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Diperbaharui oleh:	*[nama dosen]*

Program Studi Teknik Industri
Fakultas Teknik
Universitas Pembangunan Nasional Veteran Jakarta

RENCANA PEMBELAJARAN SEMESTER (RPS)

Program Studi [*Study Program*]	**S1 Teknik Industri** [*Undergraduate - Industrial Engineering*]
Tahun Akademik [*Academic Year*]	2022/2023
Nama Mata Kuliah [*Course Title*]	**Pemodelan Sistem (System Modeling)**
Kode Mata Kuliah [*Course Code*]	TKI120502
Beban Kuliah [*Course Credits*]	2 SKS [*2 credit hours*]
Waktu Kontak [*Contact Hours*]	100 menit Tatap Muka/pekan 120 menit Tugas Terstruktur/pekan 120 menit Kegiatan Mandiri/pekan
Semester [*Course Semester*]	5
Sifat Kuliah (Wajib / Pilihan) [*Course Type (Required / Elective)*]	Wajib
Kategori Mata Kuliah [*Categorization of Course*]	Ilmu Teknik Industri (Industrial Engineering Science)
Prasyarat [*Prerequisites*]	Riset Operasi II (Operations Research II) Analitika Data (Data Analytics)
Syarat Pengambilan Bersama [*Co-Requisites*]	
Koordinator Kategori Mata Kuliah [*Course Coordinator*]	Yulizar Widiatama, M.Eng
Dosen Pengampu [*Course Instructors*]	Elvi Armadani, S.T., M.T., CPLM.

Deskripsi Singkat Mata Kuliah [*Course Description*]

Mata kuliah pemodelan sistem memberikan konsep sistem, berpikir dengan sistem, pemodelan sistem untuk pemecahan masalah. Mata kuliah ini menggunakan konsep dasar pemodelan matematika, riset operasi, maupun simulasi untuk membantu memodelkan berbagai sistem yang memiliki kompleksitas interaksi antar komponen. Mata kuliah ini akan mereview konsep dasar pemodelan yang mencakup karakterisasi sistem, formulasi masalah, proses pembangunan model (pemodelan dengan formulasi matematika deterministik dan stokastik, pemodelan dengan pendekatan simulasi), implementasi model, analisis, verifikasi dan validasi model.

The system modeling course provides *concept of system*, *systems thinking*, *systems modeling for problem solving*. This course uses the basic concepts of mathematical modeling, operations research, and simulation to help model various systems that have complex interactions between components. This course will review the basic concepts of modeling which include system characterization, problem formulation, model development process (modeling through mathematical formulations, modeling using computational/simulation approach), model implementation, model analysis, model verification and validation.

Capaian Pembelajaran Lulusan (CPL) yang Dibebankan pada MK [*Student Outcomes*]

Kode CPL	CPL	Bloom Taxonomy
CPL4	Kemampuan untuk mengidentifikasi, merumuskan, menganalisis dan menyelesaikan permasalahan kompleks di bidang teknik industri.	4
CPL7	Kemampuan untuk merencanakan, menyelesaikan, dan mengevaluasi tugas dengan memperhatikan batasan yang diberikan.	5

Indikator Kinerja (IKA) [*Performance Indicator*]

Kode IKA	IKA	Relevant CPL
IKA 4-1	Mampu mengidentifikasi permasalahan	4
IKA 7-2	Mampu merencanakan tugas	7
IKA 7-3	Mampu menyelesaikan tugas	7

Setelah mempelajari mata kuliah ini, peserta mata kuliah akan mampu:

Capaian Pembelajaran Mata Kuliah (CPMK) [*Learning Outcomes*]

CPMK	Uraian CPMK	Relevant IKA
CPMK 1	Mahasiswa memahami dan mampu menjelaskan konsep sistem dan berpikir sistem	4-1
CPMK 2	Mahasiswa mampu menjelaskan definisi masalah, situasi masalah, dan menggambarkannya menggunakan diagram.	4-1
CPMK 3	Mahasiswa mampu membedakan pendekatan Hard OR dan Soft System Methodology dalam menyelesaikan masalah	7-2
CPMK 4	Mahasiswa mampu membangun model yang dapat digunakan untuk menyelesaikan masalah dalam sistem nyata.	7-2
CPMK 5	Mahasiswa mampu melakukan verifikasi, validasi, dan analisis sensitivitas terhadap model yang sudah dibangun	7-3

Bahan Kajian/Materi Pembelajaran [*Outline Syllabus*]

- Introduction to System Modelling Course: Contract, IE and System Modelling
- Introduction to System Modelling: System Thinking, Concept of System, Principles of System Approach
- Introduction to System Methodology: Dealing with Complexity, Systems thinking, Hard System, Soft System, OR/MS Methodology, Soft System Methodology, Hybrid Methodology
- System Model: Model & Problem Solving, Model and Its Objectives, Characteristics and Use of Model, Classification of Models
- Problem Situation: Stakeholders Analysis, Definition of Problem, Problem Elements, Problem Situation System Model and Diagram: System Model, Properties of Good Model, Relevant System, The Art of Modelling, Causal Loop Diagrams, Influence Diagram.
- Mathematical Model: What is mathematical model? Objectives and Use of Mathematical Models, Development of Mathematical Model, Estimation of Parameter.
- Hard OR Methodology: Hard OR Methodology, Problem Formulation, Problem Modelling, LOD

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Case, Model Testing, Sensitivity and Error Analysis
- Mathematical Model (What is mathematical model? Objectives and Use of Mathematical Models, Development of Mathematical Model, Estimation of Parameter)
- Marginal & Inkremental (Biaya Total, Biaya Marginal, Biaya Rata-Rata, Breakeven, Revenue Total, Revenue Marginal)

Metode Penilaian dan Keselarasan dengan CPMK [*Assessment Learning Outcomes*]

Teknik Penilaian	Presentase (%)	CPMK 1	CPMK 2	CPMK 3	CPMK 4	CPMK 5
Tugas Individu	10	1	2	2	2	3
Kuis	10	3	2	3	0	2
Proyek	55	7	8	10	10	20
Aktivitas Partisipatif	5	1	1	1	1	1
Ujian Tengah Semester (UTS)	10	0	5	5	0	0
Ujian Akhir Semester (UAS)	10	0	0	0	5	5
Total Bobot	**100**	**12**	**18**	**16**	**18**	**31**

Metode Pembelajaran *[Learning Method]*

Diskusi Kelompok (Small Group Discussion)
Demonstrasi/Simulasi (Role-Play & Simulation)
Studi Kasus (Case Study / Case Based)
Belajar Mandiri (Self-Directed Learning)
Belajar Kelompok (Cooperative Learning)
Pembelajaran Kontekstual (Contextual Learning)
Pembelajaran Berbasis Proyek (Project Based Learning)
Belajar Mencari Informasi secara Mandiri (Discovery Learning)

Daftar Sumber Belajar dan Referensi [*Reading List and References*]

Utama [*Primary*]**:**

[1] Daellenbach, H., McNickle, D. and Dye, S., 2012. Management science: decision-making through systems thinking. Macmillan International Higher Education.
[2] Buede, D. M., Miller, W. (2016). The Engineering Design of Systems: Models and Methods, Wiley Series in Systems Engineering. 3rd ed., Wiley-Interscience.
[3] Williams, H.P. (2013). Model Building in Mathematical Programming, 5th ed., John Wiley & Sons Ltd.

Tambahan [*Supplementary*]**:**

[a] Murthy, D.N.P., Page, M.W., Rodin.E.Y., 1990, Mathematical Modelling, Pagamon Press.
[b] Fajarika, D., **Armadani, E**., & Hadi, M. Z. (2023, October). Perancangan Model Konseptual Pengembangan Industri Oleokimia Berbasis Kelapa Sawit dengan Pendekatan Dinamika Sistem. In *Prosiding Seminar Nasional Teknik Industri (SENASTI)* (Vol. 1, pp. 108-116).

Status

☐ Mata kuliah baru [*Introduction*]
☒ Pembaharuan materi [*Revision*]
☐ Penghapusan mata kuliah [*Discontinuation*]

Otorisasi

Tanggal Penyusunan	**Koordinator Kategori Mata Kuliah**	**Dosen Pengampu**
20/08/2024	(Yulizar Widiatama, M.Eng)	(Yulizar Widiatama, M.Eng)
	Gugus Kendali Mutu	**Ketua Program Studi**
	(M. Rachman Waluyo, M.T.)	(Ir. Nurfajriah, ST, MT, IPM)

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Rencana Perkuliahan Mingguan [*Weekly Course Plan*]

Minggu [*Week*]	**CPMK**	**Dosen Pengampu** [*Lecturer*]	**Pokok Bahasan & Sub-Pokok Bahasan** [*Topic & Sub-Topics*]	**Daftar Sumber Belajar** [*References*]	**Metode Pembelajaran** [*Learning Methods*]	**Tugas dan Metode Evaluasi** [*Assignments and Assessment Methods*]
1	CPMK 1	Elvi Armadani, S.T., M.T., CPLM	Pokok bahasan: • Introduction to System Modelling Course Sub pokok bahasan: • Contract • IE and System Modelling	[1], [2]	Kelas Kecil Presentasi Dosen Diskusi	• Membaca [1], [2]
2	CPMK 1	Elvi Armadani, S.T., M.T., CPLM	Pokok bahasan: • Introduction to System Modelling Sub pokok bahasan: • System Thinking • Concept of System • Principles of System Approach	[1], [2]	Kelas Kecil Presentasi Dosen Diskusi	• Membaca [1], [2]
3	CPMK 2	Elvi Armadani, S.T., M.T., CPLM	Pokok bahasan: • Introduction to System Methodology Sub pokok bahasan: • Dealing with Complexity • Systems thinking • Hard A: MZH B: MZH C: RTC R2 Chap. 6 R1 Chap. 6-7 System • Soft System • OR/MS Methodology • Soft System Methodology • Hybrid Methodology	[1], [2]	Kelas Kecil Presentasi Dosen Diskusi	• Membaca [1], [2]
4	CPMK 2	Elvi Armadani, S.T., M.T., CPLM	Pokok bahasan: • System Model Sub pokok bahasan: • Model & Problem Solving • Model and Its Objectives • Characteristics and Use of Model • Classification of Models	[1], [2]	Kelas Kecil Presentasi Dosen Diskusi	• Membaca [1], [2] • Quiz (Integrated System)

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Minggu [*Week*]	**CPMK**	**Dosen Pengampu** [*Lecturer*]	**Pokok Bahasan & Sub-Pokok Bahasan** [*Topic & Sub-Topics*]	**Daftar Sumber Belajar** [*References*]	**Metode Pembelajaran** [*Learning Methods*]	**Tugas dan Metode Evaluasi** [*Assignments and Assessment Methods*]
5,6	CPMK 2, CPMK 3	Elvi Armadani, S.T., M.T., CPLM	Pokok bahasan: • Problem Situation Sub pokok bahasan: • Stakeholders Analysis • Definition of Problem • Problem Elements • Problem Situation • System Model and Diagram: System Model, Properties of Good Model, Relevant System, The Art of Modelling, Causal Loop Diagrams, Influence Diagram	[1,3]	Kelas Kecil Presentasi Mahasiswa Diskusi	• Membaca [1,3] • Tugas Berkelompok (Project)
7	CPMK 3	Elvi Armadani, S.T., M.T., CPLM	Pokok bahasan: Hard OR Methodology Sub pokok bahasan: Hard OR Methodology Problem Formulation Problem Modelling LOD Case Model Testing Sensitivity and Error Analysis	[2,3]	Kelas Kecil Presentasi Mahasiswa Diskusi	• Membaca [2,3] • Tugas Berkelompok (Project) • Bedah Buku
8	UTS					
9,10	CPMK 4	Yulizar Widiatama , M.Eng	Pokok bahasan: • Mathematical Model Sub pokok bahasan: • What is mathematical model? Objectives and Use of Mathematical Models, Development of Mathematical Model, Estimation of Parameter	[2]	Kelas Besar, Presentasi Dosen, Diskusi	• Membaca [3], [4] • Tugas Berkelompok (Project)
11	CPMK 4, CPMK 5	Yulizar Widiatama , M.Eng	Pokok bahasan: • Marginal & Inkremental Sub pokok bahasan: • Biaya Total • Biaya Marginal • Biaya Rata-Rata • Breakeven	[2]	Presentasi Dosen, Diskusi	• Membaca [3], [4] • Tugas Berkelompok (Project) • Bedah Buku

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Minggu [*Week*]	**CPMK**	**Dosen Pengampu** [*Lecturer*]	**Pokok Bahasan & Sub-Pokok Bahasan** [*Topic & Sub-Topics*]	**Daftar Sumber Belajar** [*References*]	**Metode Pembelajaran** [*Learning Methods*]	**Tugas dan Metode Evaluasi** [*Assignments and Assessment Methods*]
			• Revenue Total • Revenue Marginal			
12	CPMK 5	Yulizar Widiatama , M.Eng	Pokok bahasan: • Constraint Decision Making	[2], [3]	Kelas Besar, Presentasi Dosen, Diskusi	• Membaca [2], [3] • Tugas Berkelompok (Project) • Bedah Buku
13	CPMK 5	Yulizar Widiatama , M.Eng	Pokok bahasan: • Multiple Constraints – Linear Programming	[1], [3]	Kelas Besar, Presentasi Dosen, Diskusi	• Membaca [2], [3] • Tugas Berkelompok (Project) • Bedah Buku
14	CPMK 5	Yulizar Widiatama , M.Eng	Pokok bahasan: • verifikasi model Sub pokok bahasan: • validasi model	[2], [3]	Kelas Kecil, Presentasi Mahasiswa, Diskusi	• Membaca [2], [3] • Tugas Berkelompok (Project) - Bedah Paper
15	CPMK 5	Yulizar Widiatama , M.Eng	Pokok bahasan: • Analisis sensitvitas model	[1], [4]	Kelas Kecil, Presentasi Mahasiswa, Diskusi	• Membaca [c], [d] • Tugas Berkelompok (Project) - Bedah Paper
16	UAS					