# Silabus

Kurikulum 2023

**Program Magister Sistem Informasi**

Departemen Sistem Informasi

Fakultas Teknologi Elektro dan Informatika Cerdas

**Institut Teknologi Sepuluh Nopember**

# Daftar Isi

## Profil Lulusan

Profil Lulusan dari Program Studi Magister Sistem Informasi  adalah Manajer Sistem Informasi.

## Capaian Pembelajaran Lulusan

Setelah menyelesaikan Program Studi Magister Sistem Informasi , lulusan diharapkan memiliki capaain pembelajaran sebagai berikut:

1. Mampu menunjukkan sikap dan karakter yang mencerminan: ketakwaan kepada Tuhan YME, berbudi pekerti luhur, peka dan peduli terhadap masalah social dan lingkungan, menghargai perbedaan budaya dan kemajemukan, menjunjung tinggi penegakan hukum, mendahulukan kepentingan bangsa dan masyarakat luas, melalui inovasi, kreatifitas, dan potensi lain yang dimiliki.
2. Mampu mengembangkan dan memecahkan permasalahan ipteks dalam bidang keilmuannya melalui riset dengan pendekatan inter atau multidisiplin hingga menghasilkan karya inovatif dan teruji, serta mendapat pengakuan nasional dan internasional.
3. Mampu mengelola pembelajaran diri sendiri, dan mengembangkan diri sebagai pribadi pembelajar sepanjang hayat untuk bersaing di tingkat nasional, maupun internasional, dalam rangka berkontribusi nyata untuk menyelesaikan masalah dengan memperhatikan prinsip keberlanjutan.
4. Mampu berperan sebagai manager proyek SI yang memiliki kemampuan untuk mengelola proyek SI
5. Mampu mendesain infrastruktur TI; mengelola data, informasi dan konten; mengelola IS dan operasi; mengembangkan dan menerapkan sistem informasi; inovasi dan perubahan organisasi
6. Mempunyai pengetahuan Proses Bisnis dan organisasi, Optimasi dan heuristic, penggalian data, semantic web, Agile software dev, manajemen TI, manajemen resiko, tatakelola keamanan informasi, best practice TI, serta teknologi TI baru seperti IoT sehingga dapat menghasilkan karya ilmiah atau inovasi unggul bidang TI yang kompetitif di pasar nasional/global

## Struktur Mata Kuliah

Struktur Mata Kuliah Program Magister adalah Sebagai berikut:

Beban sks Progam Magister Sistem Informasi adalah **36** sks, yang direncanakan dapat ditempuh dalam 4 semester, sebagai berikut:

**Semester I**

| No | Kode MK | Nama Mata Kuliah | sks |
|---|---|---|---|
| 1 | ES235101 | Infrastruktur Teknologi Informasi | 3 |
| 2 | ES235102 | Pengembangan dan Penerapan Sistem | 3 |
| 3 | ES235103 | Manajemen dan Operasional Sistem Informasi | 3 |
| 4 | ES235104 | Manajemen Data, Informasi dan Konten | 3 |
| **Jumlah Sks** | | | **12** |

**Semester II**

| No | Kode MK | Nama Mata Kuliah | sks |
|---|---|---|---|
| 1 | ES235201 | Metodologi Penelitian | 2 |
| 2 | ES235202 | Inovasi dan Perubahan Organisasi | 3 |
| 3 | ES2359XX | Mata Kuliah Pilihan 1 | 3 |
| **Jumlah Sks** | | | **8** |

**Semester III**

| No | Kode MK | Nama Mata Kuliah | sks |
|---|---|---|---|
| 1 | ES2359XX | Mata Kuliah Pilihan 2 | 3 |
| 2 | ES2359XX | Mata Kuliah Pilihan 3 | 3 |
| 3 | ES2359XX | Mata Kuliah Pilihan 4 | 3 |
| **Jumlah Sks** | | | **9** |

**Semester IV**

| No | Kode MK | Nama Mata Kuliah | sks |
|---|---|---|---|
| 1 | ES235401 | Tesis | **7** |
| **Jumlah Sks** | | | **7** |

**Mata Kuliah Pilihan:**

| No | Kode MK | Nama Mata Kuliah | sks |
|---|---|---|---|
| **Laboratorium Manajemen Sistem Informasi (MSI)** | | | |
| 1 | ES235901 | Topik dalam E-Government dan Smart City | 3 |
| 2 | ES235902 | Topik dalam Tata Kelola dan Audit Sistem Informasi | 3 |
| 3 | ES235903 | Topik dalam Manajemen Investasi dan Produktivitas SI/TI | 3 |
| 4 | ES235904 | Topik dalam E-Government dan Smart City | 3 |
| **Laboratorium Rekayasa Data dan Inteligensi Bisnis (RDIB)** | | | |
| 1 | ES235905 | Topik dalam Soft Computing | 3 |
| 2 | ES235906 | Topik dalam Pemodelan dan Analitika Prediktif | 3 |
| 3 | ES235907 | Topik dalam Pemodelan Sistem Kognitif | 3 |
| 4 | ES235908 | Topik dalam Pemodelan dan Analitika Preskriptif | 3 |
| **Laboratorium Sistem Enterprise (SE)** | | | |
| 1 | ES235909 | Topik dalam Perilaku Adaptif di Proses Organisasi | 3 |
| 2 | ES235910 | Topik dalam Pemodelan dan Simulasi | 3 |
| 3 | ES235911 | Topik dalam Sistem Dinamik dan Aplikasinya di Berbagai Bidang | 3 |
| 4 | ES235922 | Topik dalam Manajemen Proses Bisnis | 3 |
| **Laboratorium Infrastruktur Keamanan dan Teknologi Informasi (IKTI)** | | | |
| 1 | ES235912 | Topik dalam Internet untuk Segala | 3 |
| 2 | ES235913 | Topik dalam Desain Data Center | 3 |
| 3 | ES235914 | Topik dalam Tatakelola Keamanan Informasi | 3 |
| 4 | ES235915 | Topik dalam Arsitektur Enterprise | 3 |
| 5 | ES235916 | Topik dalam Emerging Technologies | 3 |
| 6 | ES235917 | Topik dalam Teknologi Machine Learning | 3 |
| **Laboratorium Akuisisi Data dan Diseminasi Informasi (ADDI)** | | | |
| 1 | ES235918 | Topik Dalam Teknologi Database | 3 |
| 2 | ES235919 | Topik Dalam Integrasi Data | 3 |
| 3 | ES235920 | Topik Dalam Knowledge Graphs | 3 |
| 4 | ES235921 | Topik dalam Pengolahan Data Multimedia | 3 |

Silabus Mata Kuliah Wajib

ES235101 – Infrastruktur Teknologi Informasi

SYLLABUS

## Information Technology Infrastructure, 3 Credit

ES235101 – 1st Semester

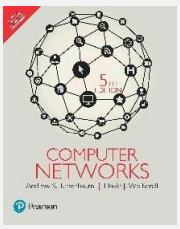
Currently, the business competition is fierce and enticing. Almost every organization is responding by leveraging Information Technology (IT). The IT infrastructure at the master's level is focused on utilizing computer networks to maximize support for the organization's business objectives. This course will equip participants with the ability to plan computer networks that align with the needs of the organization's business. To achieve this, the course content focuses on computer network principles, computer network protocols, computer network technologies, and computer network management. By the end of the course, participants are expected to be capable of drafting computer network plan documents, conducting research in the field of computer networks, and having a foundation for further study in Computer Networking-related topics.

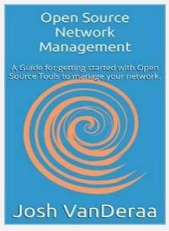
| Course Learning Outcome | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding Computer Network Principles | V | | | V | | |
| Understanding Computer Network Protocols | V | | | V | | |
| Understanding Computer Network Technologies | V | | | V | | |
| Implementing Computer Network Management | V | | | V | | |
| Planning Computer Networks for Organizational Business | V | | V | | V | |

**Study Materials**

- Computer Networks.
- Computer Network Management.

**Reference**






- Andrew S., Tanenbaum and David J. Wetherhall, (2019), Computer networks (5th Edition), Pearson Education, India.
- Alexander, Clemm, (2006), Network Management Fundamental (1st Edition), Cisco Press.
- Josh, VanDeraa, (2022), Open Source Network Management, Josh VanDeraa

**Lecturers**

Febriliyan Samopa

ES235102 – Pengembangan dan Penerapan Sistem

SYLLABUS

# System Development and Implementation, 3 Credit

ES235102 – 1st Semester

While the software industry has gained significant experience, many still struggle to improve their understanding, documentation, and management of product requirements. Inaccurate user input definition, incomplete software requirement definitions, software requirement changes, and misunderstandings of business needs are the primary reasons why many software projects are less successful. This course aims to provide students with the experience to understand the best practices in defining and documenting software requirements, generating designs from existing requirements, and indirectly implementing and managing systems.

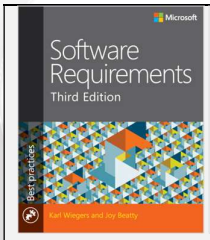
Through this course, students are expected to be able to create software requirement documentation related to real-world software project issues in accordance with best practice guidelines, and to implement it. The course aims to equip students with the techniques to produce software requirement documentation and software design, as well as software release management skills, enabling them to compete and be better prepared to address real-world challenges in the workplace. Additionally, it is expected that students will gain a solid understanding of the latest research in the field of system development and implementation.

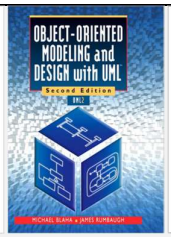
| Course Learning Outcomes | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Analyzing and documenting the policies and information management processes of the organization and developing and implementing them in an information system | | V | | V | V | V |
| Capable of capturing and structuring data and information using appropriate conceptual modeling techniques, while maintaining compliance with laws, regulations, and standards while ensuring privacy and integrity protection | | V | | V | V | |
| Understanding the system development life cycle and being able to manage development processes based on planned, hybrid, and agile approaches | | V | | V | V | V |
| Able to monitor emerging technologies to understand their potential support in the domain | | V | | V | | |

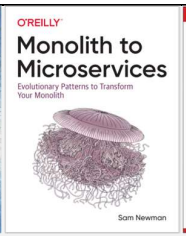
**Study Materials:**

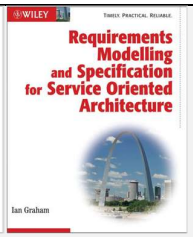
- Introduction to Software Requirement Specification: Identifying users, Defining vision & scope, Understanding user needs, Deriving functional requirements, Analyzing & verifying requirements, Managing requirement changes.
- Object-Oriented Analysis and Design (OOAD) Concepts and Various UML Diagrams: Object technology, Object-oriented analysis and design.
- Software Analysis and Design with UML: Storyboarding the user's experience, Class diagrams, Requirements review, Robustness analysis review; UML tools.
- Fundamentals of Software Construction; Translating UML Diagrams into Program Code; Design Patterns.
- Software Architecture: Monolith, Service-Oriented Architecture, Micro-services.
- Software Implementation Process.
- Software Testing.
- Requirements, Design, and Software Implementation Management in Enhanced Software Development based on Planned, Hybrid, and Agile approaches.

**References :**










- Karl Wiegers, Joy Beatty: Software Requirements, Microsoft Press; 3 edition, 2013.
- Christine B. Tayntor, Successful Packaged Software Implementation, Auerback Publications, 2006.
- M. Blaha, J. Rumbaugh: Object Oriented Modeling and Design with UML, 2nd edition, Prentice-Hall, 2005.
- S. Newman: Monolith to Microservices - Evolutionary Patterns to Transform Your Monolith, O'Reilly Media, 2020
- Ian Graham: Requirements Modelling and Specification for Service Oriented Architecture, Wiley, 2008.

**Lectures:**


Aris Tjahyanto


Rarasmaya Indraswari

ES235103 – Manajemen dan Operasional Sistem Informasi

SYLLABUS

## Information Systems Management and Operations, 3 Credit

ES235103 – 1st Semester

Management and Operations of Information Systems encompass competencies that enable students to understand the concepts, principles, and activities for managing the development and operational processes of Information Systems and Information Services from planning, design, Information System project management, service operation to continuous improvement.

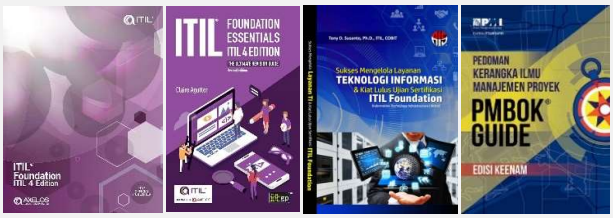
| Course Learning Outcomes | Capaian Pembelajaran Lulusan (CPL) | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Capable of explaining important concepts related to IT Service Management. | | | | V | V | |
| Capable of explaining the main models of IT Service Management, including: SVS, SVC, Dimensions, Guiding Principles, Governance, Practices. | | | | V | V | |
| Capable of explaining the 34 practices of IT Service Management, including: Objectives, related concepts, resources involved (Processes & Value Streams, Organization & People, Technology & Information, Partners & Suppliers), contributions to the Service Value Chain. | | | | V | V | |
| Capable of explaining the Principles, Domains, and Activities of Project Management. | | | | V | V | |

**Study Materials:**

- Important concepts of IT Service Management
- Key models of IT Service Management
- 34 IT Service Management Practices, including: Objectives, related concepts, resources involved (Processes & Value Streams, Organization & People, Technology & Information, Partners & Suppliers), contributions to the Service Value Chain, including examples of SOP documents and application tools

Project Management Body of Knowledge (PMBOK)

**References:**




- ITIL Foundation ITIL 4 Edition, AXELOS, 2019.
- ITIL 4 Essentials, Claire Agutter, ITGP, 2020
- Sukses Mengelola Layanan Teknologi Informasi & Kiat Lulus Ujian Sertifikasi Itil Foundation, Tony D. Susanto, AISINDO, 2017.
- Pedoman Kerangka Ilmu PMBOK Edisi 6, PMI, 2021.

**Lecturer:**

Tony D Susanto, S.T., M.T., Ph.D (ITIL, COBIT, TOGAF)

## ES235104 – Manajemen Data, Informasi dan Konten

SYLLABUS

### Data, Information, and Content Management, 3 Credit

ES235104 – 1st Semester

In an organization, data is a vital corporate asset, where data and information can provide insights into customers, products, and company services. Data and information are not just assets in the sense that organizations invest in them to achieve strategic goals and gain future value, but data and information are also crucial for the day-to-day operations of most organizations. Extracting value from data doesn't happen in a vacuum or by chance. Disciplined practices for managing data quality, metadata, and architecture require data governance that provides structural support for data and information management activities. Data and information governance also enable the implementation of strategic initiatives, such as document and content management. The field of data, information, and content management encompasses competencies that enable graduates to become effective contributors in the process of enhancing domain capabilities to achieve their goals using both structured and unstructured data effectively.

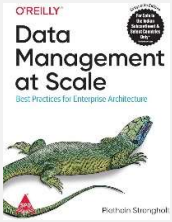
| Course Learning Outcome | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Selecting and designing data management technology that fits the domain's needs. | V | | | V | V | |
| Implementing data access policies in the context of a database management system. | | | | V | | |
| Designing and implementing data warehouses using contemporary technology solutions. | | | | V | V | |
| Creating a scalable infrastructure for very large data using parallel and distributed technology. | V | | | | | V |
| Understanding methodologies and techniques in content management, big data search, semantic search, content analytics, and SEO (Search Engine Optimization). | V | | | | | V |

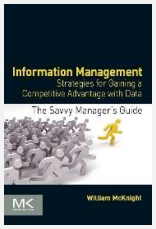
**Study Materials:**

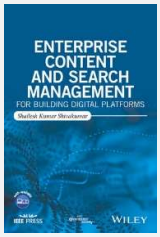
- Core areas of data management and how to handle and integrate complex large-scale datasets.
- How to build large-scale data architectures and interpret core patterns for distributing data, its characteristics, and some of its applications.
- How to implement large-scale master data and reference data management and enable large-scale data consumption using service patterns.
- Data Warehouses and their components, such as cubes or multidimensional databases.
- Data stream processing, data visualization, and Hadoop.
- NoSQL databases and Graph databases.
- Digital content management, enterprise search, content strategy, and fundamentals of content management systems.
- Content management system architectures, asset

management, and document management.
- Content governance: validation, analytics, Key Performance Indicators (KPIs), SEO (Search Engine Optimization), and evaluation.

**References:**








- Piethein Strengholt. ***Data Management at Scale: Best Practices for Enterprise Architecture***. O'Reilly Media. 2020.
- William McKnight. ***Information Management: Strategies for Gaining a Competitive Advantage with Data***. Sixth Elsevier, Inc. 2014.
- Shailesh Kumar Shivakumar. ***Enterprise Content and Search Management for Building Digital Platform***. IEEE Computer Society, Inc. 2017.

**Lecturer:**

Arif Djunaidy

ES235202 – Inovasi dan Perubahan Organisasi

SYLLABUS

## Innovation and Organizational Change, 3 Credit

ES235202 – 2nd Semester

Innovation and organizational change equip students with the ability to operate businesses and entrepreneurship using a logically structured goal-oriented framework. Innovation and organizational change can help create successful digital businesses, shape business promotion and sales, operations, value enhancement, growth and scalability, as well as leadership and structure.

| Course Learning Outcome | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding the process, development, and risks of innovation | V | V | | | V | V |
| Understanding technology readiness levels and creating a product roadmap | V | V | | | V | V |
| Identifying relevant key performance indicators for the business/organization | V | V | | | V | V |
| Creating a business plan | V | V | | | V | V |

**Study Materials:**

- Innovation and entrepreneurship: the process, development, and risks of innovation; implications of innovation based on its types; innovation trends and factors; digital business terminology.
- Business and organizational design: elements of business and organization; customer relationships within the business/organizational ecosystem; relevant key performance indicators; risk management.
- Business and organizational operations: customer relationship analysis; technology readiness levels,
- Value capture and its strategies: the need to consider business value capture; calculating business value; innovation for value enhancement.
- Growth and scalability: funding options for growth; investment stages and interests of various types of investors; business plans for ventures.
- Leadership and structure: the role of leadership, management, and governance in business endeavors; the roles of directors, employees, and contractors; ownership structure for the business.

product roadmap; innovation value.

**References:**


Dick, Whittington, *Digital Innovation and Entreperneurship,* (2018), Cambridge University Press, Inggris.

**Lecturer**

Erma Suryani

ES235901 – Topik dalam E-Government dan Smart City

SYLLABUS

**Topics in e-Government & SmartCity Management, 3 Credit**

ES235901 – Elective

Various recent government regulations such as Presidential Regulation 95/2018 on Electronic-Based Government, Presidential Regulation 132/2022 on the National Electronic-Based Government Architecture, Government Regulation 59/2022 on Urban Areas, the National Program for the Movement of 100 Smart Cities in Indonesia, and the Draft Law on Digital Governance have compelled all local governments, cities, regencies, and provinces in Indonesia to implement Electronic-Based Government (e-Government) and develop their urban areas with a Smart City approach. On the academic side, research in e-Government and Smart Cities is on the rise, giving rise to new research areas. This course on Topics in e-Government and Smart Cities aims to educate students about various concepts, models, and components of e-Government and Smart Cities, explore trends and the latest implementations of e-Government and Smart Cities worldwide, and provide practical experience in developing Smart City Masterplans and Electronic-Based Government Architecture. It also aims to identify trends and research opportunities related to e-Government and Smart Cities.

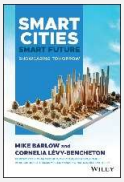
| Course Learning Outcome | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Capable of explaining and comparing the advantages and disadvantages of various models, concepts, components, and standards in e-Government and Smart Cities. | | | V | | V | |
| Capable of explaining examples and implementations of both Smart Cities and e-Government in various regions and around the world. | | | V | | V | |
| Capable of practicing the creation of parts of Smart City Masterplans and Electronic-Based Government Architecture documents. | | | V | | V | |
| Capable of explaining the latest research trends and knowledge gaps related to e-Government and Smart Cities. | | | V | | V | |

**Study Materials**

- Models, concepts, and components of e-Government and Smart Cities.

- Examples of best practices in e-Government and Smart Cities around the world.
- Planning for Smart Cities and e-Government: Smart City Masterplans and Electronic-Based Government Architecture.
  Trends and research opportunities in e-Government and Smart Cities.

**References**




- Peraturan: Perpres 95/2018 tentang Sistem Pemerintahan Berbasis Elektronik, Perpres 132/2022 tentang Arsitektur SPBE Nasional, Peraturan Pemerintah 59/2022 tentang Perkotaan.
- ISO 37122
- Smart Cities Smart Future, Mike Barlow & Cornelia Levy Bencheton, Wiley, 2018.

**Lecturer**

Tony D Susanto, S.T., M.T., Ph.D (ITIL, COBIT, TOGAF)

ES235902 – Topik dalam Tata Kelola dan Audit Sistem Informasi

SYLLABUS

## Topics in Information Systems Audit and Governance, 3 Credit

ES235902 – Elective

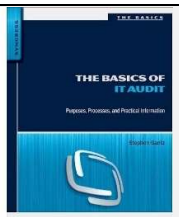
This course teaches students to understand the principles, concepts, and models of Information Systems Governance to ensure alignment between the Information System and organizational goals. It also covers the concepts, types, components, framework, and activities of Information System Audit to evaluate whether the management of the Information System meets specific standards.

| Graduate Learning Outcome | Course Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Capable of explaining the concepts, principles, models, and components of Information Technology Governance. | | | | | V | |
| Capable of performing Goal Cascading from Business Goals to IT Goals down to IT Management & Governance components using the COBIT 2019 Framework. | | | | | V | |
| Capable of evaluating IT Management and Governance using COBIT Performance Management (CPM). | | | | | V | |
| Capable of explaining the key concepts of IT Audit, Types of IT Audits, IT Audit Components, IT Audit Processes & Activities, and the IT Audit Framework. | | | | | V | |

**Study Materials**

- Concepts, principles, models, and components of Information Technology Governance.
- Mapping Business Objectives to IT Objectives and IT Management & Governance components using the COBIT 2019 Framework.
- Evaluating IT Management & Governance using CPM (COBIT Performance Management).
- Concepts, types, components, processes & activities, and framework of IT Audit (Information Systems Audit)..

**References**




- COBIT® 2019 FRAMEWORK: Introduction & Methodology, ISACA, 2019.
- Perangkat Audit TIK, BRIN, 2021.
- The Basics of IT Audit: Purposes, Processes, and Practical Information; Stephen D. Gantz, 2014.

**Lecturer**

Tony D Susanto, S.T., M.T., Ph.D (ITIL, COBIT, TOGAF)

ES235903 – Topik dalam Manajemen Investasi dan Produktivitas Teknologi Informasi

SYLLABUS

## Topics in Information Systems and Technology Investment and Productivity, 3 Credit

ES235903 – Elective

The Information Technology Productivity Paradox is a situation in which the comparison between the costs or efforts (inputs) expended is still greater than the benefits or outputs on the use of information technology (IT). Research on investment and productivity in the IT field becomes essential because: (i) the proportion of IT spending has significantly increased, and (ii) it exacerbates the cost-benefit gap or the growing disparity between input and output. IT expenditures should be seen as a crucial investment.

Unlike typical investments, IT investment involves tangible and intangible costs and benefits, both direct and indirect. Therefore, analyzing IT investment and productivity to obtain the best solution is important for IT managers, considering tangible and intangible, direct, and indirect costs and benefits.

The course "Topics in IT Investment Management and Productivity" provides students with the experience and skills to conduct IT investment and productivity analysis using various financial, non-financial, econometric, or other relevant IT performance measurement methods. The learning methods used include literature reviews, contextual analysis, and a final project leading to research, or a thesis based on IT investment and productivity management.

The course content focuses on IT investment concepts, IT productivity concepts, measurement of IT investment performance, measurement of IT productivity, financial techniques for IT investment, intangibility, cost-benefit analysis, information economics, balanced scorecard, multi-factor scoring, IT portfolio, benchmarking, productivity functions including econometric analysis, literature review, and article publications based on literature review. The final assignment for the course is intended to produce a research proposal or thesis document that analyzes IT investment and equips students to address issues in the field of IT investment and productivity.

| Graduate Learning Outcome | Course Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Identifying the most suitable alternative IT investment options based on the organizational information needs. | V | V | | V | V | V |
| Identifying, creating, and managing policies related to IT investment to achieve optimal IT productivity levels. | V | V | | V | V | V |
| Analyzing appropriate calculations and methods for IT investment and IT productivity. | V | V | | V | V | V |
| Managing and coordinating the use of IT resource investments. | V | V | | V | V | V |
| Applying effective IT organizational management skills to ensure the efficiency and effectiveness of IT service | V | V | | V | V | V |

| | | | | | | |
|---|---|---|---|---|---|---|
| investment productivity. | | | | | | |

**Study Materials**

- Concepts of IT investment management
- Concepts of IT productivity
- Methods for calculating tangible and intangible, direct, or indirect costs
- Cost-Benefit Risk Analysis
- IT acquisition models
- Information Economics
- IT/IS Portfolio and IT resources
- Balanced Scorecard in IT Investment
- Econometric calculation methods and IT productivity functions
- Selecting investment alternatives for IT/IS solutions
- Systematic Literature Review, Case Studies, and Final Projects

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- Gerardus Blokdyk (2022), Cobb Douglass Production Function, SStarcook


**Additional:**


- Sholiq; Subriadi, A.P, Desain Perangkat Lunak dengan UML dan Estimasi Biaya Pengembangan (2021), CV Amerta Media


**Lecturer**

Apol Pribadi

## ES235904 – Topik dalam Perilaku Manusia di Era Digital

SYLLABUS

**Topics in Human Behaviour in Digital Era, 3 Credit**

ES235904 – Elective

The course "Topics in Human Behavior in the Digital Era" is part of applied and social sciences, involving various research and practical applications concerning the complex interaction between diverse human behaviors and the emerging and evolving digital technologies of the present day. This course specifically aims to: (1) Provide an interdisciplinary perspective relevant to behavioral sciences, such as psychology, public health, communication, education, sociology, anthropology, political science, law, economics, and business (2) Disseminate both quantitative and qualitative studies to enhance understanding, methodologies, policies, and everyday life (3) Focus on various aspects of human behavior, including biological, physical, cognitive, social, emotional, and moral dimensions, in the context of using new technologies (4) Examine various emerging technologies such as the internet, social media, mobile technology, the Internet of Things, smart cities, augmented reality, and artificial general intelligence.

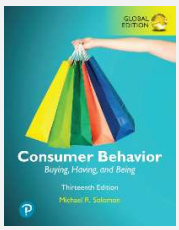
| Course Learning Outcome | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding the concepts and theories of human | V | | | | V | V |

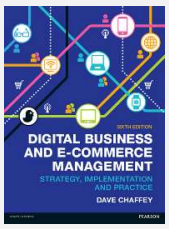
| | | | | | | |
|---|---|---|---|---|---|---|
| behavior. | | | | | | |
| Understanding various forms of digital technology and their usage. | V | | | | V | V |
| Presenting contemporary issues related to human behavior in the digital era. | V | | | | V | V |
| Understanding and explaining methods for addressing human behavior problems related to digital technology. | V | | | | V | V |
| Understanding and applying studies of human behavior, as well as related theories and methods, in real-life cases in reputable scholarly articles. | V | | | | V | V |

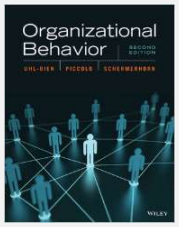
**Study Materials**

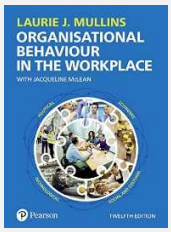
- Theories of Human Behavior and Organizational Behavior.
- Theories of Digital Business Management and E-Commerce Technology.
- Quantitative and Qualitative Methods Used for Addressing Human Behavior Issues.
- Journals that address human behavior issues in the digital era.

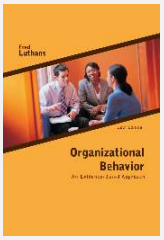
**References**













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**Lecturer**

Reny Nadlifatin

ES235905 – Topik dalam Soft Computing

SYLLABUS

**Topics in Human Behaviour in Digital Era, 3 Credit**

ES235905 – Elective

Software plays a crucial role in Artificial Intelligence (AI) and is widely used in solving complex optimization problems. Software is employed to address problems that involve estimation and uncertainty of 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 inspired by the behaviors of animals. In this course, we will briefly study the implementation of several commonly used software methods for solving real-world problems.

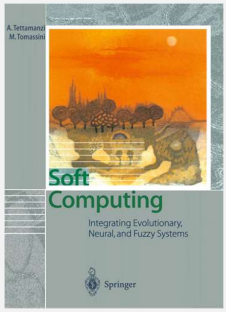
| Course Learning Outcome | Graduate Learning Outcome |
|---|---|

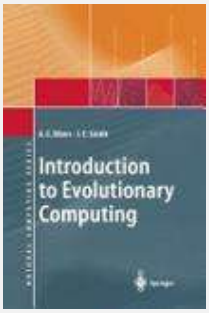
| | #01 | #02 | #03 | #04 | #05 | #06 |
|---|---|---|---|---|---|---|
| Understanding the concepts of various software and optimization techniques. | V | | | | V | V |
| Understanding the implementation of problems that can be solved by software. | V | | | | V | V |
| Understanding the concepts and types of evolutionary-based algorithms. | V | | | | V | V |
| Understanding the application of software and evolutionary-based methods to real-world cases in reputable scholarly articles. | V | | | | V | V |

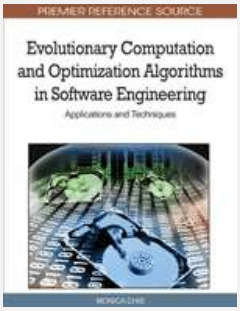
**Study Materials**

- Commonly used software methods: neural networks, fuzzy logic, etc.
- Fundamentals of evolutionary-based computing concepts: the structure of evolutionary algorithms and their strategies: GA (Genetic Algorithms), PSO (Particle Swarm Optimization), ACO (Ant Colony Optimization), etc.
- Recent research examples on software and evolution-based computing in specific fields.

**References**









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- Chis, M., (2010). Evolutionary Computation and Optimization Algorithms in Software Engineering: Applications and Techniques, Romania.


**Lecturers**


Amalia Utamima


Raras Tyasnurita

ES235906 – Topik dalam Pemodelan dan Analitika Prediktif

SYLLABUS

## Topics in Predictive Modelling and Analytics, 3 Credit

ES235906 – Elective

The ability to use data as a tool to project the future is one of the valuable skills for Information Systems graduates. With the advancement of database technology and the implementation of information systems in business organizations, data has become increasingly organized and centralized. This makes data more powerful in preparing business organizations for various uncertain events in the future. By using various data mining and forecasting techniques, these issues can be studied and estimated. Therefore, this course

has two objectives: (1) to use data mining techniques to classify categorical data (2 credits), and (2) to practice forecasting methods for projecting time series data (2 credits).

| Course Learning Outcome | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Interpreting time series data characteristics through data visualization and selecting appropriate forecasting techniques. | V | | | | V | V |
| Projecting the future using robust forecasting techniques for both linear and non-linear data. | V | | | | V | V |
| Using data mining techniques for predicting numerical and categorical data (supervised learning). | V | | | | | V |
| Using machine (deep) learning to solve classification problems based on context. | V | | | | V | |
| Applying predictive modeling and analytics to real-world cases based on reputable scholarly articles. | V | | | | | V |

**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, naive Bayes, K-Nearest Neighbor, Support Vector Machine, random forest.
- Instruments for measuring forecast and prediction accuracy: time series (error measurements), categorical (confusion matrix, precision, recall, accuracy, AUC/ROC).

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- Michael Steinbach, Pang-Ning Tan, Vipin Kumar. (2018). Introduction to Data Mining 2nd Edition. Pearson.

**Pengampu**


Arif Djunaidy


Wiwik Anggraeni


Retno Aulia V.

ES235907 – Topik dalam Pemodelan Sistem Kognitif

SYLLABUS

## Topics in Cognitive Modelling and Analytics, 3 Credit

ES235907 – Elective

As technology and information systems continue to evolve to address human problems, systems that mimic human intelligence are becoming more prevalent. Some examples include expert systems with knowledge bases extracted from humans or recommendation systems that provide suggestions based on previously inferred data patterns. These systems can be applied in various fields as needed, such as healthcare, commercial transactions, smart homes/cities/cars. In this course, you will learn the fundamentals of cognitive computing and software implementation in research based on artificial intelligence (AI), machine

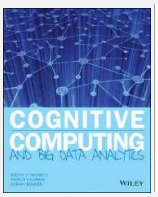
learning (ML), or the Internet of Things (IoT).

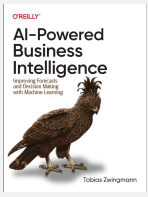
| Course Learning Outcome | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding the fundamental concepts of cognitive computing as found in reputable scholarly articles. | V | | | V | V | V |
| Examining the roles of AI, ML, IoT, and Cognitive Computing in specific domains. | V | | | V | V | V |
| Understanding the implementation of knowledge representation in the context of specific problems. | V | | | V | V | V |
| Understanding the roles of Natural Language Processing and Expert Systems in supporting cognitive systems. | V | | | V | V | V |

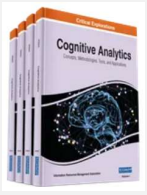
**Study Materials**

- Fundamentals of cognitive computing, design principles for cognitive systems (e.g., IBM's Watson).
- Software 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 on AI, ML, IoT, and cognitive computing in specific domains: healthcare, smart home, smart cities.
- Recent research examples on NLP and expert systems: chatbots, recommender systems.

**References**









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**Lecturers**


Faizal Mahananto


Ahmad Muklason


Retno Aulia V.

ES235908 – Topik dalam Pemodelan dan Analitika Preskriptif

SYLLABUS

## Topics in Prescriptive Modelling and Analytics, 3 Credit

ES235908 – Elective

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

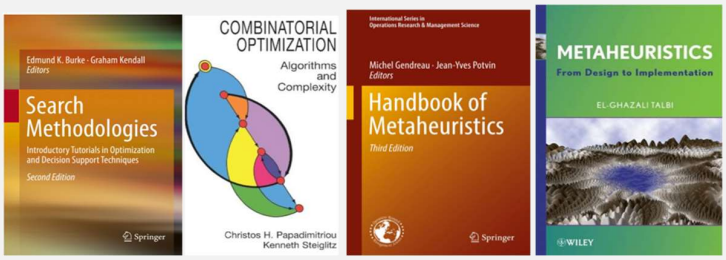
| Course Learning Outcome | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding combinatorial optimization problems. | V | | | | V | V |
| Explaining the complexity of combinatorial | V | | | | V | V |

| | | | | | | |
|---|---|---|---|---|---|---|
| optimization problems. | | | | | | |
| Determining the appropriate heuristic algorithms based on the complexity of the optimization problem. | V | | | | V | V |
| Implementing heuristic algorithms in a programming language to solve combinatorial optimization problems. | V | | | | V | V |
| Analyzing the performance of heuristic algorithms. | V | | | | V | V |

**Study Materials**

- Combinatorial Optimization Problems: Boolean Satisfiability Problem, Bin Packing Problem, Traveling Salesman Problem, Vehicle Routing Problem, and Timetabling & Scheduling Problem.
- Multi-objective Optimization and Computability.
- Exact and Approximation Algorithms.
- Heuristic and Metaheuristic Methods: Hill Climbing, Metaheuristics like Tabu Search, Neighborhood Search-based Algorithms like Simulated Annealing, Great Deluge, Iterated Local Search; Population-based Algorithms like Genetic Algorithms.
- Hyperheuristic Methods.

**References**





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**Lecturers**


Ahmad Muklason


Raras Tyasnurita


Amalia Utamima

ES235909 – Topik dalam Perilaku Adaptif di Proses Organisasi

SYLLABUS

# Topics in Adaptive Behaviour in Organizational Process, 3 Credit

ES235909 – Elective

Organizations are built upon processes. Therefore, managers need to be able to manage processes in a way that helps the organization become effective, efficient, and flexible. This course aims to assist students in developing theories related to the processes within organizations using an exploratory case study approach (Yin, 2009). Students are encouraged to discover various patterns that indicate adaptive behavior within organizations. These patterns are not prescribed in Company Standard Operating Procedures (SOP) or Enterprise Systems, but they address operational issues that do not have solutions yet. These patterns can be identified as adaptive behavior. Organizations can use these patterns to evaluate the effectiveness of implemented Information Systems. Additionally, these patterns can facilitate the development or management of Information Systems in the future.

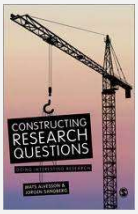
| Course Learning Outcome | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |

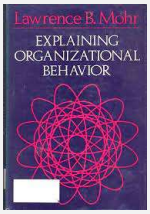
| | | | | | | |
|---|---|---|---|---|---|---|
| Understanding the concept of exploratory case study for process research. | ✓ | ✓ | | | | |
| Planning and designing an exploratory case study for process research. | ✓ | ✓ | | ✓ | | ✓ |
| Preparing and conducting an exploratory case study for process research. | ✓ | ✓ | | ✓ | | ✓ |
| Analyzing data and reporting the results of the exploratory case study for process research. | ✓ | ✓ | | ✓ | | ✓ |

**Study Materials**

- Developing Research Motivation
- Collaborative Literature Review
- Qualitative Coding
- Developing Case Study Protocol
- Developing Interesting Research Questions through Problematization
- Analyzing Data and Making Case Study Report

**References:**



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**Pengampu**

**Arif Wibisono**

ES235910 – Topics in Modelling and System Simulation

SYLLABUS

## Topics in Modeling and System Simulation, 3 CREDITS

MK ES235910 – Elective

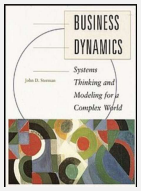
The topics in Modeling and System Simulation encompass competencies that enable graduates to have the ability to formulate, model, and simulate discrete and continuous systems to analyze policies and strategies, with the aim of managing and enhancing organizational performance.

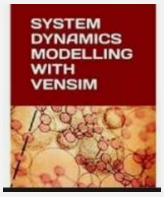
| Course Learning Outcomes | Graduate Learning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding and explaining the concepts of systems, models, and simulations | V | V | | | V | V |
| Developing discrete system simulation models | V | V | | | V | V |
| Developing continuous system simulation models (dynamic systems) | V | V | | | V | V |
| Developing scenarios for dynamic system simulation models | V | V | | | V | V |

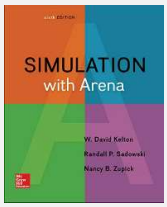
**Study Materials**

- **Fundamentals of modeling and simulation;** Definition of Model, Simulation Understanding, Benefits of Simulation, Classification of Simulation Models;
- **Basic concepts of simulation systems;** Basic Structure of Simulation Model, Simulation Steps, Examples of Simulation Models;
- **Approaches in modeling;** Event, Activity, Process Modeling;
- **Discrete simulation model;** Basic concepts of discrete simulation, Components of Discrete Simulation, Arena Simulation Language;
- **Continuous simulation model (Dynamic System);** Stages in Developing Dynamic System Model, Characteristics of Dynamic System Models;
- **Dynamic System (DS) as a means of System Thinking;** Variables of Dynamic System Models, Causal Loop Diagrams (CLD), Flow Model Diagrams.
- **Model Validation;** Basic Concept of Validation, Validation Steps, Error Rate Percentage (E1), Error Variance Percentage (E2);
- **Scenario planning;** Basic Scenario Concept, Role of Scenarios in Simulation Models, Difference between Scenario Planning and Forecasting.

**References**









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**Lecture**

Erma Suryani

ES235911 – Topics in Dynamic Systems and Their Applications in Various Fields, 3 CREDITS

SYYLABUS

## Topics in Dynamic Systems and Their Applications in Various Fields, 3 CREDITS

MK ES235911 – Elective

The Topics in Dynamic Systems and Their Applications in Various Fields encompass competencies that enable graduates to have the ability to formulate systems, model complex systems, and perform dynamic system simulations in various fields to discern dynamic system behavior patterns, solve complex system problems, and enhance system performance.

| Course Learning Outcomes | CGraduation Leraning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding and explaining the concepts of systems, models, and simulations | V | V | | | V | V |
| Understanding and explaining the characteristics and stages of dynamic system | V | V | | | V | V |

| | | | | | | |
|---|---|---|---|---|---|---|
| model development | | | | | | |
| Developing a dynamic system project model for decision-making formulation according to the selected case study | V | V | | | V | V |
| Developing structural scenarios and parameter scenarios using the dynamic system method | V | V | | | V | V |

**Study Materials**

- **Fundamentals of modeling and simulation:** Model creation process, Definition of simulation, Benefits of simulation, Simulation workflow, Advantages and disadvantages of simulation models, Classification of simulation models;
- **System Complexity:** Policy Resistance, Feedback, Multi-Loop System Dynamics, Dynamic Complexity, Bounded Rationality, Essence of Simulation;
- **Basic concepts of simulation systems:** Basic structure of simulation models, Simulation steps;
- **System Dynamics Modeling:** Characteristics of dynamic system model, Stages in developing dynamic system models, Variables in dynamic system models;
- **Tools for System Thinking:** Causal Loop Diagram, Stock and Flow Diagram, Ventana Simulation;
- **Project Dynamics:** Modeling Decision Making, Modeling Human Behavior, Modeling Supply Chain Management;
- **Model Validation:** Basic Concept of Validation; Types of Validation, Validation Steps, Error Rate Percentage (E1), Error Variance Percentage (E2);
- **Model Scenarios:** Structural Scenarios; Parameter Scenarios, Sensitivity Analysis; Prediction Models.

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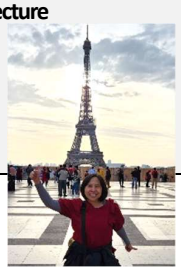
**Lecture**



Erma Suryani

ES235912 – Topics on the Internet for All

SYYLABUS

## Topics on the Internet for All, 3 CREDITS

MK ES235912 – Elective

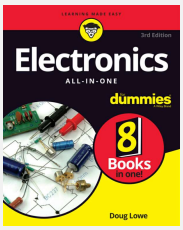
The topic of the Internet for Everything at the master's level focuses on leveraging the Internet of Things (IoT) to maximize IT support for organizational business goals in the current highly competitive and attractive business landscape. This course will equip participants with the ability to develop IoT devices that meet the needs of the organization's business. To achieve this, the course material focuses on the fundamentals of electrical circuits, digital circuits, sensors and actuators, Raspberry Pi Pico W, and programming Raspberry Pi Pico W using MicroPython. By the end of the course, participants are expected to be capable of drafting a plan for IoT development, conducting research in the field of IoT, and having a foundation for exploring advanced topics related to the Internet of Things.

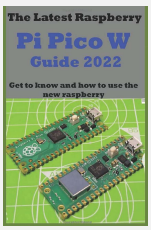
| Course Learning Outcomes | Graduate Learning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding the principles of Electrical Circuits | V | | | V | | |
| Understanding the principles of Digital Circuits | V | | | V | | |
| Applying Sensor and Actuator technology | V | | | V | | |
| Analyzing and Evaluating Raspberry Pi Pico W devices | V | | | V | | |
| Programming Raspberry Pi Pico W using the MicroPython language | V | | | V | | |
| Developing Internet of Things devices that align with the organization's business | V | | V | | V | |

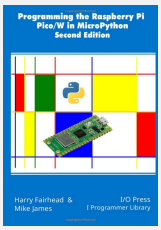
**Study Materials**

- Electrical Circuits.
- Digital Circuits.
- Sensors and Actuators.
- Raspberry Pi Pico W.
- MicroPython for
- Raspberry Pi Pico W.

**References**









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**Lecture**

Febriliyan Samopa

ES235913 – Topics in Data Center Design

SYYLABUS

## Topics in Data Center Design, 3 CREDITS

MK ES235913 – Semester 99

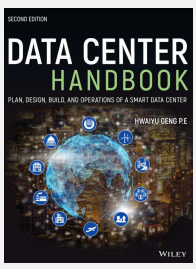
The topic in Data Center Design at the master's level is focused on planning and designing a data center that aligns with the business objectives of the organization. This course aims to equip participants with the ability to plan and create a data center that meets the organizational business needs. Therefore, the course materials focus on data center strategic planning, data center technology, data center design and construction, data center operational management, and computer network equipment within the data center. By the end of the course, participants are expected to be capable of drafting a data center development plan, conducting research related to data centers, and having a foundation for studying advanced topics related to Data Centers.

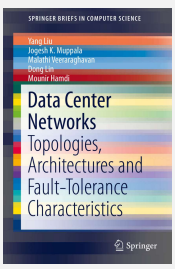
| Couse Learning Outcomes | Graduate Learning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding Data Center Strategic Planning | V | | | V | | |
| Understanding Data Center Technology | V | | | V | | |
| Understanding Data Center Design and Construction | V | | | V | | |
| Understanding Data Center Operational Management | V | | | V | | |
| Selecting Computer Network Equipment for Data Centers | V | | | V | | |
| Developing a Data Center expansion plan that aligns with the organizational business needs | V | | V | V | | V |

**Study Materials**

- Data Center Strategic Planning.
- Data Center Technology.
- Data Center Design and Construction.
- Data Center Operational Management.
- Network Equipment in Data Centers.

**References**



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**Lectures**

Febriliyan Samopa

## ES235914 – Topics in Information Security Governance

SYYLABUS

**Topics in Information Security Governance, 3 CREDITS**

MK ES235914 – ELECTIVE

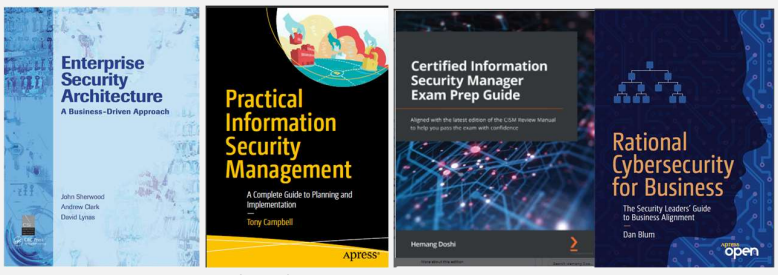
*This course discusses the concept of information security governance for organizational/corporate using the SABSA (Sherwood Applied Business Security Architecture) information security framework. The discussion begins with the concept of security strategy and architecture planning, followed by discussions on Design Security Architecture and Operations Security Architecture. Design Security Architecture includes Logical Security Architecture, Physical Security Architecture, and Component Security Architecture. Meanwhile, Operations Security Architecture covers Security Policy Management, Operational Risk Management, Assurance Management, and Security Administration and Operations.*

| Course Learning Outcomes | Graduate Learning Outcome | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding the concept of Information Security Architecture | | V | | | V | V |
| Understanding the concept of Information Security Architecture Strategy and Planning | | V | | | V | V |
| Ability to identify and design Logical Security Architecture, Physical Security Architecture, and Component Security Architecture | | V | | | V | V |
| Understanding the concept of creating Operational Security Architecture | | V | | | V | V |

**Study Material**

- Information Security Architecture
- SABSA Framework
- Logical Security Architecture
- Physical Security Architecture
- Component Security Architecture
- Security Policy Management
- Operational Risk Management
- Assurance Management
- Security Administration and Operations

**References**

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**Lectures**


Bambang Setiawan


Izzat Aulia Akbar

## ES235915 – Topics in Enterprise Architecture

SYLLABUS

**Topics in Enterprise Architecture , 3 CREDITS**

MK ES235915 – Elective

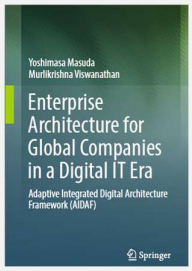
*This course covers the concepts of information technology architecture, implementation methodologies, and frameworks for implementing information technology architecture in organizations or corporations. The discussed architectures include business architecture, information system architecture, and information technology architecture that align with the organization's vision and mission*

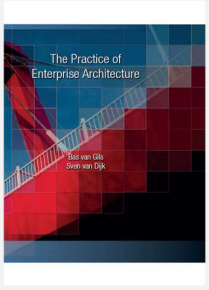
| Course Learning Outcomes | Graduate Learning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding the concept of information technology architecture | | V | | | V | V |
| Understanding frameworks in the field of information technology architecture | | V | | | V | V |
| Able to identify and design information technology architecture for organizations/corporations | | V | | | V | V |

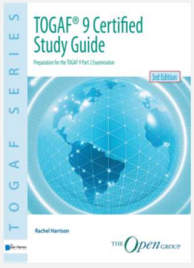
**Study Materials**

- Information Technology Architecture
- Enterprise Architecture Planning Framework
- Zachman, FEA, DoDAF, TOGAF

**References**

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**Lectures**

Bambang Setiawan Izzat Aulia Akbar

ES235916 – Topics in Emerging Technologies.

SYLLABUS

## Topics in Emerging Technologies, 3 CREDITS

MK ES235916 – Elective

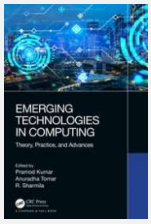
Technology is no longer separable from human life. From work to daily life, humans are always in contact with technology. Technological innovations have played a significant role in human evolution. For example, the emergence of smartphone technology enables humans not only to communicate verbally but also visually, through text, and digital documents. This is different from the past when communication required letters or landline telephones. Moreover, with the advancement of technology, data transmission can be done quickly and can carry a large amount of data in a single transfer. In fact, current technology has artificial intelligence comparable to humans, allowing it to move and make decisions autonomously. This course will discuss technological innovations created to ease human life and encourage students to participate in ongoing technological developments. By the end of this course, students are expected to understand the latest technological advancements and be capable of providing innovations to enhance the quality of life or simplify human tasks.

| Course Learning Outcomes | Graduate Learning Outcomes | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 | #07 | #08 |
| Understanding knowledge about emerging innovation and technology | V | V | | | | | | V |
| Presenting evolving technologies | V | | | | | V | | V |
| Analyzing research in emerging technologies | V | | | | | V | | V |

**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**



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**Lecture**

Izzat Aulia Akbar

ES235917 – Topics in Machine Learning Technologies

SYLLABUS

# Topics in Machine Learning Technologies, 3 CREDITS

MK ES235917 – Elective

*Machine Learning, or Pembelajaran Mesin in Indonesian, is a field of study developed to enable machines to learn automatically, either with human assistance or without it, by utilizing various mathematical methods. Through machine learning, machines are expected to assist humans in achieving specific goals. The development of technology in machine learning has advanced rapidly in line with the growth of technology and the demand for artificial intelligence. This evolution ranges from the use of Central Processing Units (CPUs) as the machine's brain to the utilization of Graphics Processing Units (GPUs). The use of machine learning has also become more user-friendly. In the past, using machine learning required manual coding of the methods to be used, but now there are many libraries and machine learning technologies available. This course will explore the technologies associated with machine learning, including both hardware and software components.*

| Course Learning Outcomes | Graduate Learning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding knowledge about technology in Machine Learning | | V | | | V | V |
| Presenting technology in machine learning | | V | | | V | V |
| Practicing machine learning technology on problems by providing innovative solutions | | V | | | V | V |

**Study Materials**

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

**References**



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**Lecture**

Izzat Aulia Akbar

ES235918 – Topics in Database Technology

SYLLABUS

## Topics in Database Technology, 3 CREDITS

MK ES235918 – Elective

The increasing volume of data and various information system requirements make it necessary to explore alternative database technologies that can provide better solutions. The proper selection of a database technology is crucial to ensure that the information system operates efficiently and effectively.

NoSQL and blockchain are the latest database technologies that are currently popular. NoSQL is suitable for applications that require managing data on a large scale or for unstructured data, while blockchain is suitable for storing secure and verified data, such as financial transactions or official documents.

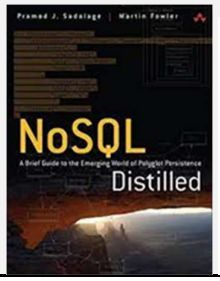
In this course, we will discuss and compare the advantages and disadvantages of both database technologies and review the applications suitable for each technology. Additionally, we will also delve into other aspects such as data modeling and architecture that need to be considered when choosing a database technology.

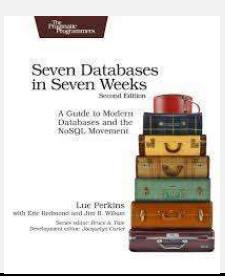
| Course Learning Outcomes | Graduate Learning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding the concept of NoSQL | V | | | V | V | V |
| Understanding and comparing various NoSQL technologies | V | | | V | V | V |
| Understanding the concept of Web3 and blockchain | V | | | V | V | V |
| Understanding, comparing, and developing various Web3 and blockchain technologies | V | | | V | V | V |

**Study Materials**

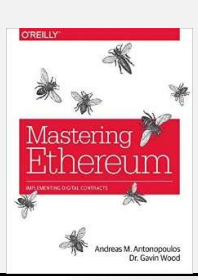
- **Map Reduce**
- **Key value Database**
- **Document Database**
- **Column Database**
- **Graph Database**
- **Web3**
- **Blockchain**

**References**







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**Lecture**

Nur Aini Rakhmawati

ES235919 – Topics in Data Integration

SY LLABUS

## Topics in Data Integration, 3 CREDITS

MK ES235919 – Elective

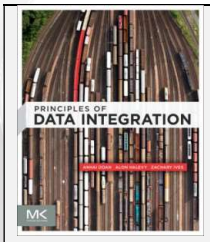
Data integration is one of the primary challenges in most IT projects. In a corporate context, data integration issues arise when data from separate sources need to be combined as a basis for new implementations. In the context of the web, data integration techniques form the foundation for leveraging the vast amount of publicly accessible data sources and enable the creation of applications such as product comparison portals, location-based mashups, and data search engines. In this course, students will learn techniques for integrating and cleaning data from large, heterogeneous data sets.

| Course Learning Outcomes | Graduate Learning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding data integration architecture and data integration concepts | V | | | V | V | V |
| Understanding and comparing string matching, schema matching, and data matching algorithms | V | | | V | V | V |
| Developing data integration algorithms to solve problems | V | | | V | V | V |

**Study Materials**

- **Data Integration Architecture**
- **Data Integration Issues**
- **String Matching**
- **Schema Matching**
- **Data Matching**
- **Machine Learning for Data Integration**
- **Deep Learning for Data Integration**

**References**




- AnHai Doan , Alon Halevy , Zachary Ives, (2012) , Principles of Data Integration, Morgan Kaufmann.

**Lecture**

Nur Aini Rakhmawati

ES235920 – Topics in Knowledge Graphs

SYLLABUS

## Topics in Knowledge Graphs , 3 CREDITS

MK ES235920 –Elective

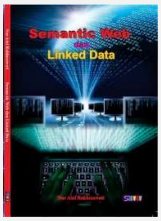
Knowledge graph is a technology that enables the storage and utilization of data in the form of interconnected graphs. It provides the ability to store data in a structured and organized manner, making it easier to access and understand. This course will cover the fundamental principles and technologies of knowledge graphs, as well as how to use Linked Data to share and utilize data effectively. Participants in the course will learn about the basic concepts of knowledge graphs and Linked Data, as well as how to use and compare these technologies in practical applications.

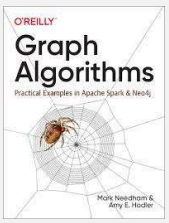
| Course Learning Outcomes | Graduate Learning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Understanding the concept of knowledge graph | V | | | V | V | V |
| Demonstrating data modeling in the form of a graph | V | | | V | V | V |
| Understanding and comparing graph algorithms in data analysis | V | | | V | V | V |
| Developing and combining the use of graph algorithms for various needs | V | | | V | V | V |

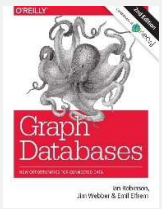
**Study Materials**

- **Semantic Web**
- **RDFS**
- **Linked data**
- **Query**
- **Algoritma Graph**
- **Case study of a knowledge graph**

**References**



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**Lecture**

Nur Aini Rakhmawati

ES235921 – Topics in Multimedia Data Processing

SYLLABUS

## Topics in Multimedia Data Processing, 3 CREDITS

MK01 – Elective

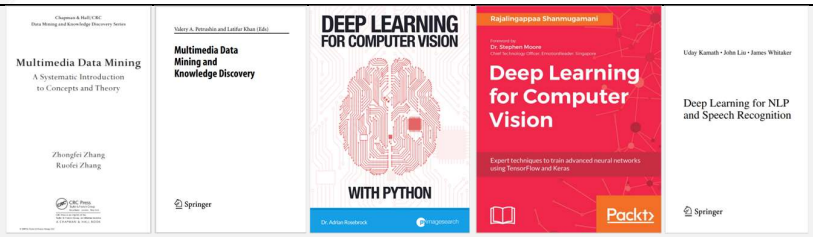
The current advancement in technology allows for the collection and storage of large amounts of multimedia data, including images, videos, audio, and text, which are used for the development of intelligent systems, robotics, and the Internet of Things (IoT). This course discusses machine learning methods for processing and extracting valuable information from multimedia data. Additionally, students will learn about the applications of these methods, such as facial recognition, voice recognition, and text analysis. By studying this course, it is expected that students will acquire the skills needed to apply the latest technology in relevant fields and create more effective, efficient, and beneficial systems.

| Course Learning Outcomes | Graduate Learning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Capable of explaining the fundamental concepts of multimedia data processing and analysis | | V | | V | V | V |
| Capable of explaining the ethical and privacy implications in multimedia data processing | | V | | V | V | |
| Capable of implementing machine learning methods to extract valuable information from multimedia data | | V | | V | V | V |
| Capable of assessing the performance of machine learning algorithms used in multimedia data processing using suitable metrics | | V | | V | | |
| Capable of applying concepts and techniques of multimedia data processing in the development of pertinent information systems | | | | | | |

**Study Materials**

- Machine learning methods for image processing, video processing, audio processing, and text processing.
- Ethical and privacy implications in multimedia data processing.
- Applications of multimedia data processing in information system development.
- Model quality; Evaluation metrics; Imbalanced dataset problem.
- Recent studies in multimedia data processing and relevant technologies.
- Application projects that apply the taught concepts and techniques.

**References**





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**Lectures**

Aris Tjahyanto

Rarasmaya Indraswari

ES235922 – Topics in Business Process Management

SYLLABUS

## Topics in Business Process Management, 3 CREDITS

MK ES235908 – Elective

The business process is the foundation of all information system applications. No information system can operate without having processes. Therefore, business process management becomes a vital aspect to ensure the effective and efficient execution of information systems. This course will guide participants in addressing the needs of business process management within organizations. To achieve this, the course material focuses on six phases in the business process lifecycle: process identification, process discovery, process analysis, process redesign, process implementation, process monitoring and evaluation, and how to manage business processes as a company capability. With an understanding of the business process lifecycle and the ability to manage business processes within organizations taught in this course, participants will be able to manage business processes at operational, tactical, and strategic levels.

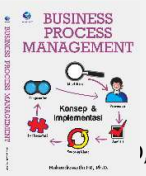
| Course Learning Outcomes | Graduate Learning Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | #01 | #02 | #03 | #04 | #05 | #06 |
| Identifying, classifying business processes, and developing a business process architecture within the organization | V | | | V | V | V |
| Analyzing and redesigning business processes | V | | | V | V | V |
| Preparing the implementation of business processes within the organization | V | | | V | V | V |
| Evaluating business processes within the organization | V | | | V | V | V |

| | | | | | | |
|---|---|---|---|---|---|---|
| Managing business processes as an organizational capability | V | | | V | V | V |

**Study Materials**

- Introduction to business process management; context of process identification; classification of business processes, business process architecture, modeling with BPMN.
- Qualitative analysis: Value-added analysis, Waste analysis, Stakeholder analysis, Root-cause analysis. Quantitative analysis: Flow Analysis, Queueing Theory, M/M/1 and M/M/C queueing models, Limitations of queueing theory; Anatomy of process simulation, Inputs to process simulation, Simulation tools; process redesign with transactional and transformational approaches
- Process-aware Information systems, implementing processes with executable models, Enterprise Systems.
- Process monitoring context, process performance dashboards, process mining introduction, automated process discovery.
- Barriers to BPM success, Six success factors of BPM maturity, measuring process maturity and BPM maturity.

**References**



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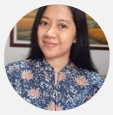
**Lecture**



Mahendrawathi ER