Course Syllabus of Curriculum 2023

Undergraduate Program of Information Systems
Department of Information Systems

2023

Faculty of Intelligent Electrical and Informatics Technology
INSTITUT TEKNOLOGI SEPULUH NOPEMBER, 2023

Table of Contents

1. Graduate Profiles and Graduate Learning Outcome

1.1. Information Systems Study Program Graduate Profiles

Based on the evaluation of the previous curriculum, focus group discussions, industry input, as well as considering knowledge and basic competencies in the field of Information Systems as defining characteristics of the program.

Main Competencies of the Information Systems (IS) Study Program

1. Analyzing an organization's business, assessing and aligning processes and systems to support organizational performance.
2. Collecting, organizing, curating, and processing data into information, as well as maintaining data processing systems for effective organizational decision-making and strategic policy formulation.
3. Designing and developing enterprise architecture, including physical and cloud services, capacity planning, and network infrastructure.
4. Managing and implementing cyber security, protecting IT assets, developing information assurance strategies, implementing and managing quality audit processes, and ensuring security throughout the system's lifecycle.
5. Applying system development methodologies and tools, such as object-oriented systems, software development lifecycle (SDLC), and agile software development models.
6. Developing applications by programming artifacts and integrated software systems that are useful for solving business and organizational problems.
7. Ethically using data and information systems with social implications and effectively visualizing findings.
8. Monitoring, controlling, and evaluating organizational IS resources, and determining the implementation of corporate systems to create IS value through IS strategies aligned with the business.
9. Analyzing investment feasibility and practicing agile project management in IS management.

As a result, the graduates profiles of the Undergraduate Program of Information Systems includes:

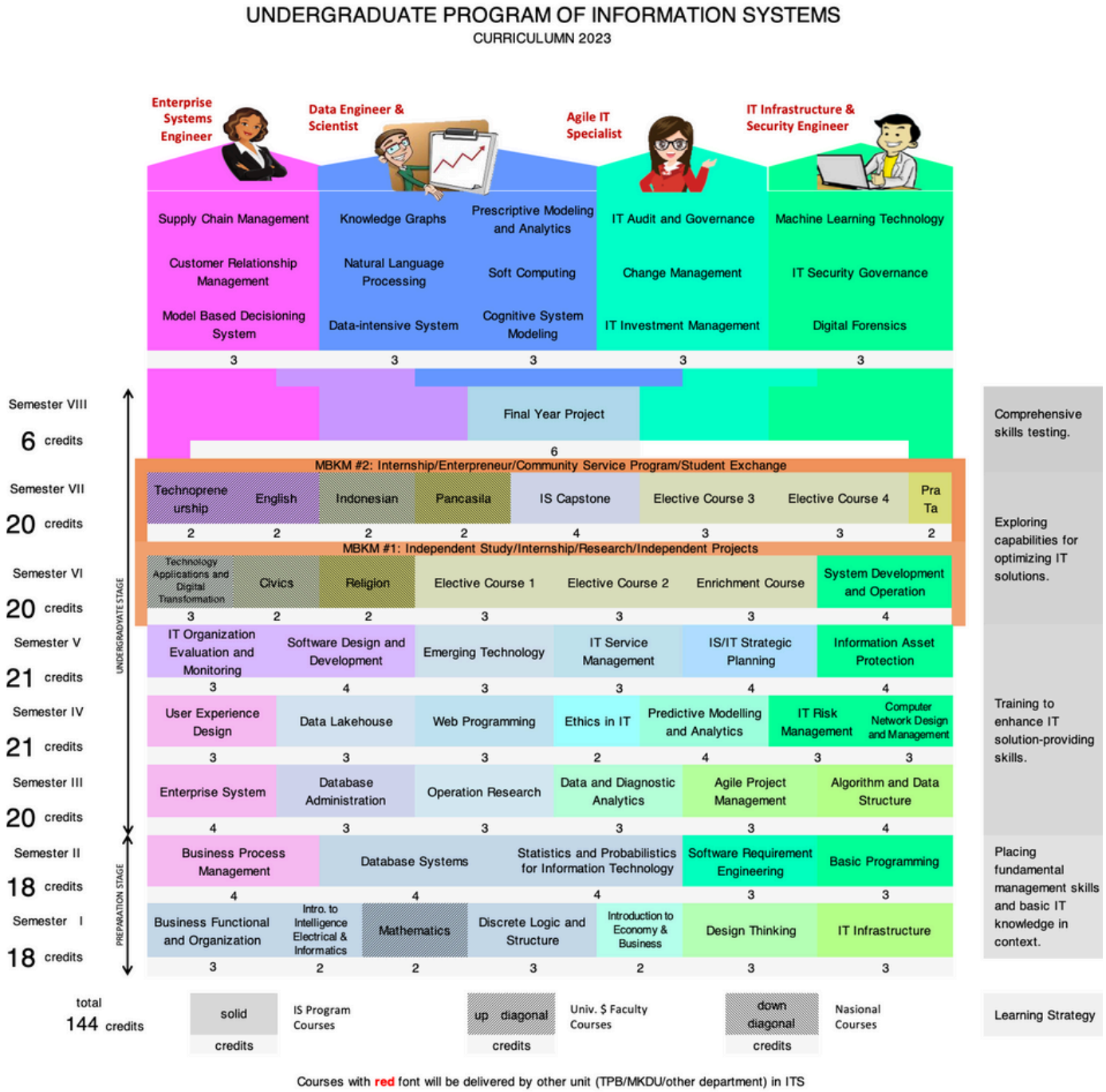
Enterprise Systems Engineer	**Agile IT Business Specialist**
Data Scientist	**IT Infrastructure & Security Engineer**

1.2. Information Systems Study Program Graduate Learning Outcomes

The Graduate learning outcomes are constructed into eight points as follows:

No	Graduate Learning Outcomes (LO)
1	Able to demonstrate attitudes and character that reflect a devotion to God Almighty, a noble manner, a sensitivity and concern for social and environmental issues, an appreciation of cultural differences and diversity, upholding the rule of law, prioritizing the interests of the nation and the community, through innovation, creativity, and other potential skills.
2	Able to assess and utilize knowledge and technology and to apply them in a specific field of expertise, and capable of making accurate decisions based on individual and group work through logical, critical, systematic, and innovative thinking.
3	Capable of conducting a self-directed learning and self-development as lifelong learners to compete at the national and international levels, as well as contributing effectively to solve the problems while considering sustainability principles.
4	Possess the ability to act as an ethical IT professional and recommend and use information management techniques for decision-making process by applying appropriate methodologies, applications, and innovations to solve computing related problems and information system projects efficiently.
5	Capable of creating value for information systems within an organization through the alignment of IS/IT and business, as well as the development of enterprise architecture, and IS/IT governance.
6	Able to construct models, applications, security systems, and organizational systems using appropriate system development methods and techniques as solutions to IS/IT-related business problems.
7	Competent in building and utilizing data and information for effective decision-making process, as well as evaluating and auditing IS/IT within an organization based on specific IS standards.
8	Possess knowledge in Business & Organization, Economics, Mathematics, Statistics, Business Processes, Data Analysis and Visualization, Rapid Development & Design Thinking, Agile Software Development, IT/IS Management, Information Security, IT/IS Best Practices, as well as emerging IT/IS technologies like IoT and Digital Forensics, enabling them to produce scientific works or innovative contributions in the field of IT/IS that are competitive in the national and global markets.

2. Courses Organization and Semesters



01 Introduction to Intelligence Electrical and Informatics

2 Credits | ES234101 – 1st Semester

The presence of information systems within an organization plays several constructive roles. These roles include (1) providing data and information standardization, (2) integrating databases, and (3) using information systems to support accurate decision-making that benefits the organization. The organizations where information systems are applied can vary in their purposes: commercial, government agencies, or public entities. Various differences in the characteristics and nature of organizations are also studied in the course "Introduction to Intelligence Electrical and Informatics" with the aim of introducing different types of information systems in each of these organizations. In addition, the latest trends in information technology infrastructure and information systems will also be discussed in this course.

Course Learning Outcomes	Graduate LO
• Understanding the definition and components of Information Systems.	1, 2, 8
• Comprehending the role of Information Systems in business.	1, 2, 8
• Differentiating between various types of Information Systems and provide practical examples within organizations/businesses.	1, 2, 8
• Explaining current trends and technologies in Information Systems.	1, 4, 8
• Conceptualizing Information Systems that are beneficial to society.	1, 4, 8

Study Materials

- Definition of Information Systems (computerized and non-computerized); components of information systems; data, information, and knowledge.
- Business Information Systems: Business-to-Business, Business-to-Customer, Customer-to-Customer, Customer-to-Business, Government-to-Government, Government-to-Citizen, Government-to-Business.
- Transaction Processing Systems, Enterprise Systems (Customer Relationship Management, Supply Chain Management, Enterprise Resource Planning, Management Information Systems, Decision Support Systems)
- Information Technology Infrastructure and Security
- Specialized Information Systems: Artificial Intelligence, Expert Systems, Virtual Reality, Augmented Reality, Internet of Things in Healthcare, Natural Disasters, etc.

References

- Tekno Sains, Pengantar Sistem Informasi
- O'Brien, James A., Marakas, George M., (2005),Introduction to Information Systems (13th Edition), McGraw-Hill
- Stair, Ralph M., Reynolds, George W., (2020),Fundamental of Information Systems, USA : Cengage Learning

Lecturers

Nisfu Asrul Sani, Andre Parvian A., Anisah Herdiyanti, Retno Aulia V.

02 Business Functional and Organization

3 Credits | ES234102 – 1st Semester

This course aims to provide knowledge related to organizational structure. Organizational structure encompasses various formal positions and reporting relationships. It also includes the number of levels in the hierarchy and the span of control of managers and supervisors. Organizational structure identifies the grouping of individuals into departments and departments into larger organizations. Additionally, organizational structure encompasses the design of systems to ensure effective communication, coordination, and integration of efforts across departments.

Course Learning Outcomes	Graduate LO
• Understanding the Organization as a System of Flows	1, 2, 3, 5, 8
• Comprehending the role of Information Systems in business.	1, 2, 3, 5, 8
• Understanding Contingency Factors in Organizational Design	1, 2, 3, 5, 8
• Analyzing Contemporary Business Organizations	1, 2, 3, 5, 8
• Making Recommendations for Improvement in Contemporary Business Organizations	1, 2, 3, 5, 8

Study Materials

- How the Organization Functions
- Design Parameters
- Contingency Factors
- Structural Configurations

References

- Mintzberg, H. (1979), The Structuring of Organizations, McGraw-Hill.

Worren, N. (2018), Organization Design: Simplifying Complex Systems (2nd Edition), Taylor and Francis.

Lecturers

Arif Wibisono

03 Discrete Logic and Structure

3 Credits | ES234103 – 1st Semester

This course helps students to better understand and analyze problems within the field of computer science and develop the skills necessary to effectively solve these problems. Logic provides the foundation for understanding how to draw valid conclusions from given premises, which is a crucial component in the decision-making process. Discrete structures provide the basis for understanding mathematical concepts used in the field of computer science, such as sets, relations, and mathematical logic. This course lays the foundation for understanding how algorithms and programming logic work.

Course Learning Outcomes	Graduate LO
• Explaining and applying basic concepts of logic such as propositions, premises, conclusions, and inference	1, 2, 6, 7, 8
• Comprehending the role of Information Systems in business.	1, 2, 6, 7, 8
• Differentiating between various types of Information Systems and provide practical examples within organizations/businesses.	1, 2, 6, 7, 8
• Explaining current trends and technologies in Information Systems.	1, 2, 4, 8
• Conceptualizing Information Systems that are beneficial to society.	1, 2, 3, 4, 6, 7, 8

Study Materials

- Introduction to Logic and Discrete Structures: What and Why Study Logic and Discrete Structures, Examples of Applications of Logic and Discrete Structure Concepts in the Field of Computer Science.
- Propositions and Logic Equivalence; Predicates and Quantifiers; Rules of Inference.
- Proof Methods: vacuous proofs, trivial proofs, proof by cases, proofs of equivalence.
- Set Theory; Number Theory; Induction; Recursion.
- Counting Methods: Multiplication Rule, Addition Rule, Pigeonhole Principle, Permutations, Combinations, Combinatorial Proof.
- Concepts of Relations; Graph Theory.
- Algorithmic problem solving

References

- Rosen, Kenneth .H., (2019), Discrete Mathematics and its Applications (8th Edition), New York: Mc-Graw-Hill Companies, Inc
- Concradie, Willem., Goranko, Valentin., (2015), Logic and Discrete Mathematics – A Concise Introduction, Wiley
- Backhouse, Roland (2011), Algorithmic Problem Solving, Wiley

Lecturers

Rarasmaya Indraswari, Ahmad Mukhlason, Amalia Utamima

04 Introduction to Economy and Business

2 Credits | ES234104 – 1st Semester

How to develop a business from scratch through a competitive strategy that will make the business grow over time? This course will guide participants in delving into customer demand, supplier costs, markets, competition, pricing, production, and differentiation. By the end of the course, participants will be able to apply fundamental economic principles to real-world business challenges.

Course Learning Outcomes	Graduate LO
• Explaining the major concepts of economic theory and practice in modern development	1, 2, 8
• Detailing key ideas about business, trade, and management	1, 2, 8
• Detailing key ideas about business, trade, and management	1, 8
• Exploring the broader economic mindset to simplify complex concepts	1, 5, 6, 8

Study Materials

- Starting and Growing a Business
- Leadership and Human Resources
- Financial Management
- Strategy and Operations
- Marketing Management

References

- DK (2014), The Business Book (Big Ideas Simply Eplained), DK
- DK (2012), The Economics Book : Big Ideas Simply Eplained (DK Big Ideas), DK

Lecturers

Achmad Holil

05 Design Thinking
3 Credits | ES234105 – 1st Semester

How do startups find a product that serves as a solution and is liked by users? This course will encourage participants to apply design thinking to generate problem-solving ideas for complex issues. To achieve this, participants will explore the practice of design thinking in startups to create products that address the problems faced by their users. At the end of the course, participants will be required to demonstrate and present problem-solving ideas that are worthy of being brought to the market.

Course Learning Outcomes	Graduate LO
• Breaking down design thinking to generate new ideas	1, 2, 8
• Exploring the practice of design thinking in startups to create new products	1, 2, 8
• Presenting design thinking as practiced by startups in developing their products	1, 4, 6, 8
• Applying the design thinking process to solve real-world problems	1, 4, 6, 8

Study Materials

- Definition of innovation.
- What is an innovative business idea?
- Design thinking methodology.
- Practical problem-solving using design thinking.

References

- Vianna, Mauricio., Vianna, Ysmar., Adler, Isabel K., Lucena, Brenda., Russo, Beatriz., (2011), Design Thinking – Business Innovation, MJV Press
- Betancur, Jose (2017), The Art Design Thinking: Make more of Your Design Thinking Workshops, Jose Betancur
- Yayici, Emrah (2016), Design Thinking Methodology Book, Emrah Yayici
- Lewrick, Michael (2018), The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businessess and Ecosystems (Design Thinking Series) ,Wiley

Lecturers

Achmad Holil

06 IT Infrastructure
3 Credits | ES234106 – 1st Semester

In the current business landscape, competition is intense and attractive. Nearly all organizations respond by harnessing Information Technology (IT). At the undergraduate level, IT infrastructure focuses on the utilization of PC hardware, basic software on PCs, and computer networks to maximize IT infrastructure supstatport for organizational goals. This course will equip participants to apply IT infrastructure that aligns with organizational business needs. Therefore, the course material focuses on the fundamentals of computer systems, computer hardware, basic software, and computer network basics. By the end of the course, participants are expected to be capable of implementing IT infrastructure and have the foundation to delve into advanced topics related to IT infrastructure.

Course Learning Outcomes	Graduate LO
• Understanding Computer System Basics	1, 4, 8
• Understanding Computer Hardware	1, 4, 8
• Understanding Basic Software	1, 4, 8
• Understanding Computer Network Basics	1, 4, 8
• Applying IT Infrastructure for Organizational Business	1, 3, 5, 8

Study Materials

- Fundamentals of Computer Systems.
- Computer Hardware.
- Basic Software.
- Computer Network Basics.

References

- Wilson, K. (2022), Exploring Computer Hardware (2022 Edition), Elluminet Press.
- Shriram K. Vasudevan, Subashri Vasudevan, Sunandhini Muralidharan, (2015), Modern Operating Systems, K International Publishing House.
- Cole, C. (2022), Basic Computer Networks.

Lecturers

Febriliyan Samopa

07 Business Process Management
4 Credits | ES234107 – 1st Semester

Business processes form the foundation of all information system applications. No information system operates without having processes in place. Therefore, managing business processes is vital to ensure the effective and efficient execution of information systems. This course challenges participants to address the needs of business process management within organizations. To achieve this, the course material focuses on the six phases in the business process cycle: process identification, process discovery, process analysis, process redesign, process implementation, and process monitoring and evaluation. With an understanding of the business process lifecycle and the ability to manage business processes within an organization, participants in this course will be able to demonstrate the execution of process models using Business Process Management (BPM) software.

Course Learning Outcomes	Graduate LO
• Classifying business processes within an organization.	1, 2, 8
• Discovering and describing AS-IS processes.	1, 2, 8
• Analyzing processes qualitatively and quantitatively.	1, 2, 8
• Redesigning business processes.	1, 4, 8
• Demonstrating the execution of process models using BPM software.	1, 4, 8

Study Materials

- Definition, components of business processes, common business processes, evolution and lifecycle of business process management, and involved parties; The role of business processes in enterprise architecture, classification of business processes, process architecture, process selection.
- Basic BPMN notation, branching & merging, rework & repetition, business objects, process decomposition; Advanced BPMN notation: Loop vs. arbitrary cycle, Multi-instance activity, Message Event, Timer Event, Racing Event, Exceptions, Business Rules; Process discovery methods, model quality assurance, modeling conventions, and guidelines.
- Value-added analysis, Waste analysis, Stakeholder analysis, Root-cause analysis; Flow Analysis, Queue Theory, M/M/1 and M/M/C queue models, Queue theory limitations; Anatomy of process simulation, Inputs to process simulation, Simulation tools.
- Redesign concepts, Devil's quadrangle, Redesign approaches, Redesign orbit; Transactional methods, Heuristic redesign; Transformational methods.
- Types of Process-Aware Information Systems (PAIS), Advantages of PAIS, Challenges of PAIS; Practice with BPMS Tools, Identifying automation constraints, Evaluating manual approaches, Enhancing process models, Detailing as needed, Specifying properties, Final stages.

References

- Dumas, Marlon and La Rosa, Marcello and Mendling, Jan and A. Reijers, Hajo, (2021), Fundamental Manajemen Proses Bisnis, Penerbit Andi.

Lecturers

Mahendrawathi ER, Arif Wibisono, Andre Parvian Aristio, Ika Nurkasanah

08 Database Systems
4 Credits | ES234108 – 1st Semester

Currently, databases serve as the fundamental framework for information systems and have fundamentally transformed the way many organizations operate. Specifically, advancements in database technology over the past few years have resulted in systems that are more powerful and intuitive to use. Many users can have fast access to data and share it with others without extra effort. These systems assist in quickly retrieving needed information from large databases in just seconds. Therefore, it is highly effective for businesses to manage various types of data, such as employee information, inventory, payroll, project management, and more. This course material focuses on relational database management, which includes conceptual database modeling and design, logical database design, relational database manipulation using Structured Query Language (SQL), and physical database design methodology using specific database management systems as the target implementation.

Course Learning Outcomes	Graduate LO
• Understanding the stages of the database system development lifecycle, the key phases of database design, and the architecture of database systems.	1, 6, 7
• Designing a conceptual database using high-level data modeling.	1, 3, 4, 7, 8
• Designing a logical database using the relational data model.	2, 4, 5, 7
• Specifying definitions, queries, and manipulations of relational data.	1, 3, 6, 7
• Understanding the methodology of physical database design and its implementation in a specific database management system environment.	1, 3, 4, 6, 7

Study Materials

- Database, database users, and the concepts and architecture of a database.
- Conceptual database design using the Entity-Relationship (ER) and Enhanced Entity-Relationship (EER) models.
- Relational data modeling and logical database design by mapping the ER model and EER model into a relational database schema.
- Specifying relational data retrieval using Relational Algebra.
- Defining, querying, and manipulating relational data using SQL.
- Refining relational databases through data normalization processes.
- Methodology for physical database design: file organization, access methods, and indexing.

References

- Jeffrey A. Hoffer, √. Ramesh, and Heikki Topi, (2016), Modern Database Management. Twelfth Edition, Pearson.
- Ramez Elmasri and Shamkant B. Navathe, (2011), Fundamentals of Database Systems, Sixth Edition, Addison-Wesley.
- Thomas Connolly and Carolyn Begg, (2005), Database Systems: A Practical Approach to Design, Implementation, and Management, Fourth Edition, Addison-Wesley.

Lecturers

Arif Djunaidy

09 Statistics and Probabilistics for Information Technology

4 Credits | ES234209 – 2nd Semester

Statistics are a cornerstone of business success, utilizing data as a reference for decision-making. With the advancement of database technology and the implementation of information systems in business organizations, data becomes more organized and centralized. However, this data only becomes valuable when analyzed using various statistical methods that are tailored to business needs. Therefore, this course has two objectives: (1) to understand the field of statistics, which is divided into two categories: descriptive and inferential, and (2) to analyze multivariate data for Structural Equation Modeling (SEM) equations.

Course Learning Outcomes	Graduate LO
• Understanding the terminology, basic concepts, and the utility of statistics from the perspective of researchers and practitioners	1, 8
• Understanding several quantitative data collection methods and when to use them	1, 3, 8
• Formulating hypotheses (endogenous/exogenous variables) and drawing data inferences according to the data scale	1, 6, 8
• Creating and implementing data collection instruments; testing validity and reliability	1, 2, 8
• Understanding probability and random variable distribution	1, 5, 8
• Understanding the fundamentals of inferential statistics for numerical and categorical data	1, 5, 8

Study Materials

- Statistics terminology and basic concepts: sample, proportion, descriptive statistics, inferential statistics, association, correlation, regression, multicollinearity.
- Primary and secondary data collection methods, data scales, visualization based on data scales, sampling methods.
- Principles of hypothesis formation, endogenous/exogenous variables, multivariate analysis (SEM - Structural Equation Modeling).
- Cleaning quantitative data, reliability testing, validity testing.
- Discrete and continuous probability, conditional probability, random variables.
- Fundamentals of statistical inference: Point estimates and sampling variability, confidence intervals, hypothesis testing for mean, proportion, and difference, one sample and two sample

References

- Kasmin, F., and Asmai, F., (2017), Probability and Statistics for Information Technology, Universiti Teknikal Malaysia Melaka
- Walpole, Myers, and Ye, (2021), Probability & Statistics for Engineers & Scientists 9th Edition, Pearson.
- Hair, J. F., Black, W., Babin, B., and Anderson, R., (2019), Multivariate Data Analysis, Cengage Learning.

Lecturers

Wiwik Anggraeni, Reny Nadlifatin, Raras Tyasnurita, Renny Pradina K.

10 Software Requirement Engineering

3 Credits | ES234210 – 2nd Semester

This course provides an overview of the procedures, processes, and techniques for analyzing and specifying system requirements. It covers the evolution of methodologies, methods of representation, tools, and engineering techniques for requirements. Students will gain experience in exploring, analyzing, specifying, managing, validating, and documenting software requirements, as well as the ability to trace back to previously defined requirements to ensure their validity.
The course not only imparts knowledge and understanding of the fundamental concepts of software requirements engineering but also the capability to elicit requirements and define them in the form of software requirement specifications, both functional and non-functional. With an understanding of, knowledge about, and proficiency in software requirements engineering, students will be capable of providing information technology solutions that align with a business's real-world needs.
Furthermore, the course equips students with the skills to use tools for managing and documenting requirements in the form of Software Requirement Specifications (SRS) or Software Requirement Specification (SKPL) documents.

Course Learning Outcomes	Graduate LO
• Understanding the definition and importance of software requirements engineering	1, 6, 8
• Understanding the concepts, models, and people involved in the software requirements engineering process and being able to suggest process improvement models for software requirements engineering	1, 2, 4, 6, 8
• Understanding the concept of requirement elicitation and being able to use various techniques and methods to gather software requirements	1, 2, 6, 8
• Understanding techniques for analyzing and validating software requirements and being able to document software requirements in the form of software requirement specification documents	1, 2, 6, 8
• Understanding the dynamic nature of software requirements change and how to manage these continuously evolving requirements without compromising software quality	1, 2, 4, 6, 8

Study Materials

- Fundamentals of software requirements engineering: definition, basic concepts, and the importance of software requirements engineering.
- The software requirements engineering process.
- Elicitation and techniques for gathering software requirements.
- Methods for analyzing software requirements: functional requirements, non-functional requirements, use-case diagrams.
- Software requirements validation process; Requirements traceability; Documentation of software requirements.
- Software requirements management.

References

- Watts S. Humphrey, (2007), A Discipline for Software Engineering, Pearson Education.
- Klaus Pohl, (2010) Requirements Engineering: Fundamentals, Principles, and Techniques, Springer.
- Dean Leffingwell, (2011), Agile Software Requirements, Pearson.
- Daniel Siahaan, (2012), Analisa Kebutuhan dalam Rekayasa Perangkat Lunak. Penerbit Andi Yogyakarta.
- SWEBOK 2004

Lecturers

Rarasmaya Indraswari, Izzat Aulia Akbar

11 Basic Programming
3 Credits | ES234211– 2nd Semester

Computational thinking skills are fundamental and highly essential in software development. This course invites students to learn computational thinking through basic programming using the Java programming language. Upon completing this course, it is expected that students will grasp the fundamental concepts of programming and be able to create Java programs to solve basic computational problems.

Course Learning Outcomes	Graduate LO
• Explaining the concept of variables and distinguishing data types in the Java programming language	1, 2, 3, 6, 8
• Applying the concepts of input and output, branching, and looping in programming	1, 2, 3, 6, 8
• Implementing arrays in programming	1, 2, 3, 6, 8
• Creating classes, methods, and objects in the Java programming language	1, 2, 3, 6 8
• Applying exception handling in programming.	1, 2, 3, 6, 8
• Developing Java programs to solve basic computational problems	1, 2, 3, 6, 8

Study Materials

- Java Programming Structure and Integrated Development Environment (IDE) for Java.
- Variable Concepts and Data Types.
- Input and Output.
- Branching and Looping.
- String Manipulation.
- Class, Method, and Object.
- Arrays.
- Exception Handling.
- Computational Problem Solving.
- Competitive Programming.

References

- Herbert Schildt (2022), Java: A Beginner's Guide 9th Edition.
- Sierra, K., Bates, B., Gee, T., (2022), Head First Java (3rd Edition), O'Reilly Media, Inc.
- Roland Backhouse (2011), Algorithmic Problem Solving, Wiley.

Lecturers

Ahmad Muklason, Renny Pradina

12 Enterprise System
4 Credits | ES2343312 – 3rd Semester

Recently, advancements in information systems and technology have driven manufacturing and service companies to create future-ready enterprise systems that can provide accurate and timely data and information to support their business processes. Enterprise Resource Planning (ERP), which is a software package with a single database to automate various cross-functional business processes, has become a standard for organizations across various industries. On the other hand, ERP is known as a complex system, and its implementation involves significant resources. Therefore, it requires an understanding of the business processes related to the software and the ability to configure and implement it to provide value to the organization.
This course will provide students with knowledge of best practices in enterprise resource planning processes and practical experience in configuring, operating, and running ERP software implementation projects. To achieve this, the teaching methods used will include lectures, discussions, project-based assignments for ERP implementation, and hands-on practice with ERP software. The course material will focus on key business processes in the latest ERP software, the ERP implementation lifecycle and methodology, and practical experience in operating ERP software.

Course Learning Outcomes	Graduate LO
• Understanding the concepts and fundamental aspects of enterprise systems	1, 3, 8
• Describing common ERP business processes, the ERP system development lifecycle, and ERP integration with CRM & SCM	1, 3, 8
• Planing and configure the integration of common business processes within a company using open-source ERP	1, 3, 5, 8
• Practicing the integration of common business processes within a company using proprietary ERP software	1, 3, 5, 8

Study Materials

- Introduction to Enterprise Systems: enterprise system concepts.
- Basic concepts of business processes: IT/IS in the business world, ERP history, Overview of ERP.
- System integration and ERP architecture: Functional silos, organizational evolution, ERP and ·system integration, ERP modules, ERP architecture.
- Types of Manufacturing and Service Companies.
- Key ERP business processes: sales, purchasing, production planning, finance, HR.
- ERP development lifecycle and implementation strategies, project management, and implementation strategies.
- Integration of ERP with CRM & SCM: Definition, evolution, types, system components, software packages, and the role of integration systems in SCRM & SCM.
- Open Source ERP Software (Odoo): Configuring sales, point-of-sales, · purchase management, inventory, manufacturing, and financial modules.
- Proprietary ERP Software: Sales & Distribution, Material Management, Production Planning, and Module Integration.

References

- Motiwalla, Luvai dan Thompson, Jeffrey, (2014), Enterprise Systems for Management (2nd Edition), Pearson Education Limited, Essex.
- Monk, E., and Wagner, B., (2013), Concepts in Enterprise Resource Planning 4th Ed., Course Technology, Cengage Learning.
- Ptak, C.A (2004), ERP: Tools, Techniques and Applications for Integrating the Supply Chain, St. Lucie Press.
- 4.O'Leary, D.E (2000), Enterprise Resource Planning Systems: Systems, Life Cycle, Electronic Commerce and Risk, Cambridge University Press

Lecturers

Mahendrawathi ER, Andre Parvian Aristio, Ika Nurkasanah

13 Database Administration
3 Credits | ES234313 – 3rd Semester

A Database Administrator, or DBA, is responsible for maintaining, securing, and operating a database, ensuring that data is stored and retrieved correctly. DBAs need to have a strong understanding of both technical and business requirements. Their role has become increasingly important in today's information-driven business environment. Across the globe, more and more organizations rely on data to uncover analytical insights about market conditions, new business models, and cost-cutting measures. Consequently, the demand for skilled DBAs continues to grow. In this course, students are expected to understand and perform the role of a DBA in relational database technology.

Course Learning Outcomes	Graduate LO
• Demonstrating Database Administration	1, 4, 6, 8
• Creating Stored Procedures and Functions	1, 4,, 6, 8
• Detecting issues and perform fine-tuning	1, 4, 6, 8

Study Materials

- Schema; User; Role; Backup; Restore; Replication
- T-SQL; Stored Procedure; Functions; Sequence; Service Broker; Linked-server
- Wait Type; Performance Dashboard; Database Internal; Indexing; Statistics; Query

References

- Ben-Gan, Itzik (2016), T-SQL Fundamentals, Third Edition, Microsoft Press.
- Carter, Peter A (2022), Pro SQL Server 2022 Administration: A Guide for the Modern DBA, Third Edition, Apress.
- Winand , Markus (2012), SQL Performance Explained Everything Developers Need to Know about SQL Performance, Marksus Winand.

Lecturers

Radityo P W

14 Operation Research
3 Credits | ES234314 – 3rd Semester

Operations Research is one of the fields of knowledge that is primarily used to determine optimal outcomes for problems that arise within an organization or business. These optimal outcomes can then be used to assist management in providing information for decision-making processes. This course will provide students with the ability to model and solve organizational and business problems (optimization) using a management science approach (mathematical). Therefore, the learning methods employed will include examples of real-world problems or case studies within organizations, companies, or businesses (problem-based learning). The course material focuses on modeling concepts, solving models, analyzing the obtained optimal results, and integer programming used to create more suitable optimal solutions for implementation.

Course Learning Outcomes	Graduate LO
• Defining existing problems and be able to model those problems.	1, 4, 7, 8
• Solving models, both graphically and use the simplex method.	1, 4, 7, 8
• Extracting additional information from the optimal solution of a model through post-optimal analysis and sensitivity analysis	1, 4, 7, 8
• Solving integer programming models	1, 4, 7, 8
• Solving specific models (e.g., transportation and assignment models)	1, 4, 7, 8

Study Materials

- Introduction to Operations Research: Definition, elements in operations research, problem-solving stages in operations research, examples of models and their solutions.
- Model Formulation: Characteristics of linear models, model components, examples of models with different types of components.
- Graphic Illustration: Solving models using graphical methods.
- Simplex Method: Solving models with different types of components (regular and irregular) using the simplex method.
- Post-Optimal Analysis: Duality and sensitivity analysis.
- Transportation and Assignment Models: Characteristics of each model, methods for solving them.
- Integer Programming: Characteristics of models involving integers and methods for solving them.

References

- Anderson, David R. (2018), An Introduction to Management Science: Quantitative Approach (15th Edition), Cengage Learning
- Taylor, Benand W. (2019), Introduction to Management Science, Pearson
- Winston, Wayne L. (2018), Practical Management Science (6th Edition), Cengage Learning Taha, Hamidyah (2016), Operations Research: An Introduction, Pearson

Lecturers

Wiwik Anggraeni,Edwin Riksakomara

15 Data and Diagnostic Analytics
3 Credits | ES234315 – 3rd Semester

Data analytics is a series of analyses in business intelligence that begins with Descriptive Analytics - Diagnostic Analytics - Predictive Analytics - Prescriptive Analytics - Cognitive Analytics. The aim of this course is to provide understanding and skills to students about Descriptive Analytics and Diagnostic Analytics. Both of these topics are aimed at enabling students to analyze data according to business needs and organizational issues as a Data Scientist would. The content of this course includes (1) fundamentals of describing and visualizing data in accordance with statistical knowledge and data storytelling, (2) data mining techniques for diagnostic analytics (unsupervised learning - clustering analysis), and (3) machine learning for anomaly detection in data.

Course Learning Outcomes	Graduate LO
• Understanding the position of Data Science among Engineering, Analysis, Analytics, and Communication along with the hierarchy of data analytics: descriptive, diagnostic, predictive, prescriptive, and cognitive	1, 3, 8
• Generating information by summarizing and visualizing numerical and categorical data	1, 8
• Implementing statistical measurement concepts and visualization to describe data	1, 3, 7, 8
• Implementing AI, Data Mining (DM), and Machine Learning (ML) concepts for conducting Diagnostic Analytics	1, 3, 7, 8

Study Materials

- ·The scope of data science: descriptive, diagnostic, predictive, prescriptive, and cognitive analytics. The interrelationship between data science and engineering, analysis, analytics, and communication.
- Terminology and basic concepts of descriptive statistics and data visualization (data storytelling): central tendency, dispersion, dot plot, scatter diagram, histogram, types of graphs, and distribution shape.
- Data mining techniques, machine learning, and artificial intelligence that can be used for Diagnostic Analytics: clustering analysis, anomaly detection.

References

- Jiawei Han, Micheline Kamber and Jian Pei, (2012), Data Mining: Concepts and Techniques, (3rd Edition), Elsevier Inc.
- Forsyth, D (2018), Probability and Statistics for Computer Science, Springer.
- Zwingmann, T. (2022), AI-Powered Business Intelligence, O'Reilly Media.

Lecturers

Retno Aulia √.

16 Agile Project Management
3 Credits | ES234316 – 3rd Semester

Startups operate in a state of permanent chaos. That's why it's crucial for participants to learn how to address the challenges of ever-changing needs, imperfect business estimates, frequent changes in project execution direction, and a lack of coordination among team members. In this course, participants are encouraged to break down complex projects into smaller parts to deliver overall high-quality results. At the end of the course, participants are required to practice agile project management and implementation.

Course Learning Outcomes	Graduate LO
• Demonstrating the philosophy and principles underlying agile	1, 4, 8
• Presenting the agile project lifecycle, including alternative configurations	1, 4, 8
• Operating the agile techniques used, along with their benefits and limitations	1, 4, 8
• Implementing agile project management, including planning, execution, and control	1, 2, 4, 8

Study Materials

- Definition and framework of agile.
- Challenges and implementation of agile.
- Agile project teams and organizations.
- Agile project planning
- Discovering scrum, kanban, sprints, etc
- Agile techniques

References

- Ries, Jeffrey (2018), Agile Project Management: The complete Step-by-Step Beginner`s Guide to Agile Project Management & Software Development (Lean Guides for Scrum, Kanban, Sprint, DSDM P & Crystal Book 1)
- Cluster, Konnor (2019), Agile Project Management: Learn How To Manage a Project with Agile Methods, Scrum, Kanban and Extreme Programming
- Lean, Eric (2020), Agile Project Management: The Complete Beginner`s Guide to Learn Project Management Step by Step
- Project Management Institute (2017), Agile Practice Guide, Project Management Institute

Lecturers

Achmad Holil

17 Algorithm and Data Structure
4 Credits | ES234317 – 4th Semester

Currently, user and business needs are changing very rapidly, necessitating a programmer who understands abstract data structures (built-in functions) and a number of important algorithms to implement computer programs quickly and accurately. This course introduces object-oriented methods, which are useful techniques for collaborative development, where projects are divided into several groups. By the end of the course, participants are expected to demonstrate the use of abstract data structures and algorithms to solve a variety of classic societal problems such as shortest path, traveling salesman, timetabling, vehicle routing, and more.

Course Learning Outcomes	Graduate LO
• Assessing algorithm complexity	2, 3, 8
• Identifying bugs during debugging and testing processes to produce quality programs	5, 8
• Designing comprehensive solutions using an object-oriented programming approach	3, 4, 6, 8
• Comprehending various types of abstract data structures and essential algorithms for managing multiple data	4, 5, 6, 8
• Implementing solution designs with algorithms and data structures quickly and accurately	1, 4, 5, 6, 8

Study Materials

- Introduction to algorithms and algorithmic language (pseudocode); asymptotic notation; algorithm complexity analysis.
- Introduction to Netbeans editor: shortcuts, code snippets, code completion, debugging.
- Concepts and principles of object-oriented programming: encapsulation, abstraction, inheritance, and polymorphism.
- Abstract data structures: Array, List, Stack, Queue.
- Sorting algorithms: Bubble sort, insertion sort, quick sort, merge sort.
- Searching : sequential search, binary search.
- Advanced abstract data structures: Trees and Graphs.
- Graph algorithms: graph traversals, shortest path, minimal spanning tree, topological sort.
- Other algorithms and their applications: Recursion and Backtracking, Divide and Conquer, Greedy Algorithm, Dynamic Programming, Branch and Bound

References

- Data Structures and Algorithm Analysis in Java, Third Edition, Dr. Clifford A. Shaffer, 2011
- Data Structures and Algorithm Analysis in Java 3rd Edition, Mark Weiss, Pearson, 2012
- Data Structures and Algorithms Made Easy in Java: Data Structure and Algorithmic Puzzles, Second Edition, Narasimha Karumanchi, 2018
- Object-Oriented Data Structures Using Java 4th Edition, Nell Dale at all, 2018
- Beginning NetBeans IDE: For Java Developers 1st ed., Geertjan Wielenga, Apress, 2015

Lecturers

Aris Tjahyanto, Renny P Kusumawardani

18 User Experience Design
3 Credits | ES234418 – 4th Semester

This course provides students with knowledge about best practices in one of the phases of Software Development, which is the Design phase. In this course, the focus is on the aspect of User Experience Design (UX Design). The course aims to design, prototype, and evaluate a User Interface. Students will be taught various techniques related to brainstorming, ideation, and prototyping. Additionally, there will be several methods for evaluating the design that has been created.

Course Learning Outcomes	Graduate LO
• Understanding the concepts and methodologies of user studies	1, 2, 6, 8
• Understanding the concepts and methodologies of user experience design.	1, 2, 3, 6, 8
• Applying techniques to understand user problem spaces.	1, 2, 3, 5, 6, 8
• Applying techniques for ideation and generating user experience designs.	1, 8
• Applying techniques for prototyping and solution spaces to implement user experience designs.	1, 8
• Applying techniques for evaluating user experience designs.	1, 8

Study Materials

- Needfinding
- Design Discovery
- Prototyping (low fidelity, medium fidelity)
- Ideation
- Visual Information Design
- Heuristic Evaluation

References

- Designing the User Interface: Strategies for Effective Human-Computer Interaction, 6th edition Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, Niklas Elmqvist, Nicholas Diakopoulos
- Interaction Design Specialization, Learn how to design great user experiences. Design that delights usersScott Klemmer, https://www.coursera.org/specializations/interaction-design
- Nielsen Norman Group. World Leaders in Research-Based User Experience. https://www.nngroup.com/

Lecturers

Arif Wibisono

19 Data Lakehouse
3 Credits | ES234419 – 4th Semester

Companies require a system for various structured and unstructured data applications. The data warehouse approach is not agile enough to handle this, while the data lake approach can be too complex to implement. Therefore, a combination of data warehouse and data lake approaches is needed, known as a data lakehouse. In this course, students are provided with materials and practical experience related to the design and creation of a data lakehouse. By the end of the course, students are expected to understand the importance of a data lakehouse and be able to create a data lakehouse prototype to meet organizational needs.

Course Learning Outcomes	Graduate LO
• Designing and building a Data Warehouse	1, 4, 6, 7, 8
• Designing and building a Data Lake	1, 4, 6, 7, 8
• Designing and building a Data Lakehouse	1, 4, 6, 7, 8

Study Materials

- ETL / ELT; Dimensions; Facts; Star Schema
- Unstructured Data; Parquet; Distributed file systems; Distributed Query Engine; Data frame
- First-generation Data Architecture; Two-Tier Data Architecture; Single unified Data Architecture

References

- Kimball, Ralph., Ross, Margy., (2013), The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling (3rd Edition), Wiley
- Inmon, Bill., Levins, Mary., (2021), Building the Data Lakehouse, Technics Publications

Lecturers

Radityo Prasetyanto Wibowo

20 Web Programming
3 Credits | ES234420 – 3rd Semester

This course is one of the series of courses that provide students with an understanding of information system application development. In this course, students will grasp web-based service architecture and create web-based applications. Additionally, students gain insights into web-based application frameworks.

Course Learning Outcomes	Graduate LO
• Understanding web-based service architecture	1, 3, 8
• Stating the technologies used to develop web applications	1, 2, 3, 8
• Analyzing various MVC frameworks for building web applications	1, 2, 3, 8
• Building web-based applications using the proposed framework	1, 6, 7, 8
• Displaying and demonstrating the process and results of web application development	1, 3, 8

Study Materials

- Information Architecture
- Web Technologies
- MVC Framework
- Web Development

References

- Web application architecture : principles, protocols, and practices /. Leon Shklar, Richard Rosen
- Full Stack Web Development for Beginners. Learn Ecommerce Web Development Using HTML5, CSS3, Bootstrap, JavaScript, MySQL, and PHP. by Riaz Ahmed
- "Practical Laravel: Develop clean MVC web applications" by Daniel Correa and Paola Vallejo.

Lecturers

Faizal Johan Atletiko

21 Ethics in IT
2 Credits | ES234421 – 4th Semester

The application of Information Technology in every aspect of human life has given rise to many issues that need to be formally regulated. Ethics in information technology refer to the ethical principles that govern the use of computers and related devices, as well as the actions of individuals who work with such technology. These principles encompass issues such as privacy, security, and intellectual property. This course provides knowledge and understanding of critical reflection and responsibility regarding various legal, ethical, and social issues related to IS/IT. By the end of the course, students are expected to be able to apply ethical codes and address ethical issues faced by professionals and IT users, as well as professional IS/IT organizations.

Course Learning Outcomes	Graduate LO
• Understanding the understanding of the code of ethics & ethical issues faced by IT professionals and users, professional IS/IT organizations.	1, 4, 8
• Understanding the understanding of various legal issues arising from the use of information technology.	1, 3, 4, 8
• Analyzing the phenomenon of information technology usage from ethical, moral, and legal perspectives.	1, 3, 4, 8

Study Materials

- Concepts of ethics, morality, law
- Professional IT, IT associations, IT certifications, IT licenses
- IT crimes
- Privacy
- Freedom of expression
- Intellectual property rights
- Anonymity
- Data acquisition ethics
- Fair data
- Fairness
- Green computing.

References

- Reynolds, Walter, G., (2015), Ethics in Information Technology, Boston, MA, USA : Cengage Learning.

Lecturers

Nur Aini Rakhmawati

22 Predictive Modelling and Analytics
4 Credits | ES234422 – 4th Semester

The ability to use data as a tool to project the future is one of the valuable skills for graduates in Information Systems. With the advancement of database technology and the implementation of information systems in business organizations, data is becoming more organized and centralized. Consequently, data becomes more powerful for preparing businesses for various uncertain future events. By using various data mining and forecasting techniques, these issues can be studied and estimated. Therefore, there are two objectives in this course: (1) using data mining techniques to classify categorical data (2 Credits), and (2) practicing forecasting techniques to project time series data (2 Credits).

Course Learning Outcomes	Graduate LO
• Interpreting time series data characteristics through data visualization and determining appropriate forecasting techniques	1, 3, 6, 8
• Projecting the future using robust forecasting techniques for linear and non-linear data	1, 3, 6, 8
• Using data mining techniques for numerical and categorical data prediction (supervised learning)	1, 3, 6, 8
• Using machine (deep) learning to solve classification problems based on relevant contexts	1, 3, 5, 8
• Acting as a data scientist: communicating findings from the predictive analytics process	1, 3, 6, 8

Study Materials

- Time series data characteristics: stationary, trend, seasonal, cycle. Simple forecasting techniques: moving average, simple exponential smoothing.
- Robust forecasting techniques: neural network variants, ARIMA variants, fuzzy variants.
- Data mining and machine learning techniques for predicting numerical data: association concepts, correlation, multicollinearity, simple and multiple regression.
- Data mining and machine learning techniques for predicting categorical data: logistic regression, decision tree, naïve bayes, K-Nearest Neighbor, Support Vector Machine, random forest concepts.
- Tools for forecasting and prediction accuracy measurement: time series (error measurements), categorical (confusion matrix, precision, recall, accuracy, AUC/ROC).

References

- Makridakis, Spyros G., Wheelwright, Steven C., Hyndman, Rob J., (1998), Forecasting: Methods and applications (3rd edition), Wiley
- Pang-Ning Tan., Michael Steinbach., Anuj Karpatne., Vipin Kumar., Data Mining (2nd edition)

Lecturers

Arif Djunaidy, Wiwik Anggraeni, Retno Aulia √.

23 IT Risk Management
3 Credits | ES234423 – 4th Semester

As a support for organizational business, IT is expected to always be reliable under any circumstances, so the organization can consistently meet customer expectations. However, there are many risks that can disrupt the continuity of IT. These risks should be identified as early as possible so that the organization can develop strategies and mitigation plans to prevent these risks from affecting its performance in achieving its goals. This course will equip students with an understanding of IT Risk concepts and Risk Management, as well as the process of identifying risks and planning mitigation steps.

Course Learning Outcomes	Graduate LO
• Understanding and explaining uncertainty in business, data and information vulnerability to threats from both internal and external sources.	1, 2, 8
• Managing IT risks and ensuring the availability of information for business continuity.	1, 2, 8
• Managing secure and accountable information systems based on applicable rules and policies.	1, 6, 8

Study Materials

- ISO31000
- COBIT 2019 For Risk
- Information Security and IT Risk Management
- Cybersecurity and Third-Party Risk: Third Party Threat Hunting
- Information System Accountability
- Governance and management of IT related Risk
- Information Security Awareness
- Risk Management Standards and Frameworks
- Risk Concepts and Contingency Plans
- Risk Profile, Risk Appetite and Risk Tolerance
- Legal, Regulatory, and Contractual Requirements;
- Monitoring, reporting and communicating IT related risk
- Risk Identification, Risk Analysis, and Risk Evaluation
- Digital Challenges and Threats

References

- ISO 31000 (2018)
- COBIT 2019
- Agrawal, Manish, Campoe, Alex, Pierce, Eric., (2014), Information security and IT risk management, First Edition, Wiley.
- Rasner, Gregory C (2021), Cybersecurity and Third-Party Risk: Third Party Threat Hunting, First Edition, Wiley.

Lecturers

Hanim Maria Astuti, Yogantara S. Dharmawan

24 Computer Network Design and Management
3 Credits | ES234424 – 4th Semester

Design and management of computer networks provide an understanding of concepts, knowledge analysis, utilization technology network needs, and network setup and monitoring with an emphasis on flexibility and convergence. It serves as a primary supporter for the operational aspect of Information Systems by provisioning and managing networks.

Course Learning Outcomes	Graduate LO
• Understanding the concepts of architecture and infrastructure for company Information Technology (IT) (computer networks, data centers, etc.)	1, 2, 8
• Understanding and creating computer network designs	1, 2, 8
• Designing computer networks according to user needs	1, 6, 8

Study Materials

- Basic Switch and End Device Configuration; Protocol Models; Physical Layer; Data Link Layer; Network Layer; Transport Layer;
- Network Management; Network Design; Network Troubleshooting
- Ethernet Switching; Address Resolution; Basic Router Configuration;
- VLAN;ACL

References

- Tanenbaum, Andrew S., Wetherall, David J, (2010), Computer Networks, Prentice Hall
- Lammle, Todd (2020), CCNA Certification Study Guide, Volume 2: Exam 200 -301, Sybex
- Tetz, Edward (2011), Cisco Networking All-in-one, For Dummies
- Cisco Networking Academy, (2020), Introduction to Networks Companion Guide (CCNAv7), Pearson

Lecturers

Febriliyan Samopa, Bekti Cahyo Hidayanto, Nisfu Asrul Sani

25 IT Organization Evaluation and Monitoring
3 Credits | ES234525 – 5th Semester

This course offers comprehensive discussions covering standards and outcome-based monitoring and evaluation procedures for the end-to-end project lifecycle. The course equips students with the competence to prepare and implement outcome-based monitoring and evaluation systems involving data management, analysis, and reporting. Students will benefit from the latest M&E philosophies and practices, including results and participatory approaches. The Monitoring and Evaluation (M&E) course encompasses all key elements of a robust M&E system along with direct practical projects to provide hands-on experience in the taught M&E concepts.

Course Learning Outcomes	Graduate LO
• Understanding the basic concepts of monitoring and evaluation	1, 5, 8
• Understanding outcome design in monitoring and evaluation	1, 5, 8
• Presenting indicators and data in monitoring and evaluation	1, 5, 8
• Elaborating on monitoring and evaluation plans	1, 2, 3, 4, 5, 6, 7, 8

Study Materials

- Fundamentals of monitoring and evaluation
- Impact, outcomes, outputs and activities
- Indicator definiton
- Indicator metrics
- Different sources of M&E data
- Participatory methods of data collection
- Data Quality Assessment
- Monitoring and evalation plan

References

- Kusek, Jody Z. and Rist, Ray C., (2004), Ten Steps to a Results-Based Monitoring and Evaluation System: A Handbook for Development Practitioners, World Bank Publications.
- Frankel, N., Gage A., (2007), M&E Fundamentals: A Self-Guided Minicourse

Lecturers

Apol Pribadi Subriadi

26 Software Design & Development
4 Credits | ES234526 – 5th Semester

The design and development of software are crucial in today's context, given the extensive implementation of IT in organizations. Therefore, the design and development of software using the right methods to enhance the reliability of the resulting software is of paramount importance for students in the Information Systems program. This course provides students with hands-on experience in designing and developing small to medium-scale software using the object-oriented paradigm, carried out in a teamwork (developer) collaboration. The teaching method employs inquiry, contextual learning, and a final group project to be completed as part of the course. The course material focuses on Object-Oriented Analysis and Design (OOAD) concepts and various UML diagrams, analysis, and design of object-oriented software using UML, the Iconix process, UML modeling tools, software construction concepts, design construction, translating UML diagrams into programming language code structure, reverse engineering, design patterns, software testing, and a final project. The final assignment for the course aims to produce a work that includes the design, development, and testing of small to medium-scale software, along with development documentation, user guides, and unit test level testing documentation.

Course Learning Outcomes	Graduate LO
• Breaking down the Object-Oriented Analysis and Design (OOAD) concepts and various Unified Modeling Language (UML) diagrams	1, 3, 8
• Applying analysis and design concepts using the Iconix process framework with various UML diagrams	1, 3, 8
• Analyzing software construction concepts and the importance of construction design	1, 3, 8
• Testing software up to the unit testing level	1, 2, 6, 8
• Building small to medium-scale software	1, 2, 6, 8

Study Materials

- Concepts of Object-Oriented Analysis and Design (OOAD) and various UML diagrams
- UML tools
- Software analysis and design using UML
- Fundamentals of software construction.
- Translating UML diagrams into program code
- Design Patterns
- Software testing
- Software development documentation
- Final Project

References

- Savage, J., Barclay, K. (2004), Object-Oriented Design with UML and JAVA, Butterworth-Heinemann
- Dennis., Wixom., Tegarden., (2015), System Analysis & Design: An Object-oriented Approach with UML, Wiley
- Podeswa, Howard, UML for The IT Business Analyst: A practical Guide to Requirements Gathering Using the Unified Modeling Language (2nd edition),
- Stephens, Matt., Rosenberg, Doug., (2007), Use Case Driven Object Modeling with UML Theory and Practice, Springer
- Martin, Robert C. (2003), UML for JAVA programmer, Prentice Hall

Lecturers

Faizal Johan Atletiko

27 Emerging Technology
3 Credits | ES234527 – 5th Semester

Technology is now inseparable from human life. From work to everyday life, humans are constantly interacting with technology. Technological innovation has played a crucial role in human evolution. For example, the emergence of smartphone technology has enabled humans not only to communicate verbally but also visually, through text, and digital documents. This is different from the previous condition where communication required letters or landline phones. Furthermore, with the advancement of technology, data transmission can be done quickly and can carry a large amount of data in one go. Even today's technology has artificial intelligence capabilities similar to humans, enabling it to move and make decisions autonomously. This course will discuss technological innovations created to make life easier for humans and encourage students to contribute to ongoing technological advancements. By the end of this course, students are expected to understand the latest technological developments and be capable of providing innovations to enhance the quality of human life or simplify tasks.

Course Learning Outcomes	Graduate LO
• Understanding knowledge about emerging innovations and technologies	1, 2, 8
• Presenting emerging technologies	1, 6, 8
• Reporting the results of technology problem analysis by providing innovative solutions	1, 6, 8

Study Materials

- Innovation, Value, and Impact Assessment
- Emerging Technologies in Telecommunication
- Essentials of Internet of Things and Wearable Devices
- Artificial Intelligence Innovations
- 3D Printing
- Human-Machine Interface
- Data Science in Emerging Technologies

References

- Küfeoğlu, S. (2022), Emerging Technologies: Value Creation for Sustainable Development, Springer Nature.
- Kumar, P., Tomar, A., and Sharmila, R., (2021), Emerging Technologies in Computer, CRC Press.

Lecturers

Izzat Aulia Akbar

28 IT Service Management
3 Credits | ES234528 – 5th Semester

With the evolution of Information Technology services today, such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), Information Technology is no longer just a technical issue but has shifted more towards being a service that needs to be planned, managed, and evaluated. Every organization must be capable of planning, designing, building or procuring services, running service operations, evaluating, and improving its Information Technology services to support organizational goals. This organizational capability is defined as Information Technology Service Management. This course teaches students one of the most popular frameworks for IT Service Management, which is ITIL (Information Technology Infrastructure Library). In this course, students will learn various concepts related to information technology services, the main components of IT Service Management, and how to practice IT Service Management principles.

Course Learning Outcomes	Graduate LO
• Explaining important concepts related to IT Service Management	1, 5, 8
• Explaining the main models of IT Service Management, including: SVS (Service Value System), SVC (Service Value Chain), Dimensions, Guiding Principles, Governance, Practices	1, 5, 8
• Explaining the 34 IT Service Management practices, including: Objectives, Related Concepts, Resources involved (Processes & Value Stream, Organization & People, Technology & Information, Partners & Suppliers), contributions to the Service Value Chain	1, 5, 8

Study Materials

- Important concepts of IT Service Management
- Key models of IT Service Management
- The 34 IT Service Management practices, including: Objectives, Related Concepts, Resources involved (Processes & Value Stream, Organization & People, Technology & Information, Partners & Suppliers), contributions to the Service Value Chain, including examples of SOP documents and application tools.

References

- Stationery Office (2020), ITIL Foundation, ITIL (ITIL 4 Foundation)
- Agutter, Clair (2020), ITIL® Foundation Essentials ITIL 4 Edition: The ultimate Revision Guide , ITGP
- Susanto, Toni D (2017), Sukses Mengelola Layanan Teknologi Informasi & Kiat Lulus Ujian Sertifikasi ITIL Foundation (Information Technology Infrastructure Library), Surabaya: Asosiasi Sistem Informasi Indonesia

Lecturers

Tony Dwi Susanto, Reny Nadlifatin

29 IS/IT Strategic Planning
4 Credits | ES234529 – 5th Semester

The demands of digital transformation today force every organization to ensure alignment between their Information Technology investments and the organizational business objectives. Therefore, every organization needs an Information Technology Strategic Plan. The Strategic Information Technology Planning course aims to educate students on understanding organizational Strategic Planning (including: vision, mission, goals, objectives, strategies, programs, activities, positioning, financial planning), formulating IT strategies, and understanding methods and tools for creating Enterprise Architecture.

Course Learning Outcomes	Graduate LO
• Explain the concept of IT as a strategic asset and competitive advantage, digital transformation, and provide examples of successful and failed IT cases	1, 5, 8
• Developing organizational Strategic Planning (including: vision, mission, goals, objectives, strategies, programs, activities, positioning, financial planning) for case exercises using SWOT and BSC methods	1, 5, 8
• Analyzing IT strategies using SWOT and IT-BSC, COBIT, Strategic Alignment Model (SAM)	1, 5, 8
• Designing Enterprise Architecture using the TOGAF framework and EA tools	1, 5, 8

Study Materials

- Vision, Mission, Goals, Objectives, KPI (Key Performance Indicators), Strategies, Programs, Activities
- SWOT, Balanced Score Card (BSC) , IT BSC, SAM, IT Strategy
- Cascading Business Goals into IT Strategies, Processes, and IT Governance & Management Components based on the COBIT framework
- Enterprise Architecture (EA) based on the TOGAF framework
- Tools for creating Enterprise Architecture

References

- Ward, John., Joe Peppard., (2002), Strategic Planning for Information Systems (3rd edition), Wiley
- Cassidy, Anita (2005), Information Systems Strategic Planning (2nd Edition), Auerbach Publications
- Kotusev, Svyatoslav (2018), The Practice of Enterprise Architecture: A Modern Approach to Business and IT Alignment (2nd Edition), SK Publishing
- McGovern, James (2003), Practicel Guide to Enterprise Architecture, Prentice Hall
- Desfray, Phillipe., Raymond, Gilbert. (2014), Modeling Enterprise Architecture with TOGAF: A practical Guide Using UML and BPMN (The MK/OMG Press), Morgan Kaufmann
- COBIT 2019

Lecturers

Tony Dwi Susanto

30 Information Asset Protection
4 Credits | ES234530 – 5th Semester

Information Asset Protection is a course that discusses ways to protect information assets from security threats. Information assets can include data, applications, systems, networks, or hardware. This course may cover topics such as encryption, authentication, access management, protection against network attacks, disaster recovery, and industry standards. The objective of this course is to provide students with an understanding of how to identify, evaluate, and manage information security risks, as well as to provide appropriate solutions to address information security issues.

Course Learning Outcomes	Graduate LO
• Understanding the knowledge about information security and the need for security	1, 2, 8
• Presenting techniques and methods for the physical, technical, and environmental protection of information assets	1, 6, 8
• Analyzing and implementing good security planning	1, 6, 8

Study Materials

- Key elements of information security management
- System access permissions
- Access control flexibility
- Privacy issues and the role of SI auditors
- Information security and external parties
- Computer crime issues
- Security Incident response and handling
- Logical access
- Identification and authentication
- Encryption-decryption
- Viruses
- Environmental control equipment

References

- Mattord, H., Whitman, M., (2009), Principles of Information Security (3rd Edition), Thomson Course Technology.
- Krutz, Ronald L., Vines, Russell Dean, (2001), The CISSP Prep Guide, Wiley.
- Tipton, Harold F., Krause, M., (2007), Information Security Management Handbook (Sixth Edition), CRC Press.
- Cannon, David L., (2011), CISA Certified Information Systems Auditor Study Guide, Wiley.
- Splaine, S., (2002), Testing Web Security, Wiley.

Lecturers

Bekti Cahyo Hidayanto, Izzat Aulia Akbar

31 IS Capstone
4 Credits | ES234631 – 7th Semester

IS Capstone is a Project-based learning with case studies in the local environment encourages students to apply what they have learned in Information Systems. The IS Capstone provides students with the freedom to solve real-world problems using the correct and structured approach. IS Capstone is carried out independently without neglecting the guidance aspect during the process. In this course, students are required to address problems based on their learning from courses like Agile Project Management, Software Planning and Development, etc., using their creativity and solutions. However, students are also given the opportunity to discuss with mentors or experts who can provide guidance on the solutions to the problems they face. Students demonstrate the results of their implementations.

Course Learning Outcomes	Graduate LO
• Practicing agile project management learning	1, 3, 5, 8
• Practicing software planning and development learning	1, 3, 5, 8
• Implementing project-based learning with case studies in the local environment	1, 3, 5, 8
• Demonstrating the results of the project implementation	1, 3, 5, 8

Study Materials

- Learning in Agile Project Management Course
- Learning in Software Planning and Development Course

References

- Ries, Jeffery (2018), Agile Project Management: The Complete Step-by-Step Beginner's Guide to Agile Project Management & Software Development (Lean Guides for Scrum, Kanban, Sprint, DSDM XP & Crystal).
- Cluster, Konnor (2019), Agile Project Management: Learn How To Manage a Project With Agile Methods, Scrum, Kanban, and Extreme Programming.
- Lean, Eric (2020), Agile Project Management: The Complete Beginner's Guide to Learn Project Management Step by Step. Eric Lean.
- Project Management Institute, Agile Practice Guide

Lecturers

Achmad Holil, Andre Parvian

32 System Development and Operation

4 Credits | ES234632 – 6th Semester

DevOps is a combination of two words, "Development" and "Operations," where this course will teach the development of a system/application along with its operational aspects. DevOps has the principle of enabling effective and efficient coordination between development teams and operations teams. Topics covered in this course may include operating systems, server management, cloud computing, workflow management systems, process automation, and more.

Course Learning Outcomes	Graduate LO
• Making accurate decisions in the context of problem-solving based on the analysis of information and data	1, 8
• Evaluating and developing innovative IT ideas as solutions to current problems	1, 2, 8
• Uncovering needs and design system integrations that enhance the competitiveness of the organization	1, 6, 8

Study Materials

- Continuous Integration and Continuous Delivery (CI/CD): The practice of frequently integrating code changes and automatically deploying them to production.
- Configuration Management: The practice of managing and automating infrastructure configurations, such as servers, networks, and databases.
- Containerization: The use of lightweight containers, such as Docker, to package and deploy software.
- Operating Systems (OS) and Non-OS Concepts, Server Management Skills (Server & On-Premises), Infrastructure Provisioning, Data and System Log Management, Compute and Storage Management.
- Cloud Region and Availability Domain, Infrastructure and Application Monitoring, Cloud Design Patterns, Analyzing Cloud Providers, Container and Configuration Management, Virtualization, Virtual Cloud Network, Process Customization, Security, and Data Protection, Identity and Access Management.

References

- Kim, Gene., Debois, Patrcik., Wills, John., Humble, Jez., (2016), The DevOps Handbook, IT Revolution Press.
- Humble, Jez., Farley, David., (2010), Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, Addison-Wesley Professional.
- Sharma, Sanjeez (2017), The DevOps Adoption Playbook: A Guide to Adopting DevOps in a Multi-Speed IT Enterprise, Wiley.

Lecturers

Febriliyan Samopa, Radityo Prasetianto Wibowo, Nisfu Asrul Sani

33 Supply Chain Management
3 Credits | ES234934 – Elective

To improve competitive advantage in the business world today, organizations cannot focus solely on themselves but must consider and collaborate with other organizations within a supply chain network. Managing the supply chain network involves the flow of materials, information, and money, thus requiring various approaches. The ability to manage the entire flow of the supply chain at different levels, namely strategic, tactical, and operational, by leveraging the latest information technology, becomes the key to an organization's competitive advantage. Digital transformation is also currently driving industries towards realizing a circular economy, known as the Digital Circular Economy, where the strategy for utilizing information technology in the supply chain will be crucial.
This course will provide students with knowledge of the main processes of supply chain management and the management of information flow within the supply chain using the latest IT/IS to enhance supply chain performance. To achieve this, the learning methods employed will include lectures, discussions, presentations, problem-solving in supply chain scenarios, and project-based assignments to address real-world supply chain issues. The course material will focus on supply chain management concepts, supply chain business processes, the role of information, as well as technology and information systems in supporting supply chain management. Additionally, students will gain experience in identifying problems and proposing IT components to resolve issues within real supply chain contexts, particularly those related to the topic of Digital Circular Economy.

Course Learning Outcomes	Graduate LO
• Elaborating on the concept of supply chain management in order to map business processes with supply chain strategies within it.	1, 3, 8
• Applying forecasting methods, aggregate planning, and demand management techniques to address supply chain issues.	1, 3, 8
• Solving common business process problems in supply chain management, including inventory management, procurement, order fulfillment, as well as logistics and transportation using IT/IS.	1, 3, 5, 8
• Describing the role of IT/IS in supply chain management and be capable of proposing IT solutions for real-world supply chain problem-solving.	1,358

Study Materials

- Basic Concepts of Supply Chain Management: Definition of supply chain and supply chain management, driving factors, flows within the supply chain, supply chain activities.
- Common Business Processes in Supply Chain Management: Scope, common business processes, Supply Chain Operations Reference (SCOR).
- Demand Management Processes: Demand management and forecasting, characteristics of forecasting, types of data and forecasting methods, time series forecasting, demand management tools.
- Aggregate Planning Process: The hierarchy of operational planning processes, aggregate planning with level and chase strategies, available-to-promise (ATP), and the influence of demand management on aggregate planning.
- Inventory Management Process: Types, costs, risks, and the value of inventory; inventory classification (ABC Classification), inventory management techniques (EOQ, and ROP).
- IT/IS Trends in Supporting the Digital Circular Economy.

References

- Pujawan, N. dan Mahendrawathi ER, 2017, Supply Chain Management edisi III, Andi Offset.
- Chopra, Sunil., & Meindl, Peter., 2007, Supply Chain Management: Strategy, Planning and Operation, Prentice-Hall.
- Simchi-Levi, David, Kaminsky, P., and Simchi-levi, E., 2003, Designing and Managing the Supply Chain: Concepts, Strategy, and Case Studies, Second Edition, McGraw-Hill.
- audon, K and Laudon, J. P., Management Information Systems: Managing the Digital Firm 15th Ed, Prentice-Hall.
- Croxton, K. L., Garcia-Dastugue, S., Lambert, D.M., Rogers, D.S., (2001), The Supply Chain Management Processes, International Journal of Logistics Management, Vol. 12, No. 2.
- Wisner, J. D. and Stanley, L. L. (2008), Process Management: Creating Value along the Supply Chain, Thomson Higher Education.
- Mavropoulos, A., & Nilsen, A. W. (2020). Industry 4.0 and Circular Economy. In John Wiley & Sons Ltd. John Wiley & Sons Ltd.

Lecturers

Mahendrawathi ER, Ika Nurkasanah

34 Customer Relationship Management

3 Credits | ES234935 – Elective

Customer Relationship Management (CRM) is a study of how companies engineer and manage relationships with their customers. This course initially explores how companies can transition from transactional customer relationships to more intimate and individualized ones (one-to-one relationships). Subsequently, it delves into the fundamental theories and concepts of CRM, including CRM strategy, operational CRM, analytical CRM, and collaborative CRM.

In this course, students also learn about strategies and methods for conducting electronic CRM (e-CRM) and related activities. In addition to using reference books, students stay updated on the latest CRM theories and issues from reputable international journals. They are assigned case studies to assess and improve CRM programs in various industries and apply CRM concepts and theories to real-world business cases in society.

Assessment methods for students include written exams, both in-person and online presentations, article reviews, surveys for evaluating and enhancing CRM programs in companies, and producing course outcomes such as research results, community service, and the development of CRM models or frameworks.

Course Learning Outcomes	Graduate LO
• Understanding the concepts and knowledge of engineering and Customer Relationship Management (CRM).	1, 2, 3, 8
• Elaborating on the latest theories and recent issues in CRM.	1, 3, 8
• Planning and disseminateing theories and concepts of CRM to the community, both in-person and online.	1, 2, 3, 8
• Assessing and implementing improvements to a CRM program in a case study.	1, 2, 3, 8

Study Materials

- CRM Definition, Types of CRM, CRM Implementation in Business, CRM Initiatives Undertaken by Companies.
- Review of International Journals Discussing CRM Implementation, Researching and Comparing CRM Implementation in Companies in Indonesia, Strategic Framework for CRM, Value Creation Process, Performance Assessment Process.
- CRM Implementation in E-commerce, Definition and Implementation of CRM in Business, CRM Application in Indonesian Companies (by company representatives), Multi-channel Implementation Process, Creating CRM Modules as User References.
- Conducting CRM Needs Analysis, Crafting a CRM Framework, Performance Evaluation, Organizing for CRM Implementation.

References

- Francis Buttle, 2009, Customer Relationship Management: Concepts and Technologies, 2nd ed., Butterworth-Heinemann is an imprint of Elsevier.
- Don Peppers and Martha Rogers, 2011, Managing Customer Relationships: A Strategic Framework, 2nd ed., John Wiley & Sons, Inc.
- Jill Dyché, 2001, CRM Handbook, The: A Business Guide to Customer Relationship Management, Addison Wesley.
- Kenneth C. Laudon and Carol Guercio Traver, 2017, E-commerce: Business, Technology, Society, 13th ed., New York University, Carol Guercio Traver, Azimuth Interactive, Inc.
- Dave Chaffey, Digital Business and E-Commerce Management: Strategy, Implementation and Practice, 6th ed., Pearson Education Limited Edinburgh Gate Harlow CM20 2JE United Kingdom.

Lecturers

Mudjahidin, Andre Parvian Aristio

35 Model Based Decisioning System
3 Credits | ES234936 – Elective

The Model-Based Decision System (SKBM) focuses on providing access to manipulate simulation models whose outputs can be used as a basis for decision-making. Simulation is employed as a technique to conduct multiple experiments testing various outputs generated from the model. Simulation models can aid in projecting the future state of a system to enhance the performance of the explored system. This course equips students with the skills to perform system analysis, model development, model simulation, model validation, and the development of multiple scenarios for choosing among various alternatives in decision-making.

Course Learning Outcomes	Graduate LO
• Understanding and explaining the concepts of systems, models, and simulation	1, 2, 8
• Understanding and explaining the factors and decision-making environment.	1, 2, 4, 8
• Developing system dynamics simulation models and performing model validation	1, 2, 4, 6, 7, 8
• Developing predictive model scenarios and conducting sensitivity analysis	1, 2, 4, 6, 7, 8
• Developing and analyzing model-based decision systems.	1, 2, 4, 6, 7, 8

Study Materials

- Fundamentals of Modeling and Simulation: The modeling process, Understanding simulation, Benefits of simulation, Simulation workflow, Advantages and disadvantages of simulation models, Classification of simulation models.
- Basic Concepts of Simulation Systems: Basic structure of a simulation model, Simulation steps.
- Modeling Decision Situations: Simulation model of dynamic systems: Characteristics of dynamic system models, Steps in developing dynamic system models, Variables in dynamic system models, Flow diagram of dynamic system models, Example of a dynamic system model, Ventana Simulation.
- Project Dynamics: Application of dynamic system simulation models in various fields.
- Model Validation: Basic Concepts of Validation; Types of Validation, Validation Steps, Error Rate Percentage (E1), Error Variance Percentage (E2).
- Model Scenarios: Structure Scenarios and Parameter Scenarios, Sensitivity Analysis; Decision Analysis Model, Performance of Decision Alternatives, Prediction Model.
- Model Implementation Plan: Selection of scenario alternatives to improve the effectiveness and efficiency of decision-making.

References

- Suryani, Erma (2006), Pemodelan & Simulasi, Graha Ilmu.
- Sterman, John D (2000), Business Dynamics: Systems Thinking and Modeling for a Complex World, McGraw-Hill Higher Education.
- Suryani, Erma., Hendrawan, Rully Agus., Rahmawati, Ulfa Emi., (2020), Model dan Simulasi Sistem Dinamik, Deepublish.
- Suryani, Erma., Hendrawan, Rully Agus., Mahardhika, Muhammad Andika Satrugna., Rahmawati, Ulfa Emi., (2022), Pengembangan Mode Transportasi Light Rail Transit, Deepbulish.
- Suryani, Erma., Hendrawan, Rully Agus., Rahmawati, Ulfa Emi., (2021), Implementasi model simulasi system dinamik dalam industry jagung, Deepublish.
- Garcia, Juan Martin (2023), System Dynamics Modellling With Vensim: A quick guide to building causal loops and stock and flow diagram.

Lecturers

Erma Suryani

36 Knowledge Graphs
3 Credits | ES234937– Elective

We are surrounded by data everywhere. However, data is locked behind proprietary, unreliable, and even unstable programming interfaces that prevent us from utilizing it optimally. Knowledge graphs have the potential to revolutionize how we discover, access, integrate, and use data. This course will introduce the fundamental principles and technologies of knowledge graphs, such as Linked Data, to enable data sharing and reuse on a large scale.

Course Learning Outcomes	Graduate LO
• Understanding the concept of knowledge graph	1, 4, 7, 8
• Demonstrating data modeling in the form of a graph	1, 4, 6, 7, 8
• Understanding graph algorithms in data analysis	1, 4, 7, 8
• Demonstrating the use of graph algorithms in various needs	1, 4, 7, 8

Study Materials

- Semantic Web
- RDFS
- Linked data
- Query
- Algorithm Graph
- Developments of Knowledge Graph-based Applications

References

- Rakhmawati, Nur A., (2015), Semantic Web dan Linked Data (2015), siBuku Media.
- Hogan, A., dkk., (2021), Knowledge Graphs (Synthesis Lectures on Data, Semantics, and Knowledge), Morgan & Claypool Publishers.
- Needham, M., and Hodler, Amy E., (2019), Graph Algoritms, O'Reilly Media, Inc.
- Robinson, I., Webber, J., and Eifrem, E., (2015), Graph Database, O'Reilly Media, Inc.

Lecturers

Nur Aini Rakhmawati

37 Natural language Processing
3 Credits | ES234938 – Elective

Natural Language Processing encompasses the theoretical and technical fundamentals of processing unstructured data in the form of communication conducted in natural languages, primarily in the form of text.

Course Learning Outcomes	Graduate LO
• Understanding the conceptual fundamentals of natural language processing	1, 8
• Designing simple natural language encoding schemes based on calculations	1, 4, 8
• Applying simple language modeling	1, 2, 6, 8
• Identify appropriate natural language preprocessing techniques for specific tasks	1, 4, 6, 8
• Applying data analysis techniques to natural language text	1, 2, 6, 8
• Implementing natural language data set creation steps	1, 2, 6, 8
• Creating natural language processing models, evaluating, and recommending improvements	1, 2, 6, 8

Study Materials

- The conceptual fundamentals of natural language processing
- The basics of information theory and its relevance to natural language
- Language modeling and its evaluation
- Natural language text preprocessing
- Exploratory data analysis on natural language texts
- Creation of natural language datasets
- Building machine learning models for natural language processing tasks and their evaluation

References

- Jurafsky, D., and Martin, James H., (2014), Speech and Language Processing, Pearson Education.
- Einsenstein, J. (2019), Introduction to Natural Language Processing, MIT Press

Lecturers

Renny Pradina Kusumawardani

38 Data-intensive System
3 Credits | ES234939 – Elective

The rapid development of database technology provides numerous options for selecting data storage and retrieval technologies. This has led to changes in the development processes of data-centric systems. This course equips students to choose, implement, and build systems with a paradigm of multiple database technologies (polyglot persistence). By the end of the course, students are expected to be able to construct information systems using the polyglot persistence paradigm, which will enhance an organization's competitiveness in terms of reliability, maintenance, and scalability.

Course Learning Outcomes	Graduate LO
• Understanding the metrics of data-intensive systems	1, 4
• Demonstrating components of data-intensive systems	1, 4, 6
• Designing and building polyglot persistence-based systems	1, 4, 6, 7, 8

Study Materials

- Reliability; Scalability; Maintainability
- Data Storing and Retrieval; Data Encoding; Data Partition; Data Replication
- Key-Value Database; Graph Database; Columnar database; Relational Database; Document Oriented; Polygot Persistance.

References

- Kleppmann, M. (2017), Designing Data-Intensive Applications, O'Reilly Media, Inc.

Lecturers

Radityo Prasetyanto Wibowo

39 Prescriptive Modeling and Analytics
3 Credits | ES234940 – Elective

In the digital era, companies possess a valuable asset in the form of data. Data needs to be processed into information to serve as a guide for business decision-making. The more data that is collected, the greater the need for suitable data analysis techniques. Prescriptive analysis provides recommendations for optimizing processes, encompassing a combination of descriptive analysis (what is currently happening) and predictive analysis (what will happen). Prescriptive analysis addresses combinatorial optimization problems using an approximation algorithm approach (non-deterministic algorithm).

Course Learning Outcomes	Graduate LO
• Understanding combinatorial optimization problems	1, 3, 8
• Explaining the complexity of combinatorial optimization problems	1, 3, 8
• Determine the appropriate heuristic algorithm according to the complexity of the optimization problem.	1, 2, 8
• Implementing heuristic algorithms in programming languages to solve combinatorial optimization problems	1, 4, 8
• Analyzing the performance of heuristic algorithms	1, 8

Study Materials

- Combinatorial Optimization Problems: Boolean Satisfiability Problem, Bin Packing Problem, Traveling Salesman Problem (TSP), Vehicle Routing Problem (VRP), and Timetabling & Scheduling Problem.
- Multi-Objective Optimization.
- Computability.
- Exact and Approximation Algorithms.
- Metode Heuristics dan Meta-heuristics: hill climbing, meta-heuristics: tabu search, neigbourhood search based algorithm:simulated annealing, great deluge, iterated local search; population-based algorithms: genetic algorithm, ant colony.
- Metode Hyper-heuristics

References

- Burke, Edmund K., Kendall, Graham., (2014), Search Methologies: Introductory Tutorials in Optimization and Decision Support Techniques, Second Edition, Springer.
- Papadimitriou, Christos H., Steiglitz, Kenneth., (1998), Combinatorial and Optimization: Algirithms and Complexity, Dover Publications.
- Handbook of Metaheuristics (International Series in Operations Research & Management Science)
- Talbi, El-Ghazali (2009), Metaheuristics: From Design to Implementation, Wiley.

Lecturers

Ahmad Muklason, Raras Tyasnurita, Amalia Utamima

40 Soft Computing
3 Credits | ES234941 – Elective

Software plays a crucial role in Artificial Intelligence (AI) and is widely used in complex optimization problems. Software is employed to solve problems that involve estimation and uncertainty in multiple variables. Examples include decision-making and optimization problems. Some software methods are adapted from evolutionary processes, mimicking the workings of the human neural network or the behavior of animals. This course will cover several commonly used software methods for solving real-world problems.

Course Learning Outcomes	Graduate LO
• Understanding the concepts of software computation and optimization	1, 8
• Understanding several software computation methods.	1, 4, 8
• Understanding types of evolutionary-based algorithms.	1, 4, 8
• Understanding the application of software computation and evolutionary-based methods in real-world cases.	1, 2, 6, 8

Study Materials

- Commonly used software computation methods: neural networks, fuzzy logic, etc.
- Fundamentals of evolutionary-based computing concepts: evolutionary algorithm structures and strategies, such as GA (Genetic Algorithms), PSO (Particle Swarm Optimization), ACO (Ant Colony Optimization), etc.
- Examples of recent research on software and evolution-based computing in specific fields.

References

- Tettamanzi, Andrea and Tomassini, Marco., (2001), Soft Computing: Integrating Evolutionary, Neural, and Fuzzy Systems, First Edition, Springer.
- E. Eiben and J.E. Smith., (2015), Introduction to Evolutionary Computing, Springer.

Lecturers

Raras Tyasnurita, Amalia Utamima

41 Cognitive System Modeling
3 Credits | ES234942 – Elective

As technology and information systems continue to advance with the aim of solving human problems, systems that mimic human intelligence are increasingly encountered. Some examples include expert systems that have knowledge bases extracted from humans, or recommendation systems that can provide advice based on patterns of data that have been previously inferred. These systems can be applied in various fields according to the needs, such as healthcare, commercial transactions, and smart homes/cities/cars. In this course, the fundamentals of cognitive computing and software computing will be studied in their implementation in research based on artificial intelligence, machine learning, or the Internet of Things (IoT).

Course Learning Outcomes	Graduate LO
• Understanding the fundamentals of cognitive computing.	1, 8
• Understanding the implementation of soft computing as an engine in cognitive problem solving.	1, 4, 8
• Analyzing the roles of AI, ML, IoT, and Cognitive Computing in specific domains.	1, 2, 6, 8
• Understanding various knowledge representations and their manifestations.	1, 4, 6, 8
• Understanding the roles of Natural Language Processing and Expert Systems in supporting cognitive systems.	1, 2, 6, 8

Study Materials

- Fundamentals of cognitive computing and design principles for cognitive systems (such as IBM's Watson).
- Soft computing to build cognitive system models: fuzzy logic, artificial neural networks (ANN), support vector machines (SVM), evolutionary algorithms.
- Types of knowledge and their forms of representation: frames, ontology, rules, cases.
- Recent research examples in AI, ML, IoT, and cognitive computing in specific domains: healthcare, smart homes, smart cities.
- Recent research examples in NLP and expert systems: chatbots, recommender systems.

References

- Hurwitz, Judith S., Kaufman, Marica., Bowles, Adrian., (2015), Cognitive Computing and Big Data Analytics, First Edition, Wiley.
- Zwingmann, Tobias (2022), AI-Powered Business Intelligence: Improving Forecast and Decision Making with Machine Learning, O'Reilly Media.
- Cognitive Analytics: Concepts, Methodologies, Tools, and Applications: 4.

Lecturers

Faizal Mahananto, Renny Pradina K., Retno Aulia √.

42 IT Audit and Governance
3 Credits | ES234943 – Elective

This course teaches an understanding of the framework for Information Technology (IT) governance within organizations/companies. IT governance is used to ensure alignment between IT and organizational objectives and to oversee the implementation of IT in company business. Oversight is carried out through internal control systems and IT audits, with the aim of ensuring that business processes comply with the rules established by the organization/company and relevant regulations.

Course Learning Outcomes	Graduate LO
• Understanding the Concepts of Internal Control Systems and IT Governance	1, 7, 8
• Understanding COBIT as an IT Governance Framework	1, 7, 8
• Understanding the Fundamentals of IT Auditing	1, 3, 7, 8
• Comprehending the Stages of IT Environment Auditing	1, 2, 7, 8

Study Materials

- Definitions and Concepts of Governance, Differentiating Governance from Management.
- Frameworks, Standards, and Best Practices in IT Governance.
- The COBIT Framework.
- Internal Control Systems and Auditing.
- Fundamentals of IT Auditing: Key Audit Concepts, Types of Audits, Audit Components, Audit Processes & Activities, and Audit Framework.
- Stages of IT Environment Auditing.

References

- De Haes, S., Van Grembergen, W., Joshi, A., & Huygh, T, (2020) ,Enterprise Governance of Information Technology (Management for Professionals), Springer.
- COBIT 2019, Introduction and Methodology.
- Gantz, D. Gantz (2013), The Basics of IT Audit: Purposes, Processes, and Practical Information, Elsevier LTD, Oxford.
- Otero, Angel R (2018), Information Technology Control and Audit, Fifth Edition, Auerbach.
- Moeller, Robert R (2008), Sarbanes-Oxley Internal Controls: Effective Auditing with AS5, CobiT, and ITIL, First Edition, Wiley.
- Tarantino, Anthony (2006), Manager's Guide to Compliance: Sarbanes-Oxley, COSO, ERM, COBIT, IFRS, BASEL II, OMB's A-123, ASX 10, OECD Principles, Turnbull Guidance, Best Practices and Case Studies, First Edition, Wiley.

Lecturers

Bambang Setiawan

43 Change Management
3 Credits | ES234944 – Elective

Change often is a complex, challenging, and unavoidable process. Managing change at both personal and organizational levels requires fresh thinking, new models for change, and frameworks and tools that enable smooth implementation of desired changes. The Organizational Change Management course will provide students with the experience to effectively manage change within organizations, as well as apply it to changes in individual behavior and thinking. The course will offer an understanding of change concepts and best practices in change management that can be applied to a variety of changes to promote their success.

Course Learning Outcomes	Graduate LO
• Understanding the concepts of leadership and leadership styles within an organization.	1, 3, 8
• Understanding the concepts and issues related to leadership development strategies.	1, 3, 8
• Understanding the concepts, types, and models of change management.	1, 3, 8
• Applying a change management model in a case study.	1, 3, 6, 8

Study Materials

- Leadership concepts and leadership styles.
- Concepts and strategies for leadership development.
- Types and models of leadership management.
- Practices and reports on organizational change management

References

- Hiatt, Jefferey M (2006), ADKAR: A Model for Change in Business, Government and our Community, Prosci Research.
- Figliomeni, Carlo (2011), Change Management Process For Information Technology, Xlibris.

Lecturers

Apol Pribadi Subriadi

44 IT Investment Management
3 Credits | ES234945 – Elective

This course aims to provide students with the ability to conduct feasibility analysis of IT investments and offer the best options for IT-based solutions.

Course Learning Outcomes	Graduate LO
• Understanding the concepts of investment and IT investment, needs analysis, IT investment strategies, and measuring IT investment performance	1, 2, 8
• Understanding IT acquisition models, financial and non-financial methods, and information economics	1, 2, 8
• Applying multi-criteria and multi-alternative methods for investments TI	1, 3, 4, 8
• Analyzing feasibility by applying financial and non-financial methods to provide IT solution options and select the best alternatives for an organization	1, 2, 3, 4, 8

Study Materials

- Concepts of investment and IT investment, needs analysis, and IT investment performance measurement
- Financial techniques for IT investments
- Tangibility in IT investments
- Cost-benefit analysis
- Various IT acquisition models
- Information economics
- Information economic
- Balanced Scorecard in IT investments
- Multi-Factor Scoring (MFS) and Analytic Hierarchy Process
- Journals
- Case studies and final projects.

References

- Schiederjans, Marc J., Hamaker, Jamie L., Schiederjans, Ashlyn, M., (2004), Information Technology Investment: Decision Making Methodology, World Scientific Publishing Company.
- Parker, Marilyn M; Benson, Robert J; Trainor, H. Edgar, (1988), Information Economics: Linking Business Performance to Information Technology, Englewood Cliffs, N.J. : Prentice Hall.
- Keen, Jack M., (2012), Making Technology Investments Profitable: ROI Road Map from Business Case to Value Realization, Johny Wiley & Sons, Inc.

Lecturers

Apol Pribadi Subriadi, Reny Nadlifatin

45 Machine Learning Technology
3 Credits | ES234946 – Elective

Machine Learning is a field of study developed to enable machines to learn automatically, either with or without human assistance, using various mathematical methods. Through learning, machines are expected to assist humans in achieving specific goals. The development of technology in machine learning has progressed rapidly in line with advancements in technology and the demand for artificial intelligence. It has evolved from using the Central Processing Unit (CPU) as the machine's brain to the use of the Graphical Processing Unit (GPU). The use of machine learning has also become increasingly user-friendly. In the past, machine learning users had to manually code the methods they wanted to use, but now there are many libraries and machine learning technologies available. This course will explore the technologies used in machine learning, both in terms of hardware and software.

Course Learning Outcomes	Graduate LO
• Understanding knowledge about technology in Machine Learning	1, 2, 8
• Presenting technology in machine learning	1, 6, 8
• Practicing machine learning technology on problems by providing innovative solutions	1, 6, 8

Study Materials

- CPU-powered machine learning
- GPU-powered machine learning
- Scikit-learn
- Tensorflow
- Keras
- PyTorch

References

- Müller, A., and Guido, S., (2016), Introduction to Machine Learning with Phython, O'Reilly Media.
- Antiga, L., Stevens, E., and Viehmann, T., (2020), Deep Learning with PyTorch, Manning.

Lecturers

Izzat Aulia Akbar

46 IT Security Governance
3 Credits | ES234947 – Elective

Cybercrime and cyber warfare have a significant impact on business and society, which is why organizations and companies must anticipate them by establishing information security governance. This course will introduce common standards and frameworks used in the field of Information Security. The main focus will be on how to use the COBIT framework and COBIT for Information Security to establish information security governance within a company. Topics will cover information security governance, cybersecurity management, and cybersecurity assurance.

Course Learning Outcomes	Graduate LO
• Explaining the concept of information security governance	1, 7, 8
• Understanding the concept of information security risk management	1, 7, 8
• Understanding the concept of cybersecurity management	1, 3, 7, 8
• Understanding the concepts in cybersecurity assurance	1, 3, 7, 8
• Understanding the stages of preparing information security governance documents based on COBIT	1, 2, 7, 8

Study Materials

- The impact of cybercrime on businesses and society
- Frameworks, standards, and best practices in Information Security Governance.
- COBIT for InfoSec, ITIL for InfoSec, ISO 27K, NIST SP 800.
- Threats, Vulnerabilities and Associated Risk
- Information Security Governance
- Risk Management
- Cybersecurity Management
- Cybersecurity Assurance

References

- ISACA (2013), Transforming Cybersecurity Using COBIT 5, ISACA.
- Doshi, H. (2021), Certified Information Security Manager Exam Prep Guide, Packt Publishing Ltd.
- Blum, D. (2020), Rational Cybersecurity for Business, Apress.
- ISACA (2012), COBIT 5 Implementation, ISACA.
- Clinch, J., ITIL V3 and Information Security, Clinch Consulting.

Lecturers

Bambang Setiawan, Izzat Aulia Akbar

47 Digital Forensics
3 Credits | ES234948 – Elective

Digital Forensics is a course that discusses methods for collecting, analyzing, and presenting evidence originating from digital systems or devices in the investigation process. This is within the context of law and investigation. The course aims to provide students with an understanding of how to identify, evaluate, and manage digital data in investigations and within a legal context. Students will learn about ethical and legal data collection techniques and how to analyze and present data as valid evidence in legal proceedings.

Course Learning Outcomes	Graduate LO
• Understanding the potential threats to data and infrastructure and understanding alternative solutions to secure data and infrastructure	1, 2, 8
• Building data and infrastructure system security	1, 6, 8
• Reporting and demonstrating the data and infrastructure system security development process	1, 7, 8
• Applying electronic evidence identification, collection, acquisition, and preservation	1, 7, 8

Study Materials

- Computer Forensics in Today's World
- Computer Forensics Investigation Process
- Understanding Hard DiCredits and File Systems
- OS Forensics
- Network Forensics
- Dark Web Forensics
- Database Forensics
- Cloud Forensics
- Investigating Email Crimes
- Malware Forensics
- Mobile Forensics
- IoT Forensics

References

- EC-Council (2021), Computer Hacking Forensic Investigator (10th Edition), EC-Council Academia.
- Kleiman, D., (2007), The Official CHFI Study Guide (Exam 312-49): for Computer Hacking Forensic Investigator, Syngress Publishing.
- Tipton, H. F., and Krause, M., (2007), Information Security Management Handbook (6th Edition), CRC Press.
- Canon, David L., (2009), Certified Information Systems Auditor Study Guide, John Willey & Sons.

Lecturers

Bekti Cahyo Hidayanto

Thank You

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