CLO-2	use the knowledge to develop documentation for object oriented software analysis and design using Unified Modelling Language	6.1, 6.2
	CLO-3	analyze any problem in any software application and find out the alternative solutions using object oriented analysis and design approach	6.1, 6.2
	CLO-4	manage the software process and build software development teams based on object oriented analysis and design approach	6.1, 6.2

Content	Course Object Oriented System Analysis and Design includes the advanced concepts of software development approach using design visual tool Unified Modelling Language. This course will be the foundation and prerequisite for computer science faculty student who specifies in software engineering subject.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 20% performance on midterm exams, 30% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Alan Dennis, Barbara Haley Wixom. (2015). Systems Analysisi & Design, An Object-Oriented Approach with UML. (5th). John Wiley & Sons. Hoboken, New Jersey. ISBN: 9781118804674. - Carol Britton, Jill Doake. (2005). A Student Guide to Object Oriented Development. (1st). Elsevieer Butterworth-Heinemann. Burlington MA 01803 UK. ISBN: 0750661232.

Framework Layer Architecture

Module name	**Framework Layer Architecture**		
Module level	Undergraduate		
Code	COMP6122001		
Courses	Framework Layer Architecture		
Semester	Odd		
Contact person	Maria Susan Anggreainy		
Lecturer	Muhamad Keenan, Maria Susan Anggreainy		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Demonstration, Group Assignments), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe Use of design pattern in Java	3.1, 3.2
	CLO-2	designObject oriented in design pattern	4.1, 4.2, 5.1, 5.2
	CLO-3	apply Design pattern in Java	6.1, 6.2
Content	This course introduces the concepts and practice related to design pattern and its implementation in Java. This topic course learn : work with each of the design patterns, implement design patterns in real-world applications, choose from alternative design patterns by comparing their pros and cons, use the Eclipse IDE to write code and generate output		
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 28% final exam, 21% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

	Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Vaskaran Sarcar. (2018). Java Design Patterns: A Hands-On Experience with Real-World Examples . (2nd eth). Apress. -. ISBN: 978-1484240779.

Data Mining

Module name	**Data Mining**		
Module level	Undergraduate		
Code	COMP6140001		
Courses	Data Mining		
Semester	Odd		
Contact person	Kristien Margi Suryaningrum		
Lecturer	Yusrizal Oenzil, Dewi Suryani		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Discussing the cases, Lecture, Practice in Laboratory, Project Work), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	cite concept of data, data preprocessing, data warehouse, OLAP, and data cube	1.2, 6.1
	CLO-2	apply various data mining techniques	2.1, 6.1
	CLO-3	apply data mining trends and research frontiers	2.2, 6.2
Content	This course comprises the principle of data, data preprocessing, basic data mining, basic data warehouse, OLAP, data cube and trend and research in data mining. It gives student knowledge and skill in covering data and data preprocessing, pattern analysis, classification, clustering, outlier detection, and trends and research frontiers in data mining.		
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 18% performance on midterm exams, 24% final exam, 28% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

	Laboratory: The final grade in the module is composed of % performance on midterm exams, 18% final exam, 12% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Jiawei Han . (2011). Data mining : concepts and techniques . (03th). Morgan Kaufmann Publishers . Boston . ISBN: 9780123814791.

Competitive Programming

Module name	**Competitive Programming**		
Module level	Undergraduate		
Code	COMP6226001		
Courses	Competitive Programming		
Semester	Odd		
Contact person	Lie Maximilianus Maria Kolbe		
Lecturer	Lie Maximilianus Maria Kolbe		
Language	English		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Exercise and solve problem with students, Exercising the method for some cases, Individual Exercises, Practice in Laboratory), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	apply algorithm techniques and methods	6.1, 6.2
	CLO-2	calculate processing time and memory space of algorithms.	1.1
	CLO-3	Create good and correct algorithm for problem solving	2.1, 2.3
Content	The course describes fundamental concept of design and analysis of algorithms in order to calculate time and space computation, complexity, and compare design algorithm methods. It gives the students ability to choose, apply and create good algorithms to solve algorithmic problems.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 30% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		

Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Thomas H. Cormen . (2009). Introduction to algorithms . (03th). The MIT Press . Cambridge . ISBN: 9780262033848.

Database Design

Module name	**Database Design**		
Module level	Undergraduate		
Code	COMP6481001		
Courses	Database Design		
Semester	Even		
Contact person	Kristien Margi Suryaningrum		
Lecturer	Fepri Putra Panghurian, Kristien Margi Suryaningrum		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Demonstrate problem-solving through case studies, Discussion, Group Discussion, Group Presentation, Lecture), 150 minutes		
Workload	1. Class Hour: 2/1 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define database concept and the stages of database design based on Database System Development Life Cycle	1.2, 6.1
	CLO-2	Describe the relational model and relational algebra	1.2, 6.1
	CLO-3	build Entity Relationship Modelling, normalization and SQL	2.1, 2.2 , 6.2
	CLO-4	analyze database design phases include conceptual, logical, and physical	2.1, 2.2, 6.2
Content	The course introduces the concepts and methodologies of database design. This course gives students knowledge related to database design. This course is a prerequisite for the thesis with database design topic		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 35% final exam, 14% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, 18% final exam, 12% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Thomas Conolly. (2019). Database Systems: A Practical Approach to Design, Implementation, and Management. (6th). Pearson. India. ISBN: 978-9353438913.

Computer Security Fundamental

Module name	**Computer Security Fundamental**		
Module level	Undergraduate		
Code	COMP6542001		
Courses	Computer Security Fundamental		
Semester	Odd		
Contact person	Nadia		
Lecturer	Indra Dwi Rianto, Nadia		
Language	Bahasa		
Relation to curriculum	compulsory, 1st semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Class discussion, Class Presentation, Lecture), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define basic principal of computer security	1.1, 1.2
	CLO-2	explain deployment of basic server technologies	1.2, 2.1, 2.2, 2.3
	CLO-3	describe basic knowledge of malicious software	1.1, 1.2, 2.3
Content	This course educates students on the fundamental of computer security, foundation of concept of security, discusses and performs a simple LINUX system administration, simple shell scripting in LINUX and perform several servers installation on LINUX		
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 25% performance on midterm exams, 40% final exam, 35% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- William stallings & Lawrie Brown. (2012). Computer Security Principles and Practice. (2nd). Pearson. . ISBN: 978-0132775069. - Thomas Myer and Michael Southwell. (2015). Linux Command Line & Shell Scripting Bible. (3th). Wiley & Sons. Indianapolis. ISBN: 978-1-118-98384.

Network Penetration Testing

Module name	**Network Penetration Testing**		
Module level	Undergraduate		
Code	COMP6544001		
Courses	Network Penetration Testing		
Semester	Odd		
Contact person	Yohan Muliono		
Lecturer	Yohan Muliono, Irvan Santoso		
Language	Bahasa		
Relation to curriculum	compulsory, 3rd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Group Discussion, Group Presentation, Individual and Team Assignment, Lecture), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Define Ethical hacking Methodology	2.3,
	CLO-2	Execute ethical hacking method with correct step	2.2, 2.3
	CLO-3	Assess vulnerabilities system with correct method	2.2, 2.3
Content	This course introduces the concepts and practice related to ethical hacking methodology and its implementation. This topic course include: introduction to hacking, linux review, information gathering, target enumeration, vulnerability assessment, network sniffing, remote exploitation, client side exploitation, windows exploit, wireless hacking, web hacking		
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 20% performance on midterm exams, 20% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

	Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Broad J., Bindner A.. (2013). Hacking with Kali: Practical Penetration Testing Techniques. (1st). Syngress. USA. ISBN: 9780124077492.

Software Security

Module name	**Software Security**		
Module level	Undergraduate		
Code	COMP6549001		
Courses	Software Security		
Semester	Even		
Contact person	Yohan Muliono		
Lecturer	Nadia		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Class discussion, Group Presentation, Lecture), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define basic principal of threat modelling	6.1, 6.2
	CLO-2	discuss correct step for managing and addressing threats	3.1, 3.2, 4.2
	CLO-3	describe threat modeling in technologies	3.1, 4.1, 4.2
Content	This course educates students on the fundamental of threat modelling using STRIDE, attack tree and how to design an attack tree. then, educates on how to manage the threats by using defensive tactics and technologies, knowing the trade-off when addressing threats then validating the threats. in the end, students will be able to modelling threats in web and cloud, and know the human factors and usable security in threat modelling.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 40% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		

Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Adam Shostack. (2014). Threat Modeling: Designing for Security. (1st). Wiley. United States. ISBN: 1118809998.

Natural Language Processing

Module name	**Natural Language Processing**		
Module level	Undergraduate		
Code	COMP6576001		
Courses	Natural Language Processing		
Semester	Even		
Contact person	Derwin Suhartono		
Lecturer	Derwin Suhartono, Muhammad Amien Ibrahim		
Language	English		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Discussion, Experiment, Lecture, Project Research, Research, Research Papers and Presentations), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe what is Natural Language Processing and its components	3.1, 3.2
	CLO-2	explain fundamental concepts of how to work with Natural Language Processing	3.1, 3.2
	CLO-3	apply Natural Language Processing concepts in certain real-world applications	4.2, 5.1, 5.2, 6.1, 6.2
	CLO-4	construct Natural Language Processing applications	4.2, 5.1, 5.2, 6.1, 6.2
Content	Natural Language Processing is one specific field in Artificial Intelligence to perform tasks involving human language, human-machine communication, improving human-human communication, or simply doing useful processing of text or speech. This course provides students with the fundamental techniques of Natural Language Processing such as understanding words and their properties, modeling natural language, doing parsing and getting overview of Natural Language Processing applications. By completing this course, students can explain what Natural Language Processing is and describe how to implement the techniques to		

	build an application. To understand this course appropriately, students need to pass and understand Artificial Intelligence course.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 30% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Benjamin Bengfort, Tony Ojeda, Rebecca Bilbro. (2018). Applied Text Analysis with Python, Enabling Language-Aware Data Products with Machine Learning. (Firstth). O'Reilly Media. Sebastopol, United States. ISBN: 9781491963043. - Daniel Jurafsky & James H. Martin. (2008). Speech and Language Processing. (2nd). Prentice Hall. New Jersey. ISBN: 978-0131873216.

Machine Learning

Module name	**Machine Learning**		
Module level	Undergraduate		
Code	COMP6577001		
Courses	Machine Learning		
Semester	Even		
Contact person	Novita Hanafiah		
Lecturer	Andry Chowanda, Felix Indra Kurniadi, Hanry Ham, Hidayaturrahman, Ivan Halim Parmonangan, Muhammad Rizki, Nur Afny Catur Andryani, Silviya Hasana, Simeon Yuda		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Class discussion, Group Discussion, Group Presentation, Lecture, Question and Answer), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the fundamental of machine learning concept	3.1, 3.2
	CLO-2	interpret the distribution of dataset using regression method	3.1, 3.2
	CLO-3	experiment classification and clustering algorithm from given dataset	4.2, 5.1, 5.2, 6.1, 6.2
Content	This course introduces the machine learning concept, how the machine learning works, and challenges in machine learning. The student is taught to analyze the variables and the distribution in a dataset. Moreover, some techniques to tune the parameter and some learning algorithms are presented in the lecture. By completing this course, student will have knowledge to demonstrate classification and clustering for a given dataset.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 30% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Sergios Theodoridis. (2015). Machine Learning, A Bayesian and Optimization Perspective. (Firstth). Jonathan Simpson. India. ISBN: 9780128015223. - Sergios Theodoridis . (2020). Machine Learning: A Bayesian and Optimization Perspective. (2nd). Academic Press. Cambridge, Massachusetts. ISBN: 0128188030. - Aurélien Géron. (2017). Hands-on Machine Learning with Scikit-Learn and Tensorflow. (1st). O'Reilly Media, Inc.. -. ISBN: 978-1-491-96229. - Sandhya Samarasinghe. (2006). Neural Network for Applied Sciences and Engineering. (-th). Auerbach Publications. -. ISBN: 978-0-8493-3375.

Big Data Processing

Module name	**Big Data Processing**		
Module level	Undergraduate		
Code	COMP6579001		
Courses	Big Data Processing		
Semester	Even		
Contact person	Edy Irwansyah		
Lecturer	Wawan Cenggoro, Fepri Putra Panghurian, Edy Irwansyah		
Language	English		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Demonstration, exercise and solve problem with students, Lecture, project), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define big data processing concepts	1.2, 2.1
	CLO-2	explain big data architecture layers	1.2, 2.1
	CLO-3	demonstratebig data analytics and visualizations	2.1, 2.2, 6.1, 6.2
	CLO-4	Differentiate big data case studies	6.1, 6.2
Content	This course consists of big data processing skills in particularly using Hadoop, Spark, and other big data softwares. Its gives student knowledge and skill in covering big data introduction, big data architectures, all big data layers, big data analytics, big data visualization, and its current trends.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 35% final exam, 14% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, 18% final exam, 12% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Arshdeep Bahga & Vijay Madisetti. (2019). Big Data Analytics: A Hands-On Approach. (Seconth). VPT. India. ISBN: 9781949978001. - Arshdeep Bahga & Vijay Madisetti. (2016). Big Data Science & Analytics: A Hands-On Approach. (1st Eth). VPT. India. ISBN: 9781949978001.

Computer Graphics

Module name	**Computer Graphics**		
Module level	Undergraduate		
Code	COMP6583001		
Courses	Computer Graphics		
Semester	Odd		
Contact person	Hady Pranoto		
Lecturer	Hady Pranoto, Reinert Yosua Rumagit, Muhamad Fajar		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Group Assignments, Group Presentation, Lecture, Wacthing Video, VCD, Film, multimedia), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define Computer graphics system and architectures	2.1
	CLO-2	explain graphic with WebGL and viewing in graphic programming	2.1
	CLO-3	apply raster graphics, clipping, graphic transformation, illumination, lighting, shading, texture, and object modeling algorithms in 2D/3D	2.2
	CLO-4	analyze raster graphics, clipping, graphic transformation, illumination, lighting, shading, texture, and object modeling algorithms in 2D/3D	2.2
	CLO-5	construct raster graphics, clipping, graphic transformation, illumination, lighting, shading, texture, and object modeling algorithms in 2D/3D	2.2

Content	This course offers an in-depth exploration of fundamental concepts in 2D and 3D computer graphics. It introduces 2D raster graphics techniques, including scan conversion, image processing, interaction techniques and user interface design. The bulk of the course is devoted to 3D modeling, geometric transformations, and 3D viewing and rendering.Javascript and the graphics library WebGL are used throughout the course, as is shader programming on the GPU, taught from the first lab onwards. The final project is typically a small group project specified and implemented by the group using shaders to create special effects.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 28% final exam, 21% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Edward Angel, David Shreiner. (2014). Interactive computer graphics : a top-down approach with WebGL. (7th). Pearson, Addison Wesley. Boston. ISBN: 978-0133574845. - Matsuda, Kouichi. Lea, Rodger. (2013). WebGL Programming Guide: Interactive 3D Graphics Programming with WebGL. (1st). Addison Wesley. Upper Saddle River, NJ. ISBN: 978-0-321-90292.

Network and System Programming

Module name	**Network and System Programming**		
Module level	Undergraduate		
Code	COMP6584001		
Courses	Network and System Programming		
Semester	Odd		
Contact person	Ivan Sebastian Edbert		
Lecturer	Fajar Suprapto, Tatang Gunar Setiadji, Taslim Rochmadi, Rony Baskoro Lukito, Zulfany Erlisa Rasjid, Cahya Lukito, Rubil, Sulasno, Bayu Kanigoro, Josef Bernadi Gautama, Indrabudhi Lokaadinugroho, Melki Sadekh Mansuan, Muhammad Taufiq Zulfikar, Wawiko Supeno, Michael Wairisal, Putri Sanggabuana Setiawan		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Class discussion, Exercise and solve problem with students, Lecture), 100 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the concept of network programming techniques	2.1, 2.2
	CLO-2	demonstrate some programs with common protocols used in computer network	2.1, 2.2, 6.1, 6.2
	CLO-3	select network programming techniques and protocols for solving a problem	6.1, 6.2
Content	This course consists in network programming concept and techniques that enable processes to communicate with each other across computer network. The students taking this course will have an experience and skill of writing simple client-server application program.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 20% performance on midterm exams, 40% final exam, 15% take-home assignments. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of 25% performance on Lab Assignment. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	• Van Winkle, Lewis. (2019). Hands-On Network Programming with C: Learn socket programming in C and write secure and optimized network code. (1st).Packt Publishing Ltd. UK. ISBN: 978-1789349863.

Embedded Systems

Module name	**Embedded Systems**		
Module level	Undergraduate		
Code	COMP6586001		
Courses	Embedded Systems		
Semester	Odd		
Contact person	Bayu Kanigoro		
Lecturer	Muhammad Ihsan Arief N., Cahya Lukito		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Class Presentation, Lecture), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain IoT concept, history, architecture, IoT components, and Embedded platform for IoT	2.1 2.2
	CLO-2	illustrate IoT impact on real life and industry	2.1 2.2
	CLO-3	define IoT concept, history, architecture, IoT components, and Embedded platform for IoT	6.1 6.2
Content	This course emphasizes the theory, practical, real case study, and practical implementation of Embedded System in an IoT (Internet of Things). The theory covers the evolution of IoT, it's architecture, components, protocols, Embedded System as a platform of IoT, Cloud services. This course also covers advanced aspects such as security, analytics, and machine learning built on such IoT implementation. At the end, of course, students are expected to explain IoT history, illustrate its impact to real life and industries, describe the architecture, design and implement the IoT application using Embedded System, analyze IOT data, and evaluate the significance of IoT in an industry now and in the future.		

Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 50% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Perry Lea. (2018). Internet of Things for Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security. (1st). Packt Publishing Ltd. Birmingham. ISBN: 97817884

Game Design Programming

Module name	**Game Design Programming**		
Module level	Undergraduate		
Code	COMP6589001		
Courses	Game Design Programming		
Semester	Odd		
Contact person	Hady Pranoto		
Lecturer	Yanfi		
Language	English		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Class Presentation, Group Assignments, Lecture), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain general game theories and game development process	2.1
	CLO-2	explain game development in Unity Programming	2.2
	CLO-3	construct Game Design Documentation and Appropriate Game	2.2
	CLO-4	apply techniques in 2D and 3D game programming	2.3
	CLO-5	designUser Interface for Game Development	3.1
	CLO-6	deploygame application using Unity	-

Content	This course comprises general game theories, game design concepts, and implementation. It gives students basic knowledge of the player-centric approach to the process of game design and its implementation. This course also provides an introduction about programming games in Unity. The students will learn about fundamental component system underlying in Unity such as write and execute basic scripts, create the assets, developing graphics in 2D and 3D games, adding interactive devices and items within the game, and building the final app also deploy to other platform. The Game Design Course is the prerequisite for this course.
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 50% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Ernest Adams. (2013). Fundamentals of Game Design. (3rd Eth). New Riders. United States of America. ISBN: 978-0321929679. - Joseph Hocking. (2018). Unity in Action: Multiplatform game development in C#. (2nd). Manning. -. ISBN: 9781617294969.

Geographical Information System

Module name	**Geographical Information System**		
Module level	Undergraduate		
Code	COMP6590001		
Courses	Geographical Information System		
Semester	Odd		
Contact person	Edy Irwansyah		
Lecturer	Edy Irwansyah, Fepri Putra Panghurian		
Language	English		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Demonstration, Discussing the cases, Lecture, project), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain gis concept and data model	1.2, 2.1
	CLO-2	describe gis data	1.2, 2.1
	CLO-3	designgeodatabase	2.2, 6.1
	CLO-4	apply spatial analysis using GIS tools	2.2, 6.1, 6.2
	CLO-5	analyze GIS data standards and future trends	2.2, 6.1, 6.2
Content	This course comprises principle concept, design, development, and matters relating to the geographical information system (GIS) project development. Its gives students basic knowledge related to the spatial analysis, technology, and skill to develop the geographical information system application		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 18% performance on midterm exams, 30% final exam, 28% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, 24% final exam, % take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Paul Bolstad. (2019). GIS Fundamentals: A First Text on Geographic Information Systems. (Sixthth). XanEdu Publishing Inc. Minnesota. ISBN: 978-1593995522.

Computer Forensic

Module name	**Computer Forensic**		
Module level	Undergraduate		
Code	COMP6646001		
Courses	Computer Forensic		
Semester	Odd		
Contact person	Nadia		
Lecturer	Aditya Kurniawan		
Language	English		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Class discussion, Lecture), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define Basic of Computer Forensic	6.1, 6.2
	CLO-2	use Tools for performing Computer Forensic	4.1, 4.2, 5.1, 5.2, 6.1, 6.2
	CLO-3	describe Computer Forensic Technique	4.1, 4.2, 5.1, 6.1, 6.2
Content	This course introduce the concepts and practice related to digital cyber forensics. this topic course include: introduction to cyber forensics, key technical concepts of cyber forensics, tools in cyber forensic, collecting evidence, antiforensics, legal, computer forensic		
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 40% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments		

Reading List	- Shiva V. N. Parasram. (2020). Digital Forensics with Kali Linux - Second Edition. (2nd). Packt Publishing. Birmingham. ISBN: 9781838640804. - Suzanne Widup. (2014). Computer Forensics and Digital Investigation with EnCase Forensic v7. (1st). McGraw-Hill Education. Pennsylvania. ISBN: 78-0071807913.

Secure Programming

Module name	**Secure Programming**		
Module level	Undergraduate		
Code	COMP6695001		
Courses	Secure Programming		
Semester	Odd		
Contact person	Yohan Muliono		
Lecturer	Aditya Kurniawan		
Language	English		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Lecture, Practice in Laboratory, Project Work), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO) = LO**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Describe Web Technology Environment	3.1, 6.1, 6.2
	CLO-2	Construct Web Application	2.1, 2.2, 3.2, 6.1
	CLO-3	Apply Web Security Method	2.2, 2.3, 3.1
Content	This course introduces the concepts and practice related to securing web technology in advanced. This topics include Web Technology Environment, Web Structure Decision and Repetition, Web Session, Cookies and Request Response, Web Array and File Uploading, Web Dangerous Function and Regular Expression, Web Database, Web Javascript, AJAX and JSON, Web Form Processing Security, Web Database and SQL Security,Web Authentication Security, Web Data Lost Prevention, Web Securing Network Connection		
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 40% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Thomas Myer and Michael Southwell . (2010). Pro PHP Security: Fro Application Security Principles to the Implementation of XSS Defense . (02 th). Apress. New York . ISBN: 9780077109080.

Research Methodology in Computer Science

Module name	**Research Methodology in Computer Science**		
Module level	Undergraduate		
Code	COMP6696001		
Courses	Research Methodology in Computer Science		
Semester	Even		
Contact person	Hidayaturrahman		
Lecturer	Felix Indra, Budi Juarto, Derwin Suhartono, Henry Lucky, Ikhtiar Faahakhododo, Anang Prasetyo, Kristien Margi, Rezki Yunanda, Irene Anindaputri Iswanto, Hidayaturrahman, Muhamad Keenan, Alexander Agung Santoso Gunawan, Anderies , Meiliana, Muhamad Fajar, Hady Pranoto, Ade Putera, Puti Andam, Muhammad Edo, Jurike V. Moniaga, Bakti Amirul, Andry Chowanda, Dimas Ramdhan, Rhio Sutoyo, Said Achmad, Yogi Udjaja, Bayu Kanigoro, Yulianto, Azani Cempaka Sari, Eko Setyo, Yohan Muliono, Aditya Kurniawan, Said Achmad, Fredy Purnomo, Risma Yulistiani, David David, Ika Dyah, Edy Irwansyah, Nurhasanah, Alvina Aulia, Ivan Sebastian		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Group Presentation, Lecture, Project Research), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe the basics of writing research paper and the research lifecycle	-
	CLO-2	select the research topic, literature and writing strategies used in the project	4.1
	CLO-3	analyze the results from the research study	4.2
	CLO-4	Write research paper with the appropriate format	-

Content	The course is intended to spefically focus in writing research paper. In order to write a good research paper, thus the course describes the research type, the lifecycle of research, and the process to proceed a research. The course explain the process starts from selecting research topic, review of the literature, the theory used and writing strategies. Subsequentyly, the explaination of paper format and picking the right journal are also covered in this course. As become important issues in process of conducting research paper, this course also highlight several topics such as the ethics of scientific publication, authorship and plagiarism At the end, this course also describe the peer review process. The aim of this course to give student a good insight of how they will conduct their research paper when they are having their Thesis or Final Project.
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 30% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- John W. Creswell, J. David Creswell. (2017). Research Design Qualitative, Quantitative, and Mixed Methods Approaches. (Fifthth). SAGE Publications. United Kingdom. ISBN: 9781506386713. - Chris A. Mack. (2018). How to Write a Good Scientific Paper. (1st). Society of Photo-Optical Instrumentation Engineers (SPIE). Bellingham, Washington USA . ISBN: 978-1-5106-1913.

Operating System

Module name	**Operating System**		
Module level	Undergraduate		
Code	COMP6697001		
Courses	Operating System		
Semester	Odd		
Contact person	Zulfany Erlisa Rasjid		
Lecturer	Tatang Gunar Setiadji, Anderies Anderies, Fajar Suprapto. Rony Baskoro Lukito, Zulfany Erlisa Rasjid, Rubil, Bayu Kanigoro, Benfano Soewito, Henry Chong, Martin Suhartana		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Class discussion, Group Discussion, Hands-on Practice, Individual Exercises, Lecture, project, Question and Answer), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe each of the components of the Operating Systems and their interrelationship	1.2, 2.3
	CLO-2	demonstrate different techniques of the design of the Operating System	2.3, 6.1
	CLO-3	relate the fundamental design to the current development of Operating System	1.2, 2.3, 6.1
	CLO-4	demonstrate the skills in programming to write user programs to interact with the operating system	1.2, 2.3, 6.1
Content	This course covers the basic concepts of the Operating System taking examples from the two most commonly used Operating Systems, UNIX and Windows, and discusses the fundamentals of Operating System design in each of the main components of the Operating Systems, i.e. Process Management, Memory Management, I/O Management, File Management and Computer Security. This course covers systems		

	programming using C programming language. It is required for students to have basic knowledge in C.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 25% performance on midterm exams, 40% final exam, 35% take-home assignments, 10% in-class participation. Students must have a final grade of C to pass The final grade in the module is composed of % performance on midterm exams, % final exam, % take-home assignments, 10% in-class participation. Students must have a final grade of C to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- William Stallings. (2018). Operating Systems: Internals and Design Principles. (9th). Pearson Education Limited. USA. ISBN: 9781292214290. - Abraham Silberschatz, Peter B. Galvin, Greg Gagne . (2018). Operating Systems Concept. (10th). John Wiley & Sons, Inc.. Hoboken, NJ. ISBN: 978-1-119-32091. - Andrew S. Tanenbaum and Herbert Bos. (2018). Modern Operating Systems. (4th). Pearson Education Limited. New Jersey. ISBN: 978-0-13-359162.

Distributed Cloud Computing

Module name	**Distributed Cloud Computing**		
Module level	Undergraduate		
Code	COMP6710001		
Courses	Distributed Cloud Computing		
Semester	Even		
Contact person	Said Achmad		
Lecturer	Said Achmad, Muhammad Edo Syahputra		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Group Discussion, Lecture), 150 minutes		
Workload	1. Class Hour: 2/1 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define distributed system concepts, distributed system models and technologies for based system	1.2, 2.1,2.2
	CLO-2	explain the concepts of enabling technologies, computer cluster, virtual machines, and virtualization of clusters	2.2,6.1
	CLO-3	apply to make service-oriented architectures for distributed computing, and can apply to build cloud services	6.1,6.2
Content	This course consists of Introduction to Distributed Cloud Computing. The objective of this course is to give students a basic grounding in designing and implementing distributed and cloud systems. Developers of cloud services question how those services should be implemented		
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 35% final exam, 14% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

	Laboratory: The final grade in the module is composed of % performance on midterm exams, 18% final exam, 12% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Kai Hwang, Jack Dongarra, Geoffrey C. Fox. (2013). Distributed and Cloud Computing: From Parallel Processing to the Internet of Things. (1st). British Library Cataloguing. United States of America. ISBN: 978-0123858801.

Program Design Methods

Module name	**Program Design Methods**		
Module level	Undergraduate		
Code	COMP6798001		
Courses	Program Design Methods		
Semester	Odd		
Contact person	Renaldy Fredyan		
Lecturer	Ditdit Nugeraha Utama, Kenny Jingga, Dwi Nurmelly Handayani, Gintoro Gintoro, Yasri, Azani Cempaka Sari, Nyoman Ayu Gita Gayatri,Burhanudin, , Dwi Nurmelly Handayani, H. Mohammad Subekti, Reina Reina, Yulyani Arifin, Gintoro, Yasri, Irma Irawati Ibrahim, Budi Yulianto, Meiliana, Irma Kartika Wairooy, Julian Wesley, Gradiyanto Sanjaya, Irvan Santoso, Hanry Ham, Ditdit Nugeraha Utama		
Language	Bahasa		
Relation to curriculum	compulsory, 1st semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Class discussion, Demonstration, Exercise and solve problem with students, Group Discussion, Project Work, Tutorial), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the requirements of writing a program or system	1.2, 2.1
	CLO-2	apply pseudo-code to solve problem	2.1, 6.1
	CLO-3	analyze the requirements of a system	6.1, 6.2
	CLO-4	solve system design problems using UML	2.1, 6.1, 6.2

Content	This course educates students to solve problems using language independent solution and design programs and systems using UML modeling.
Study and examination requirements and forms of examination	The final grade in the module is composed of 35% performance on midterm exams, 35% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of C to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Tony Gaddis. (2019). Startig Out with Programming Logic and Design. (5th). Pearson. New York. ISBN: 978-0-134801155. - Alan Dennis, Barbara Haley Wixom, David Tegarden. (2015). Systems Analysis and Design An Object-Oriented Approach with UML. (5th). John Wiley & Sons, Inc.. New Jersey. ISBN: 978-1-118-80467.

Database Technology

Module name	**Database Technology**		
Module level	Undergraduate		
Code	COMP6799001		
Courses	Database Technology		
Semester	Odd		
Contact person	Kristien Margi Suryaningrum		
Lecturer	Dewi Suryani, Diana, Eko Setyo Purwanto, Fepri Putra Panghurian, Hendri, Henry Lucky, Kristien Margi Suryaningrum, Said Achmad, Santy, Fredy Purnomo, Ferdy Nirwansyah, Hanis Amalia		
Language	Bahasa		
Relation to curriculum	compulsory, 3rd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Demonstration, Discussion, Lecture), 150 minutes		
Workload	1. Class Hour: 2/1 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define model data and information in the form of concept diagrams and physical diagrams and apply them to the database in a DBMS, both individually and in teamwork	1.2, 2.2, 2.1
	CLO-2	explain the concepts of relational algebra, DDL, DML, transaction management on database and concurrency control	1.2, 2.2, 2.1,
	CLO-3	apply to make database applications to manipulate data in databases	6.1, 6.2
Content	This course consists of Introduction to Database Technology. It gives students knowledge and skill capable of collecting, digitalizing, representing, and introducing them to principles of database management, such as designing databases using relational models, applying normalization, querying data with structured query language (DDL and DML), transaction processing, and database interactions.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 25% final exam, 24% take-home assignments, 10% in-class participation. Students must have a final grade of C to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, 14% final exam, 16% take-home assignments, 10% in-class participation. Students must have a final grade of C to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Ramez Elmasri, Shamkant Navathe. (2015). Fundamentals of Database Systems 7th Edition. (7th). Pearson. New York. ISBN: 978-0133970777. - Ramakrishnan, Raghu, Gehrke, Johannes. (2009). Database Management Systems. (3th). McGraw-Hill. New York. ISBN: 978-0072465631.

Human and Computer Interaction

Module name	**Human and Computer Interaction**		
Module level	Undergraduate		
Code	COMP6800001		
Courses	Human and Computer Interaction		
Semester	Even		
Contact person	Reinert Yosua Rumagit		
Lecturer	Livia Ashianti, Kenny Jingga, Muhammad Taufiq Zulfikar, Kanyadian Idananta, Livia Ashianti, Yulyani Arifin, Muhammad Taufiq Zulfikar, Yanfi, Violitta Yesmaya, Muhammad Taufiq Zulfikar, Jurike V. Moniaga, Melki Sadekh Mansuan		
Language	Bahasa		
Relation to curriculum	compulsory, 2nd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Class Presentation, Group Discussion, Lecture, Project Work), 150 minutes		
Workload	1. Class Hour: 2/1 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe the concept of interaction design	3.1
	CLO-2	use guidelines, principles, models, and framework related with interaction design	6.1,6.2
	CLO-3	choose the data gathering technique from user to develop successful interaction design	3.1,3.2
	CLO-4	designthe user requirements with interaction styles	2.1,
	CLO-5	evaluate the user interfaces of interactive software	2.2,2.3

Content	This course comprises the human factors in interactive software, theories, principles and guidance in interface development, interface components, interface styles, disciplines associated with design and evaluation of user interface in order to support the usability. This course gives students the ability to design and evaluate the user interface.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 15% performance on midterm exams, 30% final exam, 25% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Helen Sharp, Jennifer Preece, Yvonne Rogers. (2019). Interaction Design. (5th). Wiley. San Fransisco. ISBN: 978-1119547259.

Object Oriented Programming

Module name	**Object Oriented Programming**		
Module level	Undergraduate		
Code	COMP6820001		
Courses	Object Oriented Programming		
Semester	Odd		
Contact person	Muhammad Fikri Hasani		
Lecturer	Herru Darmadi, Rulyna, Kartika Purwandari, Yesun Utomo,Dewi Suryani, Livia Ashianti, Budi Yulianto, Fidelson Tanzil		
Language	English		
Relation to curriculum	compulsory, 3rd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Individual Exercises, Lecture, Question and Answer), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	analyze - solution for problem solving	1.2
	CLO-2	apply - object oriented programming for problem solving	2.2
	CLO-3	design- object oriented based program	1.2
	CLO-4	construct- program using object oriented programming to solve problem solving	2.2
Content	Object Oriented Programming is one of the programing paradigm that widely used and almost all of the industry uses these paradigm to develop the application program. The main features are ADT, inheritance, dynamic binding, to perform true polymorphism, generic programming, and others. After completion of this course, student will be able to analyze and construct program using object oriented programming		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 50% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Y. Daniel Liang. (2019). Introduction to Java Programming and Data Structures, Comprehensive Version. (11th). Pearson Education. Essex. ISBN: 978-1292221878.

Web Programming

Module name	**Web Programming**		
Module level	Undergraduate		
Code	COMP6821001		
Courses	Web Programming		
Semester	Odd		
Contact person	Reinert Yosua Rumagit		
Lecturer	Junita Juwita Siregar Josef Bernadi Gautama Tegar Arto Sulthon Musthofa Pualam Dipa Nusantara Reinert Yosua Rumagit Dwinanda Kinanti Suci Sekarhati Anderies Anderies Rani Puspita		
Language	English		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Group Assignments, Group Presentation, Lecture, Wacthing Video, VCD, Film, multimedia), 200 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Describe concept of web programming	3.1,3.2
	CLO-2	Design web-based applications with structured approach	4.1,4.2
	CLO-3	Identify a proper web programming technic to build web based application	4.1,4.2
	CLO-4	Create web-based applications using PHP Framework to solve problems that occur in the IT field	5.1,5.2,6.1,6.2

Content	Web Programming course gives a guidance how the way to design and develop a Static and dynamic website. This subject explains the concept of web programming with PHP and using Laravel Framework. Laravel is a web application framework with expressive, elegant syntax. Laravel is accessible, yet powerful, providing tools needed for large, robust applications.
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 40% final exam, 30% take-home assignments. Students must have a final grade of C to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (200 minutes each) and one final exam (2200 minutes), short computer-based quizzes, take-home written assignments
Reading List	• Andy Turner. (2022). Laravel 9.x | PHP Learning Laravel with Easiest Way: The book will teach you Laravel 9.x step by step. 1. Taylor Hicks. -. ISBN: 9798839740273. • Daniel Charles Foreman. (2022). Build responsive websites With HTML5 and Bootstrap 5: Learn the most popular web technologies, HTML, CSS, and Bootstrap. (Web Foundation). 1. Independently published . English. ISBN: 9798354031986.

Speech Recognition

Module name	**Speech Recognition**		
Module level	Undergraduate		
Code	COMP6822001		
Courses	Speech Recognition		
Semester	Even		
Contact person	Hidayaturrahman		
Lecturer	Amalia Zahra, Nicholaus Hendrik		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Discussion, Group Work, Independent Learning, Lecture, Reading, Wacthing Video, VCD, Film, multimedia), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the fundamental of speech recognition	3.1, 3.2
	CLO-2	executeproper speech recognition experiments workflow	3.1, 3.2
	CLO-3	analyze the strengths and weaknesses of a system that utilizes speech technology	3.1, 3.2
	CLO-4	construct speech recognition system to solve real problems	4.2, 5.1, 5.2, 6.1, 6.2
Content	This course introduces students to the technology of speech recognition. The content of this course comprises the theoretical and practical aspects of speech recognition, ranging from the history, codebase, experimentation workflow, feature extraction, downstream task, practical application, and future potential. Completing this course provides students with an insight into speech recognition and the capability to apply it to real-world cases.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 21% final exam, 28% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, 18% final exam, 12% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Daniel Jurafsky, James Martin. (2008). Speech and Language Processing. (2nd). Prentice Hall. New Jersey. ISBN: 9780131873216.

Multimedia Systems

Module name	**Multimedia Systems**		
Module level	Undergraduate		
Code	COMP6823001		
Courses	Multimedia Systems		
Semester	Even		
Contact person	Hady Pranoto		
Lecturer	Junita Juwita Siregar, Thomas Galih Satria, Burhanudin, Melki Sadekh Mansuan		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Discussion, Individual and Team Assignment, Lecture, Project Work, Question and Answer), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain interactive multimedia and multimedia elements.	3.1, 3.2
	CLO-2	Choosesuitable multimedia elements for multimedia applications	2.1,3.2
	CLO-3	Createsimple multimedia application	2.2, 6.1 ,6.2
	CLO-4	Choosethe multimedia delivery methods for multimedia applications	2.3, 3.2
Content	This course comprises interactive multimedia principles, multimedia elements, design process, simple application production, and matters relating to latest multimedia development and technology. By completing this course, students will have basic knowledge related to multimedia and able to develop simple multimedia. This course is prerequisite for Interactive Multimedia concentration.		

Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 50% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Tay Vaughan. (2014). Multimedia: Making It Work. (9th). Mike Murach & Associates. Singapore. ISBN: 97800718328855. - Muneesawang, Paisarn. (2014). Multimedia Database Retrieval: Technology and Applications. (1st). Springer. London. ISBN: 978-3-319-11781. - Savage,Vogel. (2014). An Introduction to Digital Multimedia. (1st). Jones & Bartlett Learning. Burlington. ISBN: 978-1-4496-8839.

Computer Security

Module name	**Computer Security**		
Module level	Undergraduate		
Code	COMP6824001		
Courses	Computer Security		
Semester	Even		
Contact person	Nadia		
Lecturer	Indra Dwi Rianto, Nadia		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Case Study, Group Discussion, Individual and Team Assignment, Lecture), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain To explain the security principles, threats, attacks and security strategy	2.1 2.2
	CLO-2	evaluate To evaluate different strategies to handle security threats and attacks	2.1 2.2
	CLO-3	apply To apply different techniques in handling computer and network security	2.1 2.2 6.1 6.2
	CLO-4	DesignTo design protection server and client	6.1 6.2
Content	This course is to provide students with knowledge on Computer security, threats and strategies to provide security in a computer system covering the security computer systems, encryption, internet and wireless connection including designing security protocols, and protection the server and client.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 35% final exam, 14% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, 18% final exam, 12% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Crystal Panek. (2020). Security Fundamentals. (1st). Sybex, a Wiley Brand. Canada. ISBN: ?978-1119650669. - Richard Blum and Christine Bresnahan. (2021). Linux Command Line and Shell Scripting Bible. (1st). Wiley. Indianapolis. ISBN: 978-1-119-70091. - William Stallings and Lawrie Brown. (2018). Computer Security: Principles and Practice. (4th). Pearson Education Limited. New Jersey. ISBN: 10: 0-13-479410.

Introduction to Cloud Infrastructure

Module name	**Introduction to Cloud Infrastructure**		
Module level	Undergraduate		
Code	COMP6825001		
Courses	Introduction to Cloud Infrastructure		
Semester	Even		
Contact person	Ivan Sebastian Edbert		
Lecturer	Ivan Sebastian Edbert, Henry Lucky		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Lecture, Presentation), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	identifyproblems that can be solved using cloud global infrastructure	2.1, 2.2
	CLO-2	groupClassify real-worlds problems in accordance with cloud computing infrastructure	2.1, 2.2
	CLO-3	analyze identifying problems and choose proper Cloud Services and Cloud Infrastructure	2.1, 2.2
	CLO-4	design Cloud computing architecture and infrastructure and implementation on applciations	2.1, 2.2 6.1, 6.2
Content	This course presents a top-down view of cloud computing, cloud applications and implementations, and cloud infrastructure. The main focus of this course is understanding cloud concepts and cloud infrastructure. In this course, student will be required to complete AWS Cloud Foundation certification		
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 50% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Dan C. Marinescu. (2022). Cloud Computing: Theory and Practice 3rd Edition. (3th). Morgan Kaufmann. United States. ISBN: 978-0323852777.

Algorithm Design and Analysis

Module name	**Deep Learning**		
Module level	Undergraduate		
Code	COMP6826001		
Courses	Deep Learning		
Semester	Odd		
Contact person	Hidayaturrahman		
Lecturer	Felix Indra Kurniadi, Alexander Agung Santoso Gunawan		
Language	Bahasa		
Relation to curriculum	compulsory, 5rd semester		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Class discussion, Exercise and solve problem with students, Lecture), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Explain the fundamental deep learning theory	3.1, 3.2
	CLO-2	Execute a proper deep learning experimentation workflow	3.1, 3.2
	CLO-3	Analyze a theoretical deep learning model	3.1, 3.2
	CLO-4	Compose a deep learning code	4.2, 5.1, 5.2, 6.1, 6.2
Content	This course introduces students to the recent trends of Artificial Intelligence that utilize Deep Learning. The content of this course comprises the theoretical and practical aspects of Deep Learning, ranging from the history, codebase, experimentation workflow, model abstraction, model implementation, practical application, and future potential. The completion of this course provides students with the insight of Deep Learning and the capability to apply it to real-world cases.		

Study and examination requirements and forms of examination	The final grade in the module is composed of 21% performance on midterm exams, 21% final exam, 28% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	• Antonio Gulli, Amita Kapoor, Sujit Pal. (2019). Deep Learning with TensorFlow 2 and Keras: Regression, ConvNets, GANs, RNNs, NLP, and more with TensorFlow 2 and the Keras API, 2nd Edition. 2. Packt Publishing. Birmingham, United Kingdom. ISBN: 978-1838823412 . • Laura Mitchell, Sri. Yogesh K., Vishnu Subramanian. (2019). Deep Learning with PyTorch 1.x: Implement deep learning techniques and neural network architecture variants using Python. 2nd. Packt Publishing. Birmingham. ISBN: 978-1838553005 . • Nikhil Buduma, Nicholas Locascio. (2017). Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms. 1st. O'Reilly Media. Sebastopol. ISBN: 978-1491925614 .

Linux Systems Administraton and Security

Module name	**Linux Systems Administraton and Security**		
Module level	Undergraduate		
Code	COMP6827001		
Courses	Linux Systems Administraton and Security		
Semester	Odd		
Contact person	Ivan Sebastian Edbert		
Lecturer	Fajar Suprapto, Tatang Gunar Setiadj, Taslim Rochmadi, Rony Baskoro Lukito, Zulfany Erlisa Rasjid, Cahya Lukito, Rubil, Sulasno, Bayu Kanigoro, Josef Bernadi Gautama, Indrabudhi Lokaadinugroho, Melki Sadekh Mansuan, Muhammad Taufiq Zulfikar, Wawiko Supeno, Michael Wairisal, Putri Sanggabuana Setiawan		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Class Presentation, Combine Tutorial, exercise and solve problem with students), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Describe Linux on Virtual systems	2.1 2.2
	CLO-2	Apply security and administration on Linux	2.1 2.2
	CLO-3	Deploy a secure linux system	6.1 6.2
Content	The courses introduces the idea of using Linux on a virtual system and provides information on the different distributions of Linux, how to determine which distros work best for you and download that onto your system. This Courses also explain the importance of a root account and the other accounts on the server., how you can grant and revoke privileges to users to help you protect the data and control access to users.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 20% performance on midterm exams, 40% final exam, 15% take-home assignments. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	• Andy Vickler (2021) Linux: Linux Security and Administration, ISBN: 9798807612755

Server and Network Administration

Module name	**Server and Network Administration**		
Module level	Undergraduate		
Code	COMP6842001		
Courses	Server and Network Administration		
Semester	Even		
Contact person	Nadia		
Lecturer	Yohan Muliono Nadia		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Presentation, Case Study, Group Exercises, Lecture, Presentation), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Describe basic usage and methodology of DevOps pipeline	6.1, 6.2
	CLO-2	describe basic concept and methodology of DevSecOps approach	5.1, 5.2, 6.1, 6.2
	CLO-3	apply a correct approach to protect application deployment	4.1, 4.2, 5.1, 5.2
	CLO-4	analyze and evaluate network and system monitoring logs	4.1, 4.2, 5.1
Content	This course introduces the concepts and practice related to DevOps culture and DevSecOps pipeline, specifically on cloud computing and cloud deployment. This course also reviews some of the best practices in managing and analyzing logs to identify incoming threat. This topic course includes introduction to DevOps pipeline, version control fundamentals, Docker and containerization, CI/CD pipeline, DevSecOps paradigms and approaches, as well as log storing and log analysis approaches.		

Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 50% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Julien Vehent. (2018). Securing DevOps : Security in The Cloud. (1st). Manning. Shelter Island. ISBN: 1617294136. - Rafal Leszko. (2019). Continuous Delivery with Docker and Jenkins: Create secure applications by building complete CI/CD pipelines. (2nd). Packt Publishing. Birmingham. ISBN: 978-1838552183.

Network Penetration Testing

Module name	**Reverse Engineering and Binary Exploitation**		
Module level	Undergraduate		
Code	COMP6843001		
Courses	Reverse Engineering and Binary Exploitation		
Semester	Odd		
Contact person	Chrisando Ryan Pardomuan S		
Lecturer	Chrisando Ryan Pardomuan S Franz Adeta Junior		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Group Discussion, Group Presentation, Individual and Team Assignment, Lecture), 200 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Analyze binary program through reverse engineering approach	3.1 & 6.1
	CLO-2	Execute static analysis, dynamic analysis and debugging against binary programs	4.2 & 6.1
	CLO-3	Describe and create exploitation to vulnerable binary programs	4.1 & 6.2
Content	This course introduces the concepts and practice related to ethical hacking methodology and its implementation. This topic course include: introduction to hacking, linux review, information gathering, target enumeration, vulnerability assessment, network sniffing, remote exploitation, client side exploitation, windows exploit, wireless hacking, web hacking		

Study and examination requirements and forms of examination	The final grade in the module is composed of 20% performance on midterm exams, 20% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Eldad Eilam. (2005). Reversing: Secrets of Reverse Engineering. Wiley. ISBN: 0764574817.

Mobile Penetration Testing

Module name	**Mobile Penetration Testing**		
Module level	Undergraduate		
Code	COMP6844001		
Courses	Mobile Penetration Testing		
Semester	Even		
Contact person	Nadia		
Lecturer	Yohan Muliono Chrisando Ryan P		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Group Discussion, Individual Work, Lecture), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Describe Android Application Life Cycle and Fundamental	3.2, 5.1, 6.1, 6.,2
	CLO-2	Perform Static Analysis and Dynamic Analysis of Android Application	2.3, 3.1, 5.2, 6.1
	CLO-3	Identify API and Android Application Vulnerabilities	3.1, 5.1, 6,2
	CLO-4	Analyze and Recommend Hardening Strategy for Android Application	2.2, 3.1, 3.2, 6.2
Content	This course introduces the concepts and practice related to mobile penetration testing methodology, focused on Android-based applications. This topic course includes introduction to mobile application security, fundamental of Android environment and life cycle, static and dynamic analysis, mobile penetration testing standards and testing guides, dynamic instrumentation, API penetration testing, and hardening techniques for Android applications.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 28% final exam, 21% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Dominic Chell, Tyrone Erasmus, Shaun Colley, Ollie Whitehouse. (2015). The Mobile Application Hacker's Handbook. (1st). John Wiley & Sons. Canada. ISBN: 978-1118958506.

Basic Programming for Automation

Module name	**Basic Programming for Automation**		
Module level	Undergraduate		
Code	COMP6857001		
Courses	Basic Programming for Automation		
Semester	5		
Contact person	Muhammad Fikri Hasani		
Lecturer	Muhammad Fikri Hasani		
Language	Bahasa		
Relation to curriculum	compulsory, semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Demonstrate problem-solving through case studies, exercise and solve problem with students, Individual Exercises, Lecture, Tutorial), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain About algorithm and its representation	1.1, 2.1
	CLO-2	apply C# programming language for problem solving	2.2
	CLO-3	construct Simple program using c# programming language	2.2
	CLO-4	explain About c# usage and application for automation	1.1
Content	This course comprises of introduction of algorithm and programming in c# language, how to make basic program in c#, and solve basic problems using c#. Upon completing this course, student will have basic knowledge on c# programming language and able to solve basic problems with c#. This course is the preliminary course for the automation minor program		

Study and examination requirements and forms of examination	The final grade in the module is composed of 35% performance on midterm exams, 40% final exam, 25% take-home assignments, 10% in-class participation. Students must have a final grade of to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Mark J. Price . (2021). C# 10 and .NET 6 – Modern Cross-Platform Development: Build apps, websites, and services with ASP.NET Core 6, Blazor, and EF Core 6 using Visual Studio 2022 and Visual Studio Code, 6th Edition. (6th). Packt Publishing. Birmingham. - Tom Taulli. (2020). The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems. (1stth). APress. New York. ISBN: 0134801156. - Tony Gaddis. (2018). Starting Out with Programming Logic and Design. (5th). Pearson. New York. ISBN: 0134801156.

Robotic Process Automation Concept & Design

Module name	**Robotic Process Automation Concept & Design**		
Module level	Undergraduate		
Code	COMP6858001		
Courses	Robotic Process Automation Concept & Design		
Semester	4th & 5th semester		
Contact person	Bayu Kanigoro		
Lecturer	Bayu Kanigoro		
Language	Bahasa		
Relation to curriculum	compulsory, semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Group Presentation, Lecture), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	identify robotic process automation steps and process that can be automated by RPA	1.1
	CLO-2	explain automation technology that can solve current business problem	1.2
	CLO-3	constructRPA solution	2.1, 2.2
Content	This course emphasis on the theory, practical, case studies of Robotic Process Automation. The theory covers the RPA Foundation, Skill, Methodologies, Planning, Vendor Evaluation, Bot Development, and Deployment and Monitoring. At the end of course, students are expected to explain and develop Robotic Process Automation (RPA) technology in supporting business process.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 40% final exam, 10% take-home assignments, 10% in-class participation. Students must have a final grade of to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments		

Reading List	- Tom Taulli. (2020). The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems. (1st). Apress. -. ISBN: 978-1484257289.

Intelligence Automation

Module name	**Intelligence Automation**		
Module level	Undergraduate		
Code	COMP6859001		
Courses	Intelligence Automation		
Semester	5		
Contact person	Hidayaturrahman		
Lecturer	Eng Antoni Wibowo		
Language	Bahasa		
Relation to curriculum	compulsory, semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Presentation, Case Studies, Class discussion, Lecture), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain concept of Intelligence Automation	-
	CLO-2	Discriminate Intelligence Automation Technologies	-
	CLO-3	analyze problems using intelligence automation approach	2.1
	CLO-4	design strategy implementing intelligence automation system	1.2
Content	This course comprises the concept of Intelligence Automation technologies and implementations. The student can know and learn the techniques and methods used in preparing Intelligence Automation systems in some domains. This course gives student knowledges related with Intelligent Automation, Artificial Intelligence, Intelligent Automation Technologies, Implementation of Intelligent Automation Systems		

Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 30% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Jason L. Anderson. (2020). Artificial Intelligence for Business: A Roadmap for Getting Started with AI. (1st). Wiley. New Jersey. ISBN: 978-1119651734. - Pascal Bornet, Ian Barkin and Jochen Wirtz. (2021). Intelligents Automation: Welcome tao the World of hyperautomation. (1st). -. -. ISBN: 979869181923. - Rajendra Akerkar. (2019). Artificial Intelligence for Business. (1st). Springer. -. ISBN: 9783319974354.

Multimedia Programming Foundation

Module name	**Multimedia Programming Foundation**		
Module level	Undergraduate		
Code	COMP7094001		
Courses	Multimedia Programming Foundation		
Semester	Even		
Contact person	Yulyani Arifin		
Lecturer	Aisha Gemala Jondya, Reinert Yosua Rumagit, Yulyani Arifin		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Demonstration, Group Discussion, Group Work, Individual Exercises, Question and Answer), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	use formats in multimedia elements	3.1,3.2
	CLO-2	selectmultimedia elements builder	2.1,2.2
	CLO-3	compare formats in multimedia elements	3.1,3.2
	CLO-4	buildApplication with manipulate multimedia elements	2.2, 2.3, 6.1, 6.2
Content	Multimedia Programming Foundation is a course that contains the basic principles of multimedia elements, the description of variety multimedia file formats, basic attributes of multimedia files, the format of multimedia elements, and also the latest development in the field of multimedia. Moreover, this course also gives a basic explanation of the Java programming language for designing applications that manipulates different kind of multimedia elements.		
Study and examination requirements and forms of examination	Theory:		

	The final grade in the module is composed of 21% performance on midterm exams, 28% final exam, 7% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Ze-Nian Li, Mark S. Drew, Jiangchuan Liu. (2014). Fundamentals of Multimedia. (2nd). Springer. London. ISBN: 978-3319052892. - Wayne Gilbert. (1999). Simplified Drawing for Planning Animation. (01th). 1STBL. -. ISBN: 9780971343917. - Y. Daniel Liang. (2011). Introduction to Java programming : comprehensive version. international edition. (08th). PE. New Jersey. ISBN: 9780132472753.

Computer Vision

Module name	**Computer Vision**		
Module level	Undergraduate		
Code	COMP7116001		
Courses	Computer Vision		
Semester	Odd		
Contact person	Hidayaturrahman		
Lecturer	Diaz D. Santika, Wawan Cenggoro		
Language	English		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Class discussion, Experiment, Group Presentation, Lecture, Project Work), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe various computational principles and standard image processing operators in computer vision	3.1, 3.2
	CLO-2	explain the local features with their detectors and descriptors in computer vision	3.1, 3.2
	CLO-3	employ various features to find the correspondence between images and perform recognition in computer vision	4.2, 5.1, 5.2, 6.1, 6.2
	CLO-4	buildvarious image recognition system in computer vision	4.2, 5.1, 5.2, 6.1, 6.2
Content	Computer Vision is related to how computers could understand the information in images or videos as what human do through their eyes. Throughout the course, we will study the basic understanding of computer vision until the advance application in computer vision, such as object recognition and object detection. At the beginning of the course, we will discuss the image formation and standard image processing algorithms that are useful for many computer vision algorithms. Then, local feature is		

	introduced through edge and corner detector algorithms. Using the local features, we will study how different images could be matched. Finally, we will discuss various recognition algorithms from instance to category recognition. In addition, the standard object detection method is introduced.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 14% performance on midterm exams, 21% final exam, 35% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Dr. Richard Szeliski. (2022). Computer Vision: Algorithms and Applications. (2nd). Springer. -. ISBN: 978-3030343712. - David A. Forsyth and Jean Ponce. (2015). Computer Vision: A Modern Approach: A Modern Approach. (1st). Pearson Education Limited. London. ISBN: 9781292014081. - Richard Szeliski. (2011). Computer vision : algorithms and applications. (1st). Springer. New York. ISBN: 9781848829343.

Popular Network Technology

Module name	**Popular Network Technology**		
Module level	Undergraduate		
Code	COMP7142001		
Courses	Popular Network Technology		
Semester	Odd		
Contact person	Ivan Sebastian Edbert		
Lecturer	Fajar Suprapto, Tatang Gunar Setiadji, Taslim RochmaRony Baskoro Lukito, Zulfany Erlisa Rasjid, Cahya Lukito, Rubil, Sulasno, Bayu KanigorozJosef Bernadi Gautama, Indrabudhi Lokaadinugroho, Melki Sadekh Mansuan, Muhammad Taufiq Zulfikar, Wawiko Supeno, Michael Wairisal,Putri Sanggabuana Setiawan		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Class Presentation, Combine Tutorial, exercise and solve problem with students), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Build Cloud Native Infrastructure	2.1
	CLO-2	Illustrate technologies to use at different stages in designing Cloud Infrastructure	2.1
	CLO-3	Explain concepts of create network environment	2.1
Content	This course presents about Cloud Native Infrastrucutre, how to implement the Native Cloud infrastructure. This course also explain the features and the next concept of serverless computing with Cloud Infrastructure.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 20% performance on midterm exams, 40% final exam, 15% take-home assignments. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of 25% performance on Lab Assignment. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	• Nishant Singh, Michael Kehoe - Cloud Native Infrastructure with Azure_ Building and Managing Cloud Native Applications-O'Reilly Media (2022) ISBN: 978-1-492-09089-2

User Experience

Module name	**User Experience**		
Module level	Undergraduate		
Code	COMP8129001		
Courses	User Experience		
Semester	Even		
Contact person	Hady Pranoto		
Lecturer	Nyoman Ayu Gita Gayatri		
Language	English		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Class Presentation, Lecture, Problem Solving, Project Work), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Describethe concept of UX and its elements.	2.1
	CLO-2	Applydesign principles to prototyping and design UX	2.1
	CLO-3	Analyzethe good UX and methods to plan, analysis, design and build UX	2.2
	CLO-4	Evaluatethe design UX, based on requirement	2.3
	CLO-5	Compilethe quality of the UX, and integrate it to whole system	2.3
Content	This course introduces the methodology of enhancing user satisfaction and loyalty by improving the usability, ease of use, and pleasure provided in the interaction between the user and the IT system, including the interface, graphics, industrial design, physical interaction, and the manual. It enables student to learn how to design, use basic tools and help student use UX tools techniques by using structure system methodology for working teams. This course also provide students with examples that help		

	identifying ways to jumpstart and create something newer, better, or even more suited to design UX.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 28% final exam, 21% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Russ Unger . (2012). A project guide to UX design : for user experience designers in the field or in the making . (02th). New Riders Publishing . Berkeley . ISBN: 9780321815385.

Computer Networks

Module name	**Computer Networks**		
Module level	Undergraduate		
Code	CPEN6247001		
Courses	Computer Networks		
Semester	Odd		
Contact person	Santoso Budijono		
Lecturer	Felix Novando, Stephanus Aditya Pratama Harjono, Felix Gozali, Carl Ludwi Hendiarta, Maverick Sean Therry, Karen Prisilia Iing, Thaddeus Cleo, Vincent, Stanley Dave Teherag, Rico Wijaya		
Language	Bahasa		
Relation to curriculum	compulsory, 3rd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Demonstrate methods or procedures, Lecture, Presentation), 150 minutes		
Workload	1. Class Hour: 2/1 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe basic structures of network	2.1
	CLO-2	explain basic concepts of network	2.1
	CLO-3	explain concepts of create network environment	2.1
Content	This course presents basic components of networks that enable corporate networks to communicate with one another which is started with general overview of data communications and continued with TCP/IP network architecture, from layer physical till layer application and finally security aspects and includes recent cloud technology. It gives the students knowledge of how a corporate network builds and communicates with other networks. This course is related to all networking courses.		
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 15% performance on midterm exams, 25% final exam, 25% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

	Laboratory: The final grade in the module is composed of 35% performance on Lab Assignment. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Forouzan, B.A . (2010). TCP/IP Protocol Suite . (04 th). McGraw Hill Higher . -. ISBN: 978-0071084208.

Introduction to Data Science

Module name	**Introduction to Data Science**		
Module level	Undergraduate		
Code	DTSC6001001		
Courses	Introduction to Data Science		
Semester	Odd		
Contact person	Noviyanti Tri Maretta Sagala		
Lecturer	Alexander Agung Santoso Gunawan, Noviyanti Tri Maretta Sagala		
Language	Bahasa		
Relation to curriculum	compulsory, 1st semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Discussion, Exercising the method for some cases, Hands-on Practice, Individual Exercises, Lecture, Practice in Laboratory), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain The Basic Concept of Data Science	3.1, 3.2
	CLO-2	use Python programming to conduct data preparation and data analysis	1.2, 2.2, 2.3, 6.1, 6.2
	CLO-3	interpret Data findings visually and orally	2.3, 3.1, 3.2, 4.2, 6.1, 6.2
Content	The course will introduce the basic understanding of Data Science and how to use python for acquiring, cleaning, analyzing, exploring, and visualizing data; This course consists an introduction to data science, Python for Data Science, Linear Algebra, Descriptive Statistics, Getting Data, and working with Data. Students should have some familiarity with a programming language, basic statistical and linear algebraic concepts such as mean, median, mode, standard deviation, correlation, and the difference between a vector and a matrix.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 35% performance on midterm exams, 35% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Joel Grus. (2019). Data Science From Scratch: First Principles with Python. (Seconth). O'Reilly Media, Inc. Boston. ISBN: 978-1492041139. - Laura Igual ; Santi Seguí. (2017). Introduction to Data Science: A Python Approach to Concepts, Techniques and Applications. (1st). © Springer International Publishing . Barcelona, SPain. ISBN: 978-3-319-5001. - Wes McKinney. (2013). Python for Data Analysis. (1st). O'Reilly Media, Inc.. Sebastopol, CA. ISBN: 9781449319793.

Data Management and Organization

Module name	**Data Management and Organization**		
Module level	Undergraduate		
Code	DTSC6002001		
Courses	Data Management and Organization		
Semester	Odd		
Contact person	Noviyanti Tri Maretta Sagala		
Lecturer	Noviyanti Tri Maretta Sagala; Alexander Agung Santoso Gunawan		
Language	English		
Relation to curriculum	compulsory, 3rd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Discussion, Hands-on Practice, Individual Exercises, Lecture), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain Big Data concept and Spark Ecosystem	1.2, 2.1
	CLO-2	demonstrate HDFS File Management and Spark SQL	2.1, 2.2, 6.1, 6.2
	CLO-3	Perform ETL and Data Analysis with Spark	2.1, 2.2, 6.1, 6.2
Content	The course aims to provide on how to efficiently store big datasets and prepare them for further analysis using Spark SQL in a Hadoop environment. General topics include the Apache Spark ecosystem, ETL process, and querying datasets in Spark. Hands-on labs will be provided throughout to enrich the knowledge gained on each topic. Basic knowledge of SQL and Scala will be helpful.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 35% performance on midterm exams, 35% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		

Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Hien Luu. (2021). Beginning Apache Spark 3: With DataFrame, Spark SQL, Structured Streaming, and Spark Machine Learning Library. (2nd). APRESS. SAN JOSE, CA, USA. ISBN: 9781484273838.

Big Data Infrastructure and Technology

Module name	**Big Data Infrastructure and Technology**		
Module level	Undergraduate		
Code	DTSC6003001		
Courses	Big Data Infrastructure and Technology		
Semester	Even		
Contact person	Ade Putera Kemala		
Lecturer	Ade Putera Kemala		
Language	English		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study, Class discussion, Independent Learning, Lecture, Reading), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain concept of cloud foundations and big data infrastructure including compute, storage, database, networking and security	3.1, 3.2
	CLO-2	analyze The requirement of cloud architecture for a particular case study mainly for ETL and ELT process	2.1, 4.2, 6.1, 6.2
	CLO-3	Design The right cloud systems architecture to meet certain business needs	2.1, 2.2, 6.1, 6.2
Content	This course introduces foundational aspects of cloud computing. It covers theoretical and practical aspects of cloud technology, cloud services, cloud security, cloud architecture design, and big data infrastructure. Students do not require any specific experience or knowledge to follow this course. This course benefits the cloud and big data-related courses.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 35% performance on midterm exams, 35% final exam, and 30% take-home assignments. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Chris Fregly, Antje Barth. (2021). Data Science on AWS Implementing End-to-End, Continuous AI and Machine Learning Pipelines. (Firstth). O'Reilly Media. California. ISBN: 9781492079392. - Gareth Eagar. (2021). Data Engineering with AWS. (Firstth). Packt Publishing Ltd. Birmingham. ISBN: 9781800569041.

Data Security

Module name	**Data Security**		
Module level	Undergraduate		
Code	DTSC6004001		
Courses	Data Security		
Semester	Odd		
Contact person	Ade Putera Kemala		
Lecturer	Ade Putera Kemala, Karli Eka Setiawan		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Lecture, Group discussion, quizzes, assignments, Case Studies), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Explain the concepts of computer security and cryptography	3.1, 3.2
	CLO-2	Apply the Encryption techniques to the solve problems	2.2, 4.2, 5.1, 5.2, 6.1, 6.2
	CLO-3	Solve the block ciphers and data Encryption problems and application	2.3, 4.2, 5.1, 5.2, 6.1, 6.2
	CLO-4	Analyze the Public-Key, RSA Cryptography, Cryptography Hash Function, and it's application to computer security system	4.2, 5.1, 5.2, 6.1, 6.2
	CLO-5	Analyze the User Authentication concepts and it's usage on computer security system	4.2, 5.1, 5.2, 6.1, 6.2

Content	The course will introduce the basic understanding of Data Security and the types of chipper algorithms used in cryptography; This course consists of a data security overview, Cryptography, Encryption Technique, Block Cipher, Public-Key Encryption, Hash Function, and User Authentication. This course complements other computer programming-related courses, such as Mathematical Modeling and Data Manipulation, by fostering an understanding of data security principles and their practical implementation. There are no prerequisites for enrollment in this course.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 35% performance on midterm exams, 35% final exam, and 30% take-home assignments. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- William Stallings. (2022). Cryptography and Network Security: Principles and Practice, Global Edition. Pearson.

Data Mining and Visualization

Module name	**Data Mining and Visualization**		
Module level	Undergraduate		
Code	DTSC6005001		
Courses	Data Mining and Visualization		
Semester	Even		
Contact person	Noviyanti Tri Maretta Sagala		
Lecturer	Noviyanti Tri Maretta Sagala		
Language	English		
Relation to curriculum	compulsory, 2nd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Discussion, Individual Exercises, Lecture, Practice in Laboratory), 150 minutes		
Workload	1. Class Hour: 2/1 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the concepts of exploratory data analysis, graphics, and data visualization	3.1, 3.2
	CLO-2	Demonstrate creating graphs and building predictive models in R	2.2, 2.3, 4.2, 5.1, 5.2, 6.1, 6.2
	CLO-3	interpret The results of exploratory data & predictive models	3.1, 3.2, 4.2
	CLO-4	apply data exploration to craft stories and analysis tools	2.2, 3.1, 3.2
Content	The objective of the course is to understand how to explore and communicate data using data visualization techniques and build the model from data. The course consists of an introduction to exploratory data analysis, creating graphics in R, crafting data stories, and building predictive models. After completing this course, students are able to explore data to seek anomalies and verify the assumption and pattern before building the models. Students must be familiar with statistical methods and R programming.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 20% performance on midterm exams, 25% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, 15% final exam, 10% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Ronald K. Pearson. (2018). EXPLORATORY DATA ANALYSIS USING R. (firstth). Chapman and Hall/CRC. Boca Raton. ISBN: 9781315382111. - Kathleen Peterson. (2020). Tableau Public: The Ultimate Beginner's Guide to Learn Tableau Public Step by Step. (1st). MeM Inc.. -. ISBN: 9798663916608. - Kieran Healy. (2019). Data Visualization: A Practical Introduction. (-th). Princeton University Pres.. -. ISBN: 978- 0-691-181.

Machine Learning

Module name	**Machine Learning**		
Module level	Undergraduate		
Code	DTSC6006001		
Courses	Machine Learning		
Semester	Odd		
Contact person	Noviyanti Tri Maretta Sagala		
Lecturer	Noviyanti Tri Maretta Sagala; Abba Suganda Girsang		
Language	English		
Relation to curriculum	compulsory, 3rd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Discussion, Group Assignments, Hands-on Practice, Lecture, Practice in Laboratory), 150 minutes		
Workload	1. Class Hour: 2/1 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain concepts and challenges of machine learning systems	3.1, 3.2
	CLO-2	Demonstrate feature engineering techniques on the dataset to get important features for modelling	1.2, 2.1, 2.2, 4.2, 5.1, 5.2, 6.1
	CLO-3	Construct supervised and unsupervised learning models using python for solving a given problem	4.2, 5.1, 5.2, 6.1, 6.2
	CLO-4	examine the best machine learning model for a given problem	4.2, 5.1, 5.2, 6.1, 6.2
Content	This course provides the student with the basic ideas and intuition behind modern supervised and unsupervised learning methods as well as a bit more formal understanding of how, why, and when they work. Classes on theoretical and algorithmic aspects are complemented by practical lab sessions. Students should understand basic probability, statistics, linear algebra, and calculus. You should have some background in Python programming.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 20% performance on midterm exams, 30% final exam, 10% take-home assignments, 10% Assessment of Learning(AoL). Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of 15% final exam and 15% take-home assignments. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Aurélien Géron. (2019). Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow. (seconth). O'Reilly Media, Inc.. Sebastopol, CA. ISBN: 9781492032649. - Dipanjan Sarkar, Raghav Bali, Tushar Sharma. (2018). Practical Machine Learning with Python. (0th). APRESS. Bangalore, India. ISBN: 978-1-4842-3207.

Deep Learning

Module name	**Deep Learning**		
Module level	Undergraduate		
Code	DTSC6007001		
Courses	Deep Learning		
Semester	Even		
Contact person	Noviyanti Tri Maretta Sagala		
Lecturer	Lili Ayu Wulandhari, Alexander Agung Santoso Gunawan		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Discussion, Group Assignments, Hands-on Practice, Lecture, Reading, Wacthing Video, VCD, Film, multimedia), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain fundamental concepts of deep learning	3.1, 3.2
	CLO-2	Execute a proper deep learning experimentation workflow	2.2, 4.2, 4.2, 5.1, 5.2, 6.1, 6.2
	CLO-3	analyze architecture of deep learning models	4.2, 5.1, 5.2, 6.1, 6.2
	CLO-4	Compose a deep learning code in Python programming	4.2, 5.1, 5.2, 6.1, 6.2
Content	In this course, students will learn about the basics of deep neural networks, a branch of machine learning concerned with the development and application of modern neural networks. By the end of the course, it is expected that students will have significant familiarity with the subject, and be able to apply Deep learning to a variety of AI tasks ranging from language understanding to object detection. The essential requirements for taking this course are calculus, linear algebra, and Python programming. This course benefits the Artificial Intelligent related courses.		

Study and examination requirements and forms of examination	The final grade in the module is composed of 35% performance on midterm exams, 40% final exam, and 25% take-home assignments. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Ian Goodfellow; Yoshua Bengio; Aaron Courville. (2016). Deep Learning (Adaptive Computation and Machine Learning series) . (1stth). MIT . massachusetts. ISBN: 9780262035613. - FRANÇOIS CHOLLET. (2018). Deep Learning with Python. (1st). Manning Publications Co.. Shelter Island, NY. ISBN: 9781617294433. - Umberto Michelucci. (2022). Applied Deep Learning with TensorFlow 2. (1st). APRESS. Dübendorf, Switzerland. ISBN: 978-1-4842-8020. - Vinita Silaparasetty . (2020). Deep Learning Projects Using TensorFlow 2: Neural Network Development with Python and Keras. (1st). APRESS. Bangalore, India. ISBN: 978-1-4842-5802.

Text Mining

Module name	**Text Mining**		
Module level	Undergraduate		
Code	DTSC6008001		
Courses	Text Mining		
Semester	Odd		
Contact person	Noviyanti Tri Maretta Sagala		
Lecturer	Lili Ayu Wulandhari, Alexander Agung Santoso Gunawan		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Demonstration, Group Work, Lecture, Reading), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Explain the fundamental text mining theory	3.1, 3.2
	CLO-2	Apply text mining techniques with Python	4.2, 5.1, 5.2, 6.1, 6.2
	CLO-3	Analyze the results of text mining process	4.2, 5.1, 5.2, 6.1, 6.2
Content	This course provides concepts and techniques of text mining. The main objective is to provide students with practical and theoretical foundations to mine patterns from a collection of text using various techniques. The content of the course comprises the theoretical and practical aspects of Text Mining, ranging from history, experimentation, and practical application. The basic Python programming skill is required in this course.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 35% performance on midterm exams, 40% final exam, and 25% take-home assignments. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments		

Reading List	- Jens Albrecht, Sidharth Ramachandran, and Christian Winkler. (2020). Blueprints for Text Analytics Using Python: Machine Learning-Based Solutions for Common Real World (NLP) Applications. 1st. O'Reilly Media, Inc., Sebastopol, CA. ISBN: 9781492074083. - Benjamin Bengfort, Rebecca Bilbro, and Tony Ojeda. (2018). Applied Text Analysis with Python Enabling Language-Aware Data Products with Machine Learning. 1st. O'Reilly. Sebastopol, CA. ISBN: 978-1-491-96304

Survey and Sampling Methods

Module name	**Survey and Sampling Methods**		
Module level	Undergraduate		
Code	DTSC6009001		
Courses	Survey and Sampling Methods		
Semester	Even		
Contact person	Ro'fah Nur Rachmawati		
Lecturer	Margaretha Ohyver, Nurhasanah		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Exercise and solve problem with students, Lecture, Teaching Learning in The Class), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the concept of conducting survey research and its quality measurement	3.1, 3.2
	CLO-2	apply appropriate sampling technique from given sampling problems	4.2, 5.1, 5.2, 6.1, 6.2
	CLO-3	calculate statistical measurements of sampling technique from given problems	4.2, 5.1, 5.2, 6.1, 6.2
Content	This course introduces the student about Survey Research, Survey Question Construction, The Quality of Measurement, Pretesting and Pilot Testing, Simple Probability Samples, Stratified Sampling, Ratio and Regression Estimation, and Cluster Sampling with Equal Probabilities. This course gives student knowledge on the statistical aspects of taking, designing and analyzing many different forms of sample surveys. Before studying this course, students are required to familiar with basic ideas of expectation, sampling distributions, confidence intervals and linear regression. This course as a basic knowledge for student to incorporate survey design, implementation and data analysis.		

Study and examination requirements and forms of examination	The final grade in the module is composed of 35% performance on midterm exams, 40% final exam, 25% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Sharon L. Lohr. (2019). Sampling Design and Analysis. (2nd). CRC Press. US. ISBN: 9780367273460. - Erin Ruel, William E. Wagner III, Brian Joseph Gillespie. (2016). The Practice of Survey Research: Theory and Applications. (1st). SAGE Publication. US. ISBN: 978-1-4522-3527.

Game Design

Module name	**Game Design**		
Module level	Undergraduate		
Code	GAME6002001		
Courses	Game Design		
Semester	Odd		
Contact person	Thomas Galih Satria		
Lecturer	Thomas Galih Satria		
Language	Bahasa		
Relation to curriculum	compulsory, 1st semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Case Studies, Class discussion, Class Presentation, Discussion, Group Assignments, Group Discussion, Group Presentation, Lecture, Project Based Learning, Question and Answer), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain General Game Theories	1.1, 1.2
	CLO-2	explain Game Development Process	2.1, 2.2, 2.3
	CLO-3	Create Game Design Documentation	3.1, 3.2, 5.1
	CLO-4	Create an Appropriate Game Design	5.1, 5.2
Content	This course comprises general game theories, game design concepts, and implementation. It gives the students basic knowledge of the player-centric approach to the process of game design and it's implementation.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 25% performance on midterm exams, 25% final exam, 50% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Ernest Adams . (2013). Fundamentals of Game Design . (03 th). New Riders. . ISBN: 321929675.

Game Programming

Module name	**Game Programming**		
Module level	Undergraduate		
Code	GAME6069001		
Courses	Game Programming		
Semester	Even		
Contact person	David		
Lecturer	David, Francisco Maruli Panggabean		
Language	English		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Class discussion, Group Discussion, Group Presentation, Lecture, Practice in Laboratory, Project Work, Tutorial, Wacthing Video, VCD, Film, multimedia), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the sequencing of game actions	4.1, 4.2, 5.1, 5.2
	CLO-2	explain the anatomy of a script	4.1, 4.2, 5.1, 5.2
	CLO-3	producescript(s) to perform an action in a game	6.1, 6.2
	CLO-4	producea game using a guided practice project approach	6.1, 6.2
Content	This course provides the learning process to develop Game. This course is focusing on the process of designing, developing assets, programming and applying best practices of Game for PC platform.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 0% performance on midterm exams, 30% final exam, 70% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Francesco Sapio, Abdelrahman Saher. (2016). Unity 5.x 2D Game Development Blueprints. (1st). Packt Publishing. Birmingham. ISBN: 9781784393106.

3D Modeling for Games

Module name	**3D Modeling for Games**		
Module level	Undergraduate		
Code	GAME6071001		
Courses	3D Modeling for Games		
Semester	Odd		
Contact person	Yogi Udjaja		
Lecturer	Francisco Maruli Panggabean		
Language	English		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Class discussion, Individual Work, Lecture, Presentation, Tutorial, Wacthing Video, VCD, Film, multimedia), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	constructa low-poly 3D model	6.1, 6.2
	CLO-2	apply texture for 3D model	6.1, 6.2
	CLO-3	Modifyshape and settings to create other game objects	2.1, 2.2, 2.3
	CLO-4	discovermany ways to solve creating models	1.1, 1.2
Content	This course comprises is designed to introduce 3D modeling for games to produce great assets for games. It covers from getting to grips with the basics, moving onto some low-poly modeling, and culminating into a couple of fairly advanced builds.		

Study and examination requirements and forms of examination	The final grade in the module is composed of 0% performance on midterm exams, 60% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Andrew Gahan. (2012). 3ds Max Modeling for Games: Volume II: Insider's Guide to Stylized Game Character, Vehicle and Environment Modeling. (2nd). Taylor & Francis. USA. ISBN: 978-1138400740. - Lance Flavel. (2010). Beginning Blender: Open Source 3D Modeling, Animation, and Game Design. (01th). Apress. America. ISBN: 9781430231271.

2D Game Art

Module name	**2D Game Art**		
Module level	Undergraduate		
Code	GAME6081001		
Courses	2D Game Art		
Semester	Odd		
Contact person	Yogi Udjaja		
Lecturer	Thomas Galih Satria, Yogi Udjaja		
Language	Bahasa		
Relation to curriculum	compulsory, 1st semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Case Studies, Demonstrate methods or procedures, Discussion, Individual Exercises, Lecture, Wacthing Video, VCD, Film, multimedia), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	CreateAsset for Game Production	6.1, 6.2
	CLO-2	design The Process to Create Art in Game Production	2.1, 2.2, 2.3
	CLO-3	distinguish Art used in Game Design	2.1, 6.1, 6.2
Content	This course is designed for students to learn creating game art. It covers vast array required in the conceptual stage of game development. This course takes a basic look at creating a game concept and contains several step-by-step examples for students to help students understand how art is created. After finishing this course, the students are expected to understand the art creation process in a game production and apply it in the real game development scenario.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 0% performance on midterm exams, 60% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		

Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Bill Stoneham. (2010). How to Create Fantasy Art for Video Games: A Complete Guide to Creating Concepts, Characters, and Worlds. (1st). Barron's Educational Series. U.S.A. ISBN: 9780764145049.

Game Animation

Module name	**Game Animation**		
Module level	Undergraduate		
Code	GAME6082001		
Courses	Game Animation		
Semester	Even		
Contact person	Thomas Galih Satria		
Lecturer	Thomas Galih Satria		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Class discussion, Demonstrate problem-solving through case studies, Independent Practice/Exercise, Lecture, Presentation, project, Tutorial), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	distinguish principles and fundamentals of game animation	1.1, 1.2
	CLO-2	design assets required for game animations	2.1, 2.2, 2.3
	CLO-3	Createobjects for flowing game animations	6.1, 6.2
	CLO-4	organize Organise Game Animation Assets for Game Projects	1.1, 1.2
Content	This course comprises game animation principles, formulas, information and matters relating to fundamental of animation and game animation. It gives the student basic knowledge related to concepts and skills to create game animation pose-to-pose and straight ahead. It will provide an overview of all the major knowledge for game animation.		

Study and examination requirements and forms of examination	The final grade in the module is composed of 0% performance on midterm exams, 60% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Richard Williams. (2012). The Animator's Survival Kit: A Manual of Methods, Principles and Formulas for Classical, Computer, Games, Stop Motion and Internet Animators. (4th). Faber and Faber Limited. New York. ISBN: 978-0865478978. - Jonathan Cooper. (2021). Game Anim: Video Game Animation Explained. (2nd). CRC Press. Florida. ISBN: 978-1003-14789-.

Game Development Capstone Project

Module name	**Game Development Capstone Project**		
Module level	Undergraduate		
Code	GAME6084001		
Courses	Game Development Capstone Project		
Semester	Odd		
Contact person	Francisco Maruli Panggabean		
Lecturer	Francisco Maruli Panggabean		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Class discussion, Individual Work, Lecture, Presentation, Tutorial, Watching Video, VCD, Film, Multimedia), 100 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya): 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	apply General Game Theories	4.1, 4.2
	CLO-2	apply game design and marketing techniques to boost mobile game performance	5.1, 5.2, 6.1
	CLO-3	Build a game for PC, mobile, or web using game engine	5.1, 5.2, 6.1, 6.2
	CLO-4	Design a game with monetization	3.1, 3.2
Content	This course provides the learning process to develop Game. This course is focusing on the process of designing, developing assets, programming and applying best practices of Game for PC platform.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 30% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Clinton Keith. (2020). Agile Game Development: Build, Play, Repeat. (02 th). Addison-Wesley Professional. ISBN: 978-0136527817.

Object Oriented Game Programming

Module name	**Object Oriented Game Programming**		
Module level	Undergraduate		
Code	GAME6085001		
Courses	Object Oriented Game Programming		
Semester	Odd		
Contact person	Francisco Maruli Panggabean, S.Kom., M.TI		
Lecturer	Francisco Maruli Panggabean		
Language	English		
Relation to curriculum	compulsory, 3rd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Class Presentation, Demonstrate methods or procedures, Discussion, Group Assignments, Individual Work, Lecture, project), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe object oriented programming and its main features.	2.1, 2.2, 2.3
	CLO-2	differentiatethe distinction between conventional programming and object oriented programming.	3.1, 3.2
	CLO-3	design a program or game model using main features of object oriented programming.	2.1, 2.2, 2.3
	CLO-4	construct a program or game using main features of object oriented programming.	6.1, 6.2
Content	Object oriented programming paradigm is widely used in many industries to develop application. This paradigm can also used in game development process. The course will deliver both theoretical and practical approaches on developing games using object oriented programming paradigm.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 0% performance on midterm exams, 60% final exam, 40% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Y. Daniel Liang. (2020). Introduction to Java Programming and Data Structures, Comprehensive Version. (12th). Pearson. New Jersey. ISBN: 9780136520184.

Advanced Game Development

Module name	**Advanced Game Development**		
Module level	Undergraduate		
Code	GAME6091001		
Courses	Advanced Game Development		
Semester	Odd		
Contact person	Francisco Maruli Panggabean		
Lecturer	Francisco Maruli Panggabean		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Class discussion, Individual Work, Lecture, Presentation, Tutorial, Watching Video, VCD, Film, multimedia, 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO) = LO**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Deriving the advanced game mechanics in game development.	3.1, 3.2
	CLO-2	Organizing advanced game scripting in game development.	5.1, 5.2
	CLO-3	Building an advanced game mechanic in a game.	6.1, 6.2
	CLO-4	Producing advanced game scripting in a game.	6.1, 6.2
Content	This course provides a learning process for developing an advanced game. The course focuses on designing, developing assets, programming, and applying best practices for creating a game that can be used across multiple platforms.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 40% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		

Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Joe Hocking . (2022). Unity in Action, Third Edition: Multiplatform game development in C#. (03 th). Manning. ISBN: 978-1617299339.

Fundamental in Game Balancing

Module name	**Fundamental in Game Balancing**		
Module level	Undergraduate		
Code	GAME6092001		
Courses	Fundamental in Game Balancing		
Semester	Odd		
Contact person	Thomas Galih Satria, S.Kom., M.TI		
Lecturer	Thomas Galih Satria		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Case Studies, Class discussion, Class Presentation, Discussion, Group Assignments, Group Discussion, Group Presentation, Lecture, Project Based Learning, Question and Answer), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	evaluate game mechanics and systems, identifying imbalances and potential issues that affect gameplay experiences.	4.2, 5.1, 5.2
	CLO-2	construct an innovative and effective balancing strategies by applying mathematical models and techniques to achieve a balanced gameplay environment that enhances player satisfaction and enjoyment.	5.1, 5.2
	CLO-3	Organise with game development teams, effectively communicating their balancing strategies and recommendations.	4.1, 4.2
	CLO-4	Combine knowledge of game design principles, mathematical models, and statistical methods to develop comprehensive and cohesive balancing plans.	6.1, 6.2

Content	Upon successful completion of the Game Balancing course, students will demonstrate a comprehensive understanding of the fundamental principles and techniques essential for achieving optimal gameplay experiences. They will acquire the ability to analyze and identify imbalances within game systems, employing advanced mathematical models and statistical methods to assess player dynamics and engagement. Students will develop proficient skills in adjusting game parameters and mechanics to ensure a balanced and fair gameplay environment, enhancing player satisfaction and retention. They will be capable of effectively communicating their balancing strategies and recommendations to game development teams, fostering collaborative problem-solving and iterative design processes. Graduates of this course will be well-equipped to pursue careers as game designers, balancing specialists, or data analysts, contributing to the creation of captivating and enjoyable gaming experiences.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 40% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	Ian Schreiber, Brenda Romero . (2022). Game Balance. CRC Press. ISBN: 978-1498799577.

Cyber Law

Module name	**Cyber Law**		
Module level	Undergraduate		
Code	LAWS6110001		
Courses	Cyber Law		
Semester	Odd		
Contact person	Bambang Pratama		
Lecturer	Bambang Pratama		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Brainstroming, Case Studies, Lecture, Wacthing Video, VCD, Film, multimedia), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Identify Cyber law in Indonesia	1.2, 2.2, 2.3, 6.1
	CLO-2	Use Related legislation to solve legal problems	1.1, 2.2, 6.2
	CLO-3	Justify legal problem and recommend legal solution	2.1, 2.3, 6.1, 6.2
Content	This course studying cyber law in Indonesia and in practice, also its relation with other regulation. They are huge issue related cyber law because of technology development and new media such as Internet. This course specifically studying law in cyber related to Indonesian legal system. Technology issue about this also discussed to open student horizon about the complexity and to encourage student to ponder the theory about cyber law.		
Study and examination requirements and forms of examination	The final grade in the module is composed of 30% performance on midterm exams, 50% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		

Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Lawrence Lessig . (2008). Code V.2.0 . (02 th). Perseus Book. New York. ISBN: 978-0465039142. - Lawrence Lessig. (2008). Code V.2.0. (2ndth). Perseus Book. New York. ISBN: 978-0465039142..

Discrete Mathematics

Module name	**Discrete Mathematics**		
Module level	Undergraduate		
Code	MATH6025001		
Courses	Discrete Mathematics		
Semester	Odd		
Contact person	Siti Komsiyah		
Lecturer	Samsul Arifin, Don Tasman, Achmad Sjaifullah, Tri Murdiyanto, Siti Komsiyah, Zahedi, Wisnu Priyo Hutomo, Dodi Rujadi TE, Paston Sidauruk, Ro'fah Nur Rachmawati, Nyimas Dewi Sartika, Kristina Pestaria Sinaga, I Gusti Agung Anom Yudistira, Herolistra Baskoroputro, Nurhanan, Dave Mangindaan, Mangasi Alion Marpaung, Ngarap Imanuel Manik, Fabian Surya Pramudya		
Language	Bahasa		
Relation to curriculum	compulsory, 1st semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Demonstrate problem-solving through case studies, Discussion, Group Discussion, Individual and Team Assignment, Lecture, Problem Solving), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	evaluate the logic of compound, quantified statements and method of proof related to discrete problems	1.1, 1.2
	CLO-2	explain set theory, Fuzzy set, counting method, number theory and its applications	1.1, 1.2
	CLO-3	analyze the relations and partial order set	1.1
	CLO-4	explain basic concepts of graph theory, tree and its application.	1.1, 1.2
	CLO-5	explain finite state automata and its application in computer science	1.1, 1.2

Content	This course discusses the basic concepts of logic, rules of proof methods, principles of procedures (algorithms) regarding counting methods, set theory and functions, number theory, relations, graphs, trees, finite state automata and its application in several fields, especially in in Computer Science. Students should have some basic requirements such as knowledge of basic mathematical reasoning and understanding of discrete properties to follow this course well. This course also supports other study programs related to problem solving in mathematics, computer science, and logic programming and by studying this course students will be able to increase reasoning power to analyze discrete problems
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 35% performance on midterm exams, 40% final exam, 25% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Kenneth H. Rosen. (2019). Discrete Mathematics and its Applications. (8th). McGraw-Hill Education. New York. ISBN: 9781259676512. - Barnabas Bede . (2013). Mathematics of Fuzzy Sets and Fuzzy Logic. (1st). Springer-Verlag Berlin Heidelberg. Berlin Heidelberg. ISBN: 9783642352218.

Linear Algebra

Module name	**Linear Algebra**		
Module level	Undergraduate		
Code	MATH6030001		
Courses	Linear Algebra		
Semester	Odd		
Contact person	Alfi Yusrotis Zakiyyah		
Lecturer	Faisal, Don Tasman, Suhandojo Suhandojo, Wisnu Priyo Hutomo, Paston Sidauruk, Diah Wihardini, Anak Agung, Ngarap Imanuel Manik, Herolistra Baskoroputro, Rojali, Muhammad Asrol, Djati Hoesen Salimy, Samsul Arifin, Djati Hoesen Salimy, Alfi Yusrotis Zakiyyah, Zahedi, Rinda Hedwig, and Wiwik Wiyanti.		
Language	Bahasa		
Relation to curriculum	compulsory, 1st semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Exercise and solve problem with students, Individual and Team Assignment, Lecture), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Solve systems of linear equations using various methods.	1.1, 1.2
	CLO-2	Compute algebraic matrix operations.	1.2
	CLO-3	evaluate determinant and inverse of matrix and their applications.	1.1, 1.2
	CLO-4	explain vector operations and their geometric interpretations.	1.1
	CLO-5	formulate line and plane equations.	1.1
	CLO-6	Solve eigenvalues and eigenvectors of matrix and their applications.	1.2

Content	This course provides basic concepts of elementary linear algebra. Prerequisite for this course is concept of linear equation that has been given in high school. Topics included in this course are systems of linear equations, matrix, determinants and inverses, vectors, line and plane equations, eigenvalues and eigenvectors. This course supports other courses related with system of equations and geometry, such as Numerical Methods and Computer Graphics.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 35% performance on midterm exams, 40% final exam, 25% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Howard Anton, Anton Kaul. (2019). Elementary Linear Algebra, 12th Edition. (12th). WIley. new york USA. ISBN: 9781119268048.

Calculus

Module name	**Calculus**		
Module level	Undergraduate		
Code	MATH6031001		
Courses	Calculus		
Semester	Even		
Contact person	Viska Noviantri		
Lecturer	Wikaria Gazali, Herolistra Baskoroputro, Alfi Yusrotis Zakiyyah, Christian Harito, Djati Hoesen Salimy, Paston Sidauruk, Wisnu Priyo Hutomo, Tri Murdiyanto, Nurhanan, Kristina Pestaria Sinaga, Achmad Sjaifullah, Anak Agung, Don Tasman, Ngarap Imanuel Manik, Marincan Pardede, Tri Murdiyanto, Rojali, Muhammad Asrol, Zahedi, Nyimas Dewi Sartika, Viska Noviantri, Tuga Mauritsius, Siti Komsiyah, and Dwi Listriana K.		
Language	Bahasa		
Relation to curriculum	compulsory, 2nd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Demonstrate methods or procedures, Exercise and solve problem with students, Individual Exercises, Lecture, Problem Solving, Tutorial), 200 minutes		
Workload	1. Class Hour: 4 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 4 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	4 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define the properties of limit to describe geometric and physical problems, and other applications.	1.1
	CLO-2	explain the properties of derivative to describe geometric and physical problems, and other applications.	1.1, 1.2
	CLO-3	explain the properties of integral to describe geometric and physical problems, and other applications.	1.1, 1.2
	CLO-4	recognize the convergence of infinite series	1.1

Content	The course emphasizes in understanding of basic concepts of calculus including limits, derivative, integral, and infinite series. These basic concepts would be interpreted geometrically and physically, and applied for solving some real problems. The concept of limit is central to many problems in the physical, engineering, and social sciences. This concept give knowledge about what happens to the function when the domain gets close to some constant. There are variations on this theme, but the basic idea is the same in many circumstances. The derivative is a powerful tool for solving problem involves maximizing or minimizing a function over a specified set. The basic concept of integral applied for some problem that can be interpreted as an area and volume. At the end, a knowledge of infinite series given to completed basic concept of calculus. This course will become the foundation of advanced mathematics courses, computer science courses, and engineering courses.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 35% performance on midterm exams, 40% final exam, 25% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- James Stewart, Daniel K.Clegg, Saleem Watson. (2020). Calculus: Early Transcendentals. (9th). Cengage Learning. Boston, USA. ISBN: 978-1337613927.

Scientific Computing

Module name	**Scientific Computing**		
Module level	Undergraduate		
Code	MATH6183001		
Courses	Scientific Computing		
Semester	Even		
Contact person	Fabian Surya Pramudya		
Lecturer	Faustina Odeta, William, Charles Vinsen, Oei Angela Christabel Gunawan, Jevon Levin, Lukas Tanto Kurniawan, Susan Lady, Jason, Stephanus Aditya Pratama Harjono, Cristoper Anderson, Gratia Honestha Patiung, Karen Prisilia Iing, Skolastika Gabriella Theresandia Prasetyo, Maverick William Chandra, Anthony William Chandra, Christina Yuanita, Benaya Nusantara Edgardo, Jose Armando, Holyvia Marcella, Joshua Wijaya Surja, Jeremy Loa, Eric Prasetya Sentosa, Johanes Peter Vincentius, Jordy Wira Arta, Gratia Honestha Patiung, Kesya Amanda Wijaya, Andre Setiawan Wijaya, Veronica, Andrew Reyner Wibowo Tjiptomongsoguno, Johevin Blesstowi, Felix Gozali, Gabriel Matthew Mintana, Cristoper Anderson, Douglas Rakasiwi Nugroho, Joko Sentosa Chandra, Winston, Hans Geovani Andika, Ngarap Imanuel Manik, Don Tasman, Bakti Amirul Jabar, I Gusti Agung Anom Yudistira, Djati Hoesen Salimy, Zahedi, Nurhanan,viska Noviantri, Alexander Agung Santoso Gunawan, Rojali, Herolistra Baskoroputro, Tri Murdiyanto, Nurhasanah, Siti Komsiyah, Ivan Halim Parmonangan		
Language	Bahasa		
Relation to curriculum	compulsory, 2nd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Studies, Class discussion, Exercise and solve problem with students, Individual and Team Assignment, Simulations with Computer-based), 150 minutes		
Workload	1. Class Hour: 2/1 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Compute basic scientific computation using Python	1.2
	CLO-2	Solve the Systems of Linear Algebraic Equations, Regression and	1.2

		Interpolation through scientific computation	
	CLO-3	examine the application of Taylor series and Root of Equations in scientific computation	1.1
	CLO-4	explain the basic concept and application of Numerical Differentiation, Numerical Integration, and Ordinary Differential Equations in scientific computation	1.1
Content	This course gives students the scientific computational knowledge and skill to solve numerical problems using an open-source programming language of Python. This course introduces core concepts and techniques to implement Python programming in Numerical Methods such as linear equation system, regression and interpolation, Taylor series, numerical derivation and integration, roots of equations, and Ordinary Differential Equation. This course also supports other courses related to the utilization of scientific programming to solve numerical problems in various fields. There is no previous experience in programming is required.		
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 35% final exam, 14% take-home assignments, and 14% Assurance of Learning. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of 30% performance on take home assignments. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments		
Reading List	- Kong, Q., Siauw, T., and Bayen, A. M. . (2021). Python Programming and Numerical Methods: A Guide for Engineers and Scientists. (1st). Academic Press, Elsevier. Amsterdam. ISBN: 9780128195505. - Jaan Kiusalaas. (2013). Numerical Methods in Engineering with Python 3 (3rd Edition). (3th). Cambridge University Press. United Kingdom. ISBN: 9781107033856.		

Mobile Community Solution

Module name	**Mobile Community Solution**		
Module level	Undergraduate		
Code	MOBI6006001		
Courses	Mobile Community Solution		
Semester	Even		
Contact person	Muhammad Keenan Ario, Sonya Rapinta Manalu		
Lecturer	Muhammad Keenan Ario, Sonya Rapinta Manalu		
Language	English		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study with Test Development Project, Group Presentation, Group Work-Based Activities, Lecture, Practice in Laboratory), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the Java Programming Language concept on Android	4.1, 4.2
	CLO-2	describe the main features of Android Programming and Android Software Development	4.1, 4.2, 4.3
	CLO-3	producesimple Mobile Application using the main features of Android	4.3, 6.1
	CLO-4	constructMobile Application based on Android platform	6.1, 6.2
Content	Mobile Community Solution is a subject in Mobile Application & Technology Program that gives the student knowledge about the basic concept and main features of Android Platform. Learning Mobile Community Solution will give student the ability to learn and develop mobile applications for larger market based on Android Platform. After completing this course, students should be able to know the fundamental knowledge about mobile application programming and ability to design and developing mobile application based on Android platform. Also		

	students should be able to build an application or several applications as a collaborative open source community.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 20% performance on midterm exams, 30% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Dawn Griffiths, & David Griffiths . (2015). Head First Android Development . (01 th). O'Reilly Media. . ISBN: 9781449362188.

Mobile Multimedia Solution

Module name	**Mobile Multimedia Solution**		
Module level	Undergraduate		
Code	MOBI6009001		
Courses	Mobile Multimedia Solution		
Semester	Odd		
Contact person	Muhammad Keenan Ario		
Lecturer	Muhammad Keenan Ario, Sonya Rapinta Manalu		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Discussion, Group Assignments, Group Presentation, Lecture), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	DefineThe iOS Platform Concept and Swift Language	4.1, 4.2
	CLO-2	DescribeUser Interface Components and the Main Features of iOS Platform	4.1, 4.2
	CLO-3	DemonstrateSimple iOS Programs using the Main Features of iOS Platform	6.1, 6.2
	CLO-4	ConstructMobile Application based on iOS Platform	6.1, 6.2
Content	Mobile Multimedia Solution is a subject in Mobile Application & Technology Program that gives students the knowledge about the basic concept of Swift language and main features of iOS Platform. Learning Mobile Multimedia Solution will give students the ability to learn and develop mobile applications for a larger market based on iOS Platform. After completing this course, students should be able to know the fundamental knowledge about mobile application programming, design and develop mobile applications based on iOS Platform.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 20% performance on midterm exams, 30% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Molly Maskrey . (2016). Beginning iPhone Development with Swift 3: Exploring the iOS SDK . (03 th). Apress. . ISBN: 9781484222225. - Molly Maskrey. (2016). Beginning iPhone Development with Swift 4: Exploring the iOS SDK. (4thth). Apress. New York, USA. ISBN: 9781484230718.

Mobile Cloud Computing

Module name	**Mobile Cloud Computing**		
Module level	Undergraduate		
Code	MOBI6026001		
Courses	Mobile Cloud Computing		
Semester	Odd		
Contact person	Muhammad Keenan Ario, Sonya Rapinta Manalu, Brilly		
Lecturer	Muhammad Keenan Ario, Sonya Rapinta Manalu, Brilly		
Language	English		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study with Test Development Project, Group Presentation, Group Work-Based Activities, Lecture, Practice in Laboratory), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Explain the Flutter framework Concept	4.1, 4.2
	CLO-2	Describe user interface component and the main feature of Flutter	4.1, 4.2, 4.3
	CLO-3	Apply Web Services based on Firebase	4.3, 6.1
	CLO-4	Construct mobile application based on flutter with Web Services	6.1, 6.2
Content	Mobile Cloud Computing is a subject in Computer Science that give students knowledge about concept of flutter framework and able to develop application using flutter framework with web services and database. After completing this course, students should be able to know the fundamental knowledge about mobile application programming and ability to design and developing mobile application based on Android		

	platform. Also students should be able to build an application or several applications as a collaborative open source community.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 20% performance on midterm exams, 30% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on midterm exams, % final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Rap Payne. (2019). Beginning App Development With Flutter. 1st. Springger. Dallas, TX, USA. ISBN: 9781484251812 .

Mobile Programming

Module name	**Mobile Programming**		
Module level	Undergraduate		
Code	MOBI6059001		
Courses	Mobile Programming		
Semester	Odd		
Contact person	Sonya Rapinta Manalu		
Lecturer	Sonya Rapinta Manalu, Muhammad Keenan Ario, Rizky Yunanda, Brilly Andro Makalew		
Language	Bahasa		
Relation to curriculum	compulsory, 5th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study with Test Development Project, Group Presentation, Group Work-Based Activities, Lecture, Practice in Laboratory), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	explain the Java Programming Language concept on Android	4.1, 4.2
	CLO-2	describe the main features of Android Programming and Android Software Development	4.1, 4.2, 4.3
	CLO-3	producesimple Mobile Application using the main features of Android	4.3, 6.1
	CLO-4	constructMobile Application based on Android platform	6.1, 6.2
Content	Mobile Community Solution is a subject in Mobile Application & Technology Program that gives the student knowledge about the basic concept and main features of Android Platform. Learning Mobile Community Solution will give student the ability to learn and develop mobile applications for larger market based on Android Platform. After completing this course, students should be able to know the fundamental knowledge about mobile application programming and ability to design and developing mobile application based on Android platform. Also		

	students should be able to build an application or several applications as a collaborative open source community.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 40% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Dawn and David Griffiths. (2017). Head First Android Development: A Brain-Friendly Guide 2nd Edition. (2nd Eth). O'Reilly Media. USA. ISBN: 978-1491974056.

Web Desgin

Module name	**Web Design**		
Module level	Undergraduate		
Code	MOBI6068001		
Courses	Web Design		
Semester	Odd		
Contact person	Muhammad Keenan Ario, Brilly		
Lecturer	Muhammad Keenan Ario, Brilly		
Language	English		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study with Test Development Project, Group Presentation, Group Work-Based Activities, Lecture, Practice in Laboratory), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Explain the HTML 5 Concept	4.1, 4.2
	CLO-2	Demonstrate simple HTML 5 program using the main features of HTML 5	4.1, 4.2
	CLO-3	Describe user interface component and the main features of HTML 5	4.2, 5.1
	CLO-4	Construct mobile web application based on HTML 5	5.1, 5.2

Content	Web Design is a subject in Computer Science that gives the students knowledge about the basic concept of designing a web in mobile and how to develop web application on mobile platform. Nowdays, many mobile platforms are available in the market; such as iOS and Android. Learning Web Design will give the student the ability to learn and develop mobile web application based on HTML 5 for larger market. After completing this course, the student should know about the fundamental knowledge about HTML 5, ability to design and developing mobile web application on mobile platform like Android and iOS.
Study and examination requirements and forms of examination	The final grade in the module is composed of 20% performance on midterm exams, 30% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Matthew MacDonald. (2013). HTML5: The Missing Manual. 02. O'Reilly Media. Highway North. ISBN: 9781449363260.

Wearable Technology

Module name	**Wearable Technology**		
Module level	Undergraduate		
Code	MOBI6069001		
Courses	Wearable Technology		
Semester	Even		
Contact person	Sonya Rapinta Manalu		
Lecturer	Sonya Rapinta Manalu, Muhammad Faja		
Language	Bahasa		
Relation to curriculum	compulsory, 2nd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Guided Practice, Lecture), 150 minutes		
Workload	1. Class Hour: 3 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya): 3 time/ semester		
Credit points	3 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define terminologies related to XR, Virtual Reality, Augmented Reality, and Mixed Reality	4.1, 4.2, 4.3
	CLO-2	explain how XR works and the enabler technology for XR	5.1, 5.2
	CLO-3	buildXR solution to solve real problem	6.1, 6.2
Content	Wearable Technology is a subject in Mobile Application and Technology that gives students the knowledge about XR: how it works and how to implement main capabilities of XR in a mobile application. Learning the Wearable Technology course will give students the ability to develop applications for future mobile devices (eye and haptic wear) in a mixed environment of virtual and real objects. After completing this course, students should be able to know the basic concepts of XR, the main capabilities of XR, and be able to build XR solution.		
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 30% performance on midterm exams, 50% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		

Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Jonathan Linowes. (2018). Unity Virtual Reality Projects: Learn Virtual Reality by developing more than 10 engaging projects with Unity 2018, 2nd Edition. (2nd Eth). Packt Publishing. Birmingham, United Kingdom. ISBN: 978-1788478809.

Embedded System and Internet of Things

Module name	**Embedded System and Internet of Things**		
Module level	Undergraduate		
Code	MOBI6070001		
Courses	Embedded System and Internet of Things		
Semester	Odd		
Contact person	Muhammad Keenan Ario		
Lecturer	Muhammad Keenan Ario		
Language	English		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Case Study with Test Development Project, Group Presentation, Group Work-Based Activities, Lecture, Practice in Laboratory), 200 minutes		
Workload	1. Class Hour: 2/2 x 50 = 200 minutes (3,2999999999999998 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/2 x 60 = 240 minutes (4 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Describe IOT concept, history, architecture and IOT components.	4.1, 4.2
	CLO-2	Ilustrate IOT impact on real life and industry.	4.1, 4.2
	CLO-3	Analyze IOT data and evaluate the significancy to real life and business improvement.	4.2, 5.1
	CLO-4	Implement the IOT application using simple devices with cloud based platform	5.1, 5.2
Content	This course comprises of theory, practical, real case study, and practical implementation of Internet of Things. Theory covers the evolution of IOT, it's architecture, components, protocol, IOT platform thet mostly running as cloud services. This course also covers advanced aspect such security, analytics and machine learning built on such IOT implementation. The practical implementation cover some examples and real life adoption of IOT in several areas of industry and government.		

	At the end of the course, students are expected to explain IOT history, ilustrate it's impact to real life and industries, describe the architecture, design and implement the IOT application using simple devices, analyze IOT data, and evaluate the significancy of IOT in industry now and in the future.
Study and examination requirements and forms of examination	The final grade in the module is composed of 20% performance on midterm exams, 30% final exam, 20% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Perry Lea. (2018). Internet of Things for Architects. 1st. Packt. UK. ISBN: 9781788470599. - Agus Kurniawan. (2018). Learning AWS IoT. 1st. Packt Publishing. Jakarta. ISBN: 978178839611.

Introduction to Mobile Technology & Programming

Module name	**Introduction to Mobile Technology & Programming**		
Module level	Undergraduate		
Code	MOBI6071001		
Courses	Introduction to Mobile Technology & Programming		
Semester	Odd		
Contact person	Sonya Rapinta Manalu		
Lecturer	Sonya Rapinta Manalu		
Language	Bahasa		
Relation to curriculum	compulsory, 1st semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Class discussion, Demonstration, Lecture), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	define the user interface of interactive mobile applications using patterns and mobile anti-patterns	4.1
	CLO-2	analyze user interface of existing mobile applications according to guidelines	4.1
	CLO-3	explain the Object Oriented Concept	4.2
	CLO-4	recognize Fundamental Knowledge of Java and Mobile Technology and Development	4.2
	CLO-5	give examplesSimple Java Application using Java	6.1, 6.2
Content	This course provides an understanding of how to perform mobile interface design with the right composition and element therefore the design result could be accepted as a good user experience. This course is also a subject that gives the student knowledge about the basic concept of object-oriented and mobile technology. This course discusses basic algorithm and demonstrates them by using Java programming language.		

Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 25% performance on midterm exams, 50% final exam, 25% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass Laboratory: (*dihapus jika tidak ada sks laboratory)* The final grade in the module is composed of % performance on midterm exams, % final exam, % take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Theresa Neil. (2014). Mobile Design Pattern Gallery: UI Patterns for Smartphone Apps. (02th). O' Reilly. Sebastopol. ISBN: 978-1449363635. - Y. Daniel Liang. (2019). Introduction to Java Programming and Data Structures, Global Edition. (11th). Pearson Education. Essex.. ISBN: 9781292221892.

Computational Biology

Module name	**Computational Biology**		
Module level	Undergraduate		
Code	SCIE6062001		
Courses	Computational Biology		
Semester	Even		
Contact person	Fabian Surya Pramudya		
Lecturer	Alam Ahmad, Dwiyantari Widyaningrum, Fabian Surya Pramudya, Faisal Asadi, Gregorius Natanael, Heruna Tanty, Dave Mangindaan, Khoirunnisa Assidqi, Nesti F. Sianipar, Nurhasanah, Siti Komsiyah, Muhammad Fakhruddin, Alfi Yusrotis Zakiyyah		
Language	Bahasa		
Relation to curriculum	compulsory, 4th semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Demonstrate application of rules/laws/theories through case studies, Group Discussion, Group Presentation, Individual and Team Assignment, Lecture, Simulations with Computer-based), 150 minutes		
Workload	1. Class Hour: 2/1 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	Explain basic concept of Principle of Biology, Advances in Computational Biology, Genomics, Proteomics, Bioinformatics Database, Sequence Alignment and Molecular Evolution	1.2
	CLO-2	Identify real-world applications of Genomics, Proteomics, Bioinformatics Database, Sequence Alignment and Molecular Evolution	1.2
	CLO-3	Compute basic Bioinformatics analysis using Biopython	1.2, 2.1
	CLO-4	Analyze basic Bioinformatics analysis computational results using Biopython	1.2, 2.1

Content	This course gives students a theoretical knowledge and real-world applications of Computational Biology, specifically Bioinformatics, in ranged topics of Basic Principle of Biology, Advances in Computational Biology, Genomics, Proteomics, Bioinformatics Database, Sequence Alignment, Molecular Evolution. This course includes Case Study Presentation and Computational Practice of Bioinformatics in Python Programming Language using Biopython. The practical topics covered are within the scope of DNA Composition and Sequence Analysis, Protein Synthesis, Sequence Alignment, and other basic works related to Biological Databases. There is no experience in programming required in this course. This course also supports other courses related to Python Programming, Data Science, and Big Data.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 21% performance on midterm exams, 28% final exam, 21% take-home assignments. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of % performance on 30% take-home assignments. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Rebecca B. Orr. (2017). Campbell Biology. (11th). Pearson Education. -. ISBN: 0134093410. - Supratim Choudhuri. (2014). Bioinformatics for Beginners: Genes, Genomes, Molecular Evolution, Databases and Analytical Tools. (1st). Elsevier. Maryland. ISBN: 978-0124104716.

Computational Physics

Module name	**Computational Physics**		
Module level	Undergraduate		
Code	SCIE6063001		
Courses	Computational Physics		
Semester	Odd		
Contact person	Fabian Surya Pramudya		
Lecturer	Ade Putera Kemala, Agung Trisetyarso, Bakti Amirul Jabar, Eko Budi Purwanto, Fabian Surya Pramudya, Felix Indra Kurniadi, Iping Suhariadi, Mangasi Alion Marpaung, Paston Sidauruk, Said Achmad, Supria, Tri Murdiyanto, Viska Noviantri, Zahedi, Iping Suhariadi		
Language	Bahasa		
Relation to curriculum	compulsory, 3rd semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Demonstrate problem-solving through scenarios, Discussion, Lecture, Simulations with Computer-based), 150 minutes		
Workload	1. Class Hour: 2/1 x 50 = 150 minutes (2,5 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2/1 x 60 = 180 minutes (3 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2/1 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	solve problems in topics of Electric Charge and Electric Fields, Voltage and Current, Resistance and Capacitance, Circuits Design & Analysis, Magnetic Field, Induction and inductance, and Electromagnetic Oscillation and Alternating Current	1.2
	CLO-2	Identify the concept and real-world application of Resistance and Capacitance, Circuits Design & Analysis, Magnetic Field, Induction and inductance, and Electromagnetic Oscillation and Alternating Current	1.2
	CLO-3	experiment computational simulations of basic electrical circuits using Python programming language	1.2, 2.1

	CLO-4	analyze the computational simulation result of Voltage and Current, Resistance and Capacitance, Circuits Design & Analysis, Induction and inductance, and Electromagnetic Oscillation and Alternating Current	1.2, 2.1
Content	This course gives students a theoretical and computational practice of natural science in electricity and magnetism Physics. Students will explore the concept of Electric Charges and Fields, Voltage and Current, Resistance and Capacitance, Circuit Design and Analysis, Magnetic Field, Inductor and Inductance, Electromagnetic Oscillation, and Alternating Current. The compulsory laboratory will cover the simulation of basic electrical circuits that consist of passive components (resistors, inductors, and capacitors) and measurement devices (ammeter and voltmeter) in Python programming language. There is no experience in programming is required for this course. This course also supports other courses related to Physics and simulation.		
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 28% performance on midterm exams, 28% final exam, 7% take-home assignments, and 7% Assurance of Learning. Students must have a final grade of D to pass Laboratory: The final grade in the module is composed of performance on 30% take-home assignments. Students must have a final grade of D to pass		
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.		
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments		
Reading List	- David Halliday, Robert Resnick, Jearl Walker. (2018). Fundamentals of Physics, Extended. (12th). Wiley. Indianapolis. ISBN: 9781119460138. - Alexander, C. K., and Sadiku, M. N. O.. (2020). Fundamentals of Electric Circuits. (7th). McGraw-Hill Higher Education. Boston, MA. ISBN: 9781260226409. - Nightingale, D. and Spencer, C.. (2015). A kitchen course in electricity and magnetism. (1st). Springer. Berlin. ISBN: 9783319053059. - Tooley, M.. (2019). Electronic Circuits: Fundamentals and Applications. (5th). Routledge. New York. ISBN: 9781260226409.		

Basic Statistics

Module name	**Basic Statistics**		
Module level	Undergraduate		
Code	STAT6171001		
Courses	Basic Statistics		
Semester	Odd		
Contact person	Samsul Arifin		
Lecturer	Hapsari, Noviyanti Tri, Kemas Syamsudin, Herena Pudjihastuti, Edi Abdurachman, Yeane Irmaningrum S, Yuanivar Yuanivar, Isfarudi Isfarudi, Bharuno Mahesworo, Iwa Sungkawa, Sutoro, Diah Wihardini, Samsul Arifin, Suhandojo, I Gusti Agung Anom Yudistira, Margaretha Ohyver		
Language	Bahasa		
Relation to curriculum	compulsory, 1st semester.		
Type of teaching, contact hours	Undergraduate programs, TLS (Exercise and solve problem with students, Hands-on Practice, Individual and Team Assignment, Individual Exercises, Lecture, Software Exploring), 100 minutes		
Workload	1. Class Hour: 2 x 50 = 100 minutes (1,7 hours) per week. 2. Structured Activites, e.g. exercises and Assignments: average 60 minutes per week as class exercise or homework, included. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week. 4. GSLC (Forum Discussion through LMS Binusmaya) : 3 time/ semester		
Credit points	2 credit points		
Requirements according to the examination regulations	A student must have registered for the course.		
Recommended prerequisites	-		
Learning outcomes and their corresponding PLOs	**Course Learning Outcome (CLO)**	**Description**	**Supported Learning Objective (LObj)**
	CLO-1	describe the basic concepts of descriptive and inferential statistics.	1.2
	CLO-2	calculatethe statistical measurement which related to descriptive and inferential statistics.	1.2
	CLO-3	use Microsoft Excel to do data analysis.	1.2
Content	This course comprises Defining and Collecting Data, Organizing and Visualizing Variables, Numerical Descriptive Measures, Basic Probability, Discrete Probability Distributions, The Normal Distribution and Other Continuous Distributions, Sampling Distributions, Confidence Interval Estimation, Fundamentals of Hypothesis Testing: One-Sample Tests, Two-Sample Tests. To mastery this course, students should have basic knowledges about probability and statistics such as sample space,		

	combination, population, and sample. This course gives students knowledge and ability to do statistical data analysis and using Microsoft Excel as a tool to analyze data. This course related to Thesis course.
Study and examination requirements and forms of examination	Theory: The final grade in the module is composed of 35% performance on midterm exams, 35% final exam, 30% take-home assignments, 10% in-class participation. Students must have a final grade of D to pass
Media employed	LCD, LED Projector, PTZ Camera, whiteboards, and websites.
Assessments and Evaluation	One Midterm exam (100 minutes each) and one final exam (100 minutes), short computer-based quizzes, take-home written assignments
Reading List	- David F. Stephan . (2017). Statistics for managers using Microsoft Excel. (08th). Pearson education asia limited . Harlow. ISBN: 9781292156347.