



MODULE HANDBOOK

CLINICAL DECISION SUPPORT SYSTEM



**BACHELOR DEGREE PROGRAM
DEPARTMENT OF BIOMEDICAL ENGINEERING
FACULTY OF INTELLIGENT ELECTRICAL AND INFORMATICS
TECHNOLOGY**

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

ENDORSEMENT PAGE



MODULE HANDBOOK
Decision Support Based Diagnosis Systems
DEPARTMENT OF BIOMEDICAL ENGINEERING
 INSTITUT TEKNOLOGI SEPULUH NOPEMBER
 Number : 6837/IT2.IX.5.1.2/B/PP.03.00.00/2023


Proses Process	Penanggung Jawab Person in Charge			Tanggal Date
	Nama Name	Jabatan Position	Tandatangan Signature	
Perumus <i>Preparation</i>	Nada F. H., S.T. M.T.	Dosen <i>Lecturer</i>		November 18, 2022
Pemeriksa dan Pengendalian <i>Review and Control</i>	Dr. Rachmad Setiawan, S.T., M.T.	Tim kurikulum <i>Curriculum team</i>		November 20, 2022
Persetujuan <i>Approval</i>	Ir. Josaphat Pramudijanto, M.Eng.	Koordinator RMK <i>Course Cluster Coordinator</i>		April 13, 2023
Penetapan <i>Determination</i>	Dr. Achmad Arifin, S.T., M.Eng.	Kepala Departemen <i>Head of Department</i>		April 17, 2023

MODULE HANDBOOK CLINICAL DECISION SUPPORT SYSTEM

Module name	Clinical Decision Support System	
Module level	Undergraduate	
Code	EB234903	
Course (if applicable)	Clinical Decision Support System	
Semester	Specialization	
Person responsible for the module	Nada Fitriyatul Hikmah, S.T., M.T.	
Lecturer		
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program, specialization .	
Type of teaching, contact hours	Lectures, <60 students	
Workload	1. Lectures : 3 x 50 = 150 minutes per week. 2. Exercises and Assignments : 3 x 60 = 180 minutes per week. 3. Private learning : 3 x 60 = 180 minutes per week.	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 75% of the lectures to sit in the exams.	
Mandatory prerequisites	EB234504 Fundamentals of Intelligent Systems	
Learning outcomes and their corresponding PLOs	Course Learning Outcome (CLO) after completing this module, CLO 1: Students understand the phase for decision making and the process with various conditions according to the availability of information. CLO 2: Students understand the concept of mathematical algorithms which involve computational set theory, boolean logic, probability, and Bayes CLO 3: Students are able to understand good CDSS design and its implementation in healthcare systems. CLO 4: Students understand clinical and technical issues related to CDSS reusability. CLO 5: Students are able to explain ethical and legal issues in technology development in decision support CLO 6: Students are able to interpret the clinical decision support system (CDSS) scheme based on knowledge and non-knowledge.	PLO-02 PLO-02 PLO-02 PLO-08 PLO-08 PLO-09

	CLO 7: Students are able to computationally apply the CDSS system with biomedical data.	PLO-09
Content	Clinical Decision Support System course is an optional course required to support a health professional's decisions in terms of diagnosing subjects based on the clinical parameters that have been obtained. This course aims to enable students to understand and practice a diagnosis system based on a decision support system, its supporting technologies, as well as the current conditions for development and implementation. Based on this understanding and analytical skills, students can also use it in the biomedical engineering discipline.	
Study and examination requirements and forms of examination	<ul style="list-style-type: none"> ● In-class exercises ● Assignment 1, 2 ● Mid-term examination ● Final examination 	
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom.	
Reading list	<p>Main :</p> <ol style="list-style-type: none"> 1. Berner, ES, 2016, "Clinical Decision Support Systems Theory and Practice, Third Edition", Switzerland: Springer International Publishing. 2. Shortliffe, EH and Cimino, JJ, 2006, "Biomedical Informatics Computer Applications in Health Care and Biomedicine, Third Edition", USA: Springer Science + Business Media, LLC. <p>Supporting:</p> <ol style="list-style-type: none"> 3. Sox, HC, Higgins, MC, and Owens, DK, 2013, "Medical Decision Making", John Wiley & Sons, Inc. 4. Taylor, P., 2006, "From Patient Data to Medical Knowledge The Principle and Practice of Health Informatics", Blackwell Publishing Ltd. 5. Liang, E., Aronson, T., and Turban, JE, 2004, "Decision Support Systems and Intelligent Systems, Seventh Edition", Pearson Education, Inc. 	

I. Rencana Pembelajaran Semester / Semester Learning Plan

		INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS) FACULTY OF INTELLIGENT ELECTRICAL AND INFORMATICS TECHNOLOGY DEPARTMENT OF BIOMEDICAL ENGINEERING				Document Code
		SEMESTER LEARNING PLAN				
MATA KULIAH (MK) <i>COURSE</i>	KODE <i>CODE</i>	Rumpun MK <i>Course Cluster</i>	BOBOT (sks) <i>Credits</i>		SEMESTER	Tgl Penyusunan <i>Compilation Date</i>
Sistem Pengambilan Keputusan Klinis <i>Clinical Decision Support System</i>	EB234903	Teknik Biomedik <i>Biomedical Engineering</i>	T=3	P=0	Peminatan <i>Specialization</i>	May 19, 2023
OTORISASI / PENGESAHAN AUTHORIZATION / ENDORSEMENT	Dosen Pengembang RPS <i>Developer Lecturer of Semester Learning Plan</i>		Koordinator RMK <i>Course Cluster Coordinator</i>		Ka DEPARTEMEN <i>Head of Department</i>	
	(Nada Fitriyatul Hikmah, S.T, M.T)		(Ir. Josaphat Pramudianto, M.Eng)		(Dr. Achmad Arifin, S.T., M.Eng.)	
Capaian Pembelajaran <i>Learning Outcomes</i>	CPL-PRODI yang dibebankan pada MK <i>PLO Program Charged to The Course</i>					
	CPL-02	Mampu menemukan, memahami, menjelaskan, merumuskan, dan menyelesaikan permasalahan umum pada bidang Teknik dan permasalahan khusus pada bidang Teknik Biomedika yang meliputi instrumentasi biomedika cerdas, teknik rehabilitasi medika, pencitraan dan pengolahan citra medika, serta informatika medika. <i>Able to find, understand, explain, formulate, and solve general problems in the field of Engineering and specific problems in the field of Biomedical Engineering which include intelligent biomedical instrumentation, medical rehabilitation techniques, imaging and medical image processing, and medical informatics.</i>				

CPL-08	Mampu bekerja dalam tim lintas disiplin dan budaya serta bertanggung jawab kepada masyarakat dan mematuhi hukum dan etika profesi dalam menyelesaikan masalah Teknik Biomedika. <i>Able to work in cross-disciplinary and cultural teams and be responsible to society and comply with law and professional ethics in solving Biomedical Engineering problems .</i>
CPL-09	Mampu mengetahui/mengikuti perkembangan terkini dibidang ilmu pengetahuan dan teknologi serta menyikapinya secara obyektif dengan mengedepankan nilai-nilai kebenaran universal. <i>Able to know / follow the latest developments in the field of science and technology and respond objectively by prioritizing the universal truth values .</i>
Capaian Pembelajaran Mata Kuliah (CPMK) Course Learning Outcome (CLO) - If CLO as description capability of each Learning Stage in the course, then CLO = LLO	
CP MK 1	Mahasiswa memahami fase untuk pengambilan keputusan dan prosesnya dengan berbagai kondisi sesuai ketersediaan informasi. <i>Students understand the phase for decision making and the process with various conditions according to the availability of information.</i>
CP MK 2	Mahasiswa memahami konsep algoritma matematika yang melibatkan komputasi set theory, boolean logic, probabilitas, dan Bayes. <i>Students understand the concept of mathematical algorithms which involve computational set theory, boolean logic, probability, and Bayes.</i>
CP MK 3	Mahasiswa mampu memahami desain CDSS yang baik dan implementasinya pada sistem healthcare. <i>Students are able to understand good CDSS design and its implementation in healthcare systems.</i>
CP MK 4	Mahasiswa memahami masalah klinis dan teknik yang berkaitan dengan usability CDSS. <i>Students understand clinical and technical issues related to CDSS reusability.</i>
CP MK 5	Mahasiswa mampu menjelaskan masalah etika dan hukum dalam perkembangan teknologi pada decision support <i>Students are able to explain ethical and legal issues in technology development in decision support</i>
CP MK 6	Mahasiswa mampu menafsirkan skema clinical decision support system (CDSS) berdasarkan knowledge dan nonknowledge. <i>Students are able to interpret the clinical decision support system (CDSS) scheme based on knowledge and non-knowledge.</i>
CP MK 7	Mahasiswa mampu mengaplikasikan secara komputasi sistem CDSS dengan biomedical data. <i>Students are able to computationally apply the CDSS system with biomedical data.</i>

Peta CPL – CP MK													
		CPL-01	CPL-02	CPL-03	CPL-04	CPL-05	CPL-06	CPL-07	CPL-08	CPL-09	CPL-10	CPL-11	CPL-12
Map of PLO - CLO	CPMK 1 / SUB CPMK 1 CLO 1 / LLO 1		√										
	CPMK 2 / SUB CPMK 2 CLO 2 / LLO 2		√										
	CPMK 3 / SUB CPMK 3 CLO 3 / LLO 3		√										
	CPMK 4 / SUB CPMK 4 CLO 4 / LLO 4								√				
	CPMK 5 / SUB CPMK 5 CLO 5 / LLO 5								√				
	CPMK 6 / SUB CPMK 6 CLO 6 / LLO 6									√			
	CPMK 7 / SUB CPMK 7 CLO 7 / LLO 7									√			
Diskripsi Singkat MK Short Description of Course	<p>Mata kuliah Sistem Pengambilan Keputusan Klinis merupakan mata kuliah pilihan yang diperlukan untuk menunjang keputusan ahli kesehatan dalam hal mendiagnosis subyek berdasarkan parameter-parameter klinis yang telah diperoleh. Mata kuliah ini bertujuan agar mahasiswa mampu memahami dan mempraktekkan sistem diagnosis berbasis decision support system, teknologi-teknologi pendukungnya, serta kondisi pengembangan dan implementasinya pada saat ini. Berdasarkan pemahaman dan kemampuan analisis tersebut, mahasiswa juga dapat memanfaatkannya dalam disiplin ilmu teknik biomedik.</p> <p><i>The Clinical Decision Support System course is an optional course required to support a health professional's decisions in terms of diagnosing subjects based on the clinical parameters that have been obtained. This course aims to enable students to understand and practice a diagnosis system based on a decision support system, its supporting technologies, as well as the current conditions for development and implementation. Based on this understanding and analytical skills, students can also use it in the biomedical engineering discipline.</i></p>												
Bahan Kajian: Materi pembelajaran	<ol style="list-style-type: none"> 1. Decision making process 2. Tipe CDSS : Knowledge and Nonknowledge-Based/ <i>CDSS type: Knowledge and Nonknowledge-Based</i> 3. Algoritma matematika untuk CDSS / <i>Mathematical algorithm for CDSS</i> 												

Course Materials:	<ol style="list-style-type: none"> 4. Implementasi CDSS pada healthcare system/ <i>Implementation of CDSS in healthcare systems</i> 5. Sistem Electronic Health Record / <i>Electronic Health Record System</i> 6. <i>Usability problem</i> 7. Isu Etik dan Legal / <i>Ethical and Legal Issues</i> 8. Aplikasi CDSS / <i>CDSS application</i> 				
Pustaka References	<table border="0" style="width: 100%;"> <tr> <td style="background-color: #e0e0e0; width: 100px;">Main:</td> <td> <ol style="list-style-type: none"> 1. Berner, E.S., 2016, "Clinical Decision Support Systems Theory and Practice, Third Edition", Switzerland: Springer International Publishing. 2. Shortliffe, E.H. and Cimino, J.J., 2006, "Biomedical Informatics Computer Applications in Health Care and Biomedicine, Third Edition", USA: Springer Science+Business Media, LLC. </td> </tr> <tr> <td style="background-color: #e0e0e0;">Supporting:</td> <td> <ol style="list-style-type: none"> 1. Sox, H.C., Higgins, M.C., and Owens, D.K., 2013, "Medical Decision Making", John Wiley & Sons, Inc. 2. Taylor, P., 2006, "From Patient Data to Medical Knowledge The Principle and Practice of Health Informatics", Blackwell Publishing Ltd. 3. Liang, E., Aronson, T., and Turban, J.E., 2004, "Decision Support Systems and Intelligent Systems, Seventh Edition", Pearson Education, Inc. </td> </tr> </table>	Main:	<ol style="list-style-type: none"> 1. Berner, E.S., 2016, "Clinical Decision Support Systems Theory and Practice, Third Edition", Switzerland: Springer International Publishing. 2. Shortliffe, E.H. and Cimino, J.J., 2006, "Biomedical Informatics Computer Applications in Health Care and Biomedicine, Third Edition", USA: Springer Science+Business Media, LLC. 	Supporting:	<ol style="list-style-type: none"> 1. Sox, H.C., Higgins, M.C., and Owens, D.K., 2013, "Medical Decision Making", John Wiley & Sons, Inc. 2. Taylor, P., 2006, "From Patient Data to Medical Knowledge The Principle and Practice of Health Informatics", Blackwell Publishing Ltd. 3. Liang, E., Aronson, T., and Turban, J.E., 2004, "Decision Support Systems and Intelligent Systems, Seventh Edition", Pearson Education, Inc.
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Supporting:	<ol style="list-style-type: none"> 1. Sox, H.C., Higgins, M.C., and Owens, D.K., 2013, "Medical Decision Making", John Wiley & Sons, Inc. 2. Taylor, P., 2006, "From Patient Data to Medical Knowledge The Principle and Practice of Health Informatics", Blackwell Publishing Ltd. 3. Liang, E., Aronson, T., and Turban, J.E., 2004, "Decision Support Systems and Intelligent Systems, Seventh Edition", Pearson Education, Inc. 				
Dosen Pengampu Lecturers	Dr. Achmad Arifin, S.T., M.Eng., Nada Fitriyatul Hikmah, S.T, M.T				
Matakuliah syarat Prerequisite	EB234504 Fundamentals of Intelligent Systems				

Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i>	Penilaian / Assessment		Bentuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [<i>Estimasi Waktu</i>] / <i>Form of Learning; Learning Method;</i> <i>Student Assignment;</i> [<i>Estimated Time</i>]		Materi Pembelajaran [<i>Pustaka</i>] / <i>Learning Material</i> [<i>Reference</i>]	Bobot Penilaian / <i>Assessment Load</i> (%)
		Indikator / <i>Indicator</i>	Kriteria & Teknik / <i>Criteria & Techniques</i>	Tatap Muka / <i>In-clas</i> (5)	Daring / <i>Online</i> (6)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	<p>Mahasiswa memahami fase untuk pengambilan keputusan dan prosesnya dengan berbagai kondisi sesuai ketersediaan informasi.</p> <p><i>Students understand the phase for decision making and the process with various conditions according to the availability of information.</i></p>	<ul style="list-style-type: none"> Mampu mengidentifikasi kasus dengan melibatkan tahapan dalam decision-making process Mampu mendefinisikan decision-making pada berbagai kondisi Mampu menjelaskan perbedaan dan persamaan antara physician dan CDSS dalam mengambil kesimpulan <i>Be able to identify cases involving stages in the decision-making process</i> 	<p>Non-tes : Diskusi dan tanya jawab.</p> <p>Tes : Soal ETS (masuk dalam penilaian ETS)</p> <p>Non-test : <i>Discussion and questions and answers.</i></p> <p>Test: <i>ETS questions (included in the ETS assessment)</i></p>	<ul style="list-style-type: none"> Kuliah dan brainstorming, tanya jawab <p>[TM : 1x3x50"] [BM : 1x3x60"] [PT : 1x3x60"]</p> <ul style="list-style-type: none"> <i>Lecture and brainstorm , frequently asked questions</i> <p>[FF: 1x3 x50 "] [SA : 1x3x6 0 "] [SS : 1 x 3x6 0 "]</p>	<ul style="list-style-type: none"> Chatting dan diskusi dalam forum platform ITS <i>Chat and discussion in the ITS platform forum</i> 	<ul style="list-style-type: none"> Kontrak kuliah: - Motivasi belajar - Rencana pembelajaran - Aturan-aturan perkuliahan - Tujuan perkuliahan - Sistem penilaian, buku ajar/sumber pustaka Problem solving Decision-making process : intelligence, design, choice, implementation, monitoring Decision-making under different conditions : 	

Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i>	Penilaian / <i>Assessment</i>		Bantuan Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; <i>[Estimasi Waktu] / Form of Learning; Learning Method; Student Assignment; [Estimated Time]</i>		Materi Pembelajaran <i>[Pustaka] / Learning Material [Reference]</i>	Bobot Penilaian <i>/Assessment Load (%)</i>
		Indikator / <i>Indicator</i>	Kriteria & Teknik / <i>Criteria & Techniques</i>	Tatap Muka / <i>In-clas (5)</i>	Daring / <i>Online (6)</i>		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		<ul style="list-style-type: none"> • <i>Able to define decision-making under various conditions</i> • <i>Be able to explain the differences and similarities between the physician and CDSS in making conclusions.</i> 				certainty, risk, uncertainty <ul style="list-style-type: none"> • <i>College contracts:</i> <ul style="list-style-type: none"> - <i>Motivation to learn</i> - <i>Learning plans</i> - <i>Class rules</i> - <i>Course objectives</i> - <i>Assessment system, textbooks / library resources</i> • <i>Problem solving</i> • <i>Decision-making process: intelligence, design, choice, implementation, monitoring</i> 	

Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i>	Penilaian / <i>Assessment</i>		Bentuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [<i>Estimasi Waktu</i>] / <i>Form of Learning; Learning Method; Student Assignment; [Estimated Time</i>		Materi Pembelajaran [<i>Pustaka</i>] / <i>Learning Material [Reference]</i>	Bobot Penilaian / <i>Assessment Load (%)</i>
		Indikator / <i>Indicator</i>	Kriteria & Teknik / <i>Criteria & Techniques</i>	Tatap Muka / <i>In-clas (5)</i>	Daring / <i>Online (6)</i>		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						<ul style="list-style-type: none"> Decision-making under different conditions: certainty, risk, uncertainty 	
2-3	<p>Mahasiswa memahami konsep algoritma matematika yang melibatkan komputasi set theory, boolean logic, probabilitas, dan Bayes.</p> <p>Students understand the concept of mathematical algorithms which involve computational set theory, boolean logic, probability, and Bayes .</p>	<ul style="list-style-type: none"> Mampu membedakan konsep algoritma matematika CDSS yang meliputi set theory, boolean logic, probabilitas, dan Bayes. Mampu memahami perkembangan konsep matematika pada CDSS dan memberikan contoh Mampu melakukan komputasi algoritma matematika sesuai 	<p>Non-tes : Tugas 1 tahap 1:</p> <ul style="list-style-type: none"> Mencari case study pada paper dengan metode algoritma matematika untuk penerapan CDSS Melakukan komputasi terkait dengan konsep algoritma matematika pada CDSS 	<ul style="list-style-type: none"> Kuliah, diskusi, tanya jawab, tugas <p>[TM : 2x3x50"] [BM : 2x3x60"] [PT : 2x3x60"]</p> <ul style="list-style-type: none"> Lectures , discussions, questions and answers, assignments 		<ul style="list-style-type: none"> Set theory Boolean logic Probabilitas Bayes' Rule Informal logic Subjective probability assessment Objective probability estimates Clinical prediction rules Set theory 	5

Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / Final ability of each learning stage (LLO)	Penilaian / Assessment		Bentuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [Estimasi Waktu] / Form of Learning; Learning Method; Student Assignment; [Estimated Time]		Materi Pembelajaran [Pustaka] / Learning Material [Reference]	Bobot Penilaian /Assessment Load (%)
		Indikator / Indicator	Kriteria & Teknik / Criteria & Techniques	Tatap Muka / In-clas (5)	Daring / Online (6)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		<p>dengan penerapan CDSS</p> <ul style="list-style-type: none"> • Able to distinguish CDSS mathematical algorithm concepts which include set theory, boolean logic, probability, and Bayes . • Able to understand the development of mathematical concepts on CDSS and provide examples • Able to compute mathematical algorithms according to the application of CDSS 	<p>Tes : Soal ETS (masuk dalam penilaian ETS)</p> <p>Non-test: Task 1 stage 1 : - Looking for case studies on papers with mathematical algorithm methods for the application of CDSS - Perform computations related to the concept of mathematical algorithms on CDSS</p>	<p>[FF: 2x3 x50 "] [SA : 2x3x6 0 "] [SS : 2 x 3x6 0 "]</p>		<ul style="list-style-type: none"> • Boolean logic • Probability • Bayes' Rule • Informal logic • Subjective probability assessment • Objective probability estimates • Clinical prediction rules 	

Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i>	Penilaian / <i>Assessment</i>		Bentuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [<i>Estimasi Waktu</i>] / <i>Form of Learning; Learning Method; Student Assignment; [Estimated Time</i>		Materi Pembelajaran [Pustaka] / <i>Learning Material [Reference]</i>	Bobot Penilaian / <i>Assessment Load (%)</i>
		Indikator / <i>Indicator</i>	Kriteria & Teknik / <i>Criteria & Techniques</i>	Tatap Muka / <i>In-clas (5)</i>	Daring / <i>Online (6)</i>		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			<i>Test:</i> <i>ETS questions (included in the ETS assessment)</i>				
4 - 5	Mahasiswa mampu memahami desain CDSS yang baik dan implementasinya pada sistem healthcare. <i>Students are able to understand good CDSS design and its implementation in healthcare systems.</i>	<ul style="list-style-type: none"> Mampu menentukan standar vocabulary dari query sebagai parameter input pada CDSS Mampu menjelaskan skema perkembangan hipotesis yang berhubungan dengan diagnosis medis Mampu mendeskripsikan komponen dalam sistem desain CDSS 	<p>Non-tes : Tugas 1 tahap 2: Resume paper dan presentasi mengenai implementasi CDSS pada sistem healthcare</p> <p>Tes : Soal ETS (masuk dalam penilaian ETS)</p> <p>Non-test:</p>	<ul style="list-style-type: none"> Kuliah, diskusi, tanya jawab, tugas dalam platform myITS Classroom <p>[TM : 2x3x50"] [BM : 2x3x60"] [PT : 2x3x60"]</p> <ul style="list-style-type: none"> <i>Lectures , discussions, questions and answers,</i> 		<ul style="list-style-type: none"> Tipe medical data Electronic Health Record Standar vocabulary Hypothetico-deductive approach <p>• <i>Medical data type</i></p> <p>• <i>Electronic Health Record</i></p> <p>• <i>Vocabulary standards</i></p> <p>• <i>Hypothetico-deductive approach</i></p>	5

Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i>	Penilaian / Assessment		Bantuan Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [Estimasi Waktu] / <i>Form of Learning; Learning Method; Student Assignment; [Estimated Time]</i>		Materi Pembelajaran [Pustaka] / <i>Learning Material</i> [Reference]	Bobot Penilaian / Assessment Load (%)
		Indikator / <i>Indicator</i>	Kriteria & Teknik / <i>Criteria & Techniques</i>	Tatap Muka / <i>In-clas (5)</i>	Daring / <i>Online (6)</i>		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		<ul style="list-style-type: none"> • Able to determine vocabulary standard from query as input parameter on CDSS • Be able to explain the development scheme of hypotheses related to medical diagnosis • Be able to describe components in the CDSS design system 	<p>Task 1 stage 2 : Resume papers and presentations on CDSS implementation in healthcare systems</p> <p>Test: ETS questions (included in the ETS assessment)</p>	<p>assignments on the myITS Classroom platform</p> <p>[FF: 2x3 x50 "] [SA : 2x3x6 0 "] [SS : 2 x 3x6 0 "]</p>			
6-7	<p>Mahasiswa memahami masalah klinis dan teknik yang berkaitan dengan usability CDSS.</p> <p><i>Students understand clinical and technical issues related to CDSS reusability</i></p>	<ul style="list-style-type: none"> • Mampu mendeskripsikan masalah klinis dan teknis yang berhubungan dengan usability dari CDSS • Mampu mendefinisikan mengenai alert fatigue 	<p>Non-tes : Tugas 1 tahap 3: Resume paper dan presentasi mengenai masalah klinis dan teknik yang berkaitan dengan usability CDSS.</p>	<ul style="list-style-type: none"> • Kuliah, diskusi, tanya jawab, tugas <p>[TM : 2x3x50"] [BM : 2x3x60"] [PT : 2x3x60"]</p>		<ul style="list-style-type: none"> • Clinical challenges • Technical issues • Alert fatigue • Strategi untuk meningkatkan usability CDSS • Usability assessment 	5

Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / Final ability of each learning stage (LLO)	Penilaian / Assessment		Bantuan Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [Estimasi Waktu] / Form of Learning; Learning Method; Student Assignment; [Estimated Time]		Materi Pembelajaran [Pustaka] / Learning Material [Reference]	Bobot Penilaian /Assessment Load (%)
		Indikator / Indicator	Kriteria & Teknik / Criteria & Techniques	Tatap Muka / In-clas (5)	Daring / Online (6)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		<ul style="list-style-type: none"> Mampu menjelaskan cara untuk meningkatkan human-computer interaction pada CDSS Be able to describe clinical and technical problems related to the reusability of CDSS Able to define alert fatigue Be able to explain how to improve human-computer interaction on CDSS 	<p>Tes : Soal ETS (masuk dalam penilaian ETS)</p> <p>Non-test: Task 1 stage 3 : Resume papers and presentations on clinical and technical issues related to CDSS reusability .</p> <p>Test: ETS questions (included in the ETS assessment)</p>	<ul style="list-style-type: none"> Lectures , discussions, questions and answers, assignments <p>[FF: 2x3 x50 "] [SA : 2x3x6 0 "] [SS : 2 x 3x6 0 "]</p>		<ul style="list-style-type: none"> Clinical challenges Technical issues Alert fatigue Strategies to improve CDSS reusability Usability assessment 	
8	EVALUASI TENGAH SEMESTER MID-SEMESTER EXAM						35

Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i>	Penilaian / Assessment		Bentuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [<i>Estimasi Waktu</i>] / <i>Form of Learning; Learning Method;</i> <i>Student Assignment;</i> [<i>Estimated Time</i>]		Materi Pembelajaran [<i>Pustaka</i>] / <i>Learning Material</i> [<i>Reference</i>]	Bobot Penilaian / <i>Assessment Load (%)</i>
		Indikator / <i>Indicator</i>	Kriteria & Teknik / <i>Criteria & Techniques</i>	Tatap Muka / <i>In-clas (5)</i>	Daring / <i>Online (6)</i>		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
9 - 10	<p>Mahasiswa mampu menjelaskan tantangan etika dan hukum dalam perkembangan teknologi pada decision support</p> <p><i>Students are able to explain ethical and legal challenges in technological development in decision support</i></p>	<ul style="list-style-type: none"> Mampu mendeskripsikan masalah etika dalam CDSS yang meliputi care standard, kualifikasi pengguna, dan tenaga profesional Mampu menjelaskan regulasi dan hukum yang berlaku dalam CDSS dan perkembangannya saat ini <i>Able to describe ethical issues in CDSS which include care standards, user qualifications, and professional staff</i> 	<p>Non-tes : Tugas 2 tahap 1: Mencari study case terkini mengenai masalah etika dan hukum dalam perkembangan CDSS</p> <p>Tes : Soal ETS (masuk dalam penilaian ETS)</p> <p>Non-test: Task 2 stage 1 : <i>Looking for the latest case study on ethical and legal issues in the development of CDSS</i></p>	<ul style="list-style-type: none"> Kuliah, diskusi, tanya jawab, tugas [TM : 2x3x50"] [BM : 2x3x60"] [PT : 2x3x60"] <i>Lectures , discussions, questions and answers, assignments</i> [FF: 2x3 x50 "] [SA : 2x3x6 0 "] [SS : 2 x 3x6 0 "] 		<ul style="list-style-type: none"> Care standard Kualifikasi pengguna CDSS Keterkaitan antara tenaga profesional Regulasi dan hukum dalam CDSS <i>Care standard</i> <i>Qualification of the CDSS user</i> <i>The link between professionals</i> <i>Regulation and law in the CDSS</i> 	5


Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i>	Penilaian / Assessment		Bentuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [<i>Estimasi Waktu</i>] / <i>Form of Learning; Learning Method;</i> <i>Student Assignment;</i> [<i>Estimated Time</i>]		Materi Pembelajaran [<i>Pustaka</i>] / <i>Learning Material</i> [<i>Reference</i>]	Bobot Penilaian / <i>Assessment Load (%)</i>
		Indikator / <i>Indicator</i>	Kriteria & Teknik / <i>Criteria & Techniques</i>	Tatap Muka / <i>In-clas (5)</i>	Daring / <i>Online (6)</i>		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		<ul style="list-style-type: none"> • <i>Able to explain regulations and laws that apply in CDSS and their current developments</i> 	<p>Test: <i>ETS questions (included in the ETS assessment)</i></p>				
11 -12	<p>Mahasiswa mampu menafsirkan skema clinical decision support system (CDSS) berdasarkan knowledge dan nonknowledge.</p> <p><i>Students are able to interpret the clinical decision support system (CDSS) scheme based on knowledge and non-knowledge.</i></p>	<ul style="list-style-type: none"> • Mampu mendefinisikan model knowledge-based dan nonknowledge-based DSS • Mampu memberikan contoh CDSS berdasarkan knowledge dan nonknowledge • <i>Be able to define knowledge-based and non-knowledge-based DSS models</i> 	<p>Non-tes : Tugas 2 tahap 2: Resume paper mengenai knowledge dan nonknowledge-based CDSS</p> <p>Tes : Soal ETS (masuk dalam penilaian ETS)</p> <p>Non-test: Task 2 stage 2 :</p>	<ul style="list-style-type: none"> • Kuliah, diskusi, tanya jawab, tugas <p>[TM : 2x3x50"] [BM : 2x3x60"] [PT : 2x3x60"]</p> <ul style="list-style-type: none"> • <i>Lectures , discussions, questions and answers, assignments</i> <p>[FF: 2x3 x50 "]</p>		<ul style="list-style-type: none"> • Knowledge-Based • Nonknowledge-Based • Reasoning engine • Inference engine • <i>Knowledge-Based</i> • <i>Nonknowledge-Based</i> • <i>Reasoning engine</i> • <i>Inference engine</i> 	5

Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i>	Penilaian / Assessment		Bantuan Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; <i>[Estimasi Waktu] / Form of Learning; Learning Method; Student Assignment; [Estimated Time]</i>		Materi Pembelajaran <i>[Pustaka] / Learning Material [Reference]</i>	Bobot Penilaian /Assessment Load (%)
		Indikator / Indicator	Kriteria & Teknik / <i>Criteria & Techniques</i>	Tatap Muka / <i>In-clas (5)</i>	Daring / <i>Online (6)</i>		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		<ul style="list-style-type: none"> • <i>Able to provide CDSS examples based on knowledge and non-knowledge</i> 	<i>Resume paper on knowledge and non-knowledge-based CDSS</i> Test: <i>ETS questions (included in the ETS assessment)</i>	<i>[SA : 2x3x60 "] [SS : 2 x 3x60 "]</i>			
13-14	Mahasiswa mampu mengaplikasikan secara komputasi sistem CDSS dengan biomedical data. <i>Students are able to computationally apply the CDSS system with biomedical data.</i>	<ul style="list-style-type: none"> • Mampu merepresentasikan data yang diperoleh untuk penerapan decision support system • Mampu melakukan komputasi secara knowledge-based dan nonknowledge-based untuk aplikasi CDSS 	Non-tes : Tugas 2 tahap 3: Final project aplikasi CDSS dengan komputasi knowledge-based atau nonknowledge-based Tes :	<ul style="list-style-type: none"> • Kuliah, diskusi, tanya jawab, tugas [TM : 2x3x50"] [BM : 2x3x60"] [PT : 2x3x60"] • Lectures , discussions, questions and answers, assignments [FF: 2x3 x50 "] 		<ul style="list-style-type: none"> • Sistem Fuzzy • Neural Network • Fuzzy System • Neural Network 	15

Mg Ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i>	Penilaian / Assessment		Bantuan Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; <i>[Estimasi Waktu] / Form of Learning; Learning Method; Student Assignment; [Estimated Time]</i>		Materi Pembelajaran <i>[Pustaka] / Learning Material [Reference]</i>	Bobot Penilaian /Assessment Load (%)
		Indikator / Indicator	Kriteria & Teknik / <i>Criteria & Techniques</i>	Tatap Muka / <i>In-clas (5)</i>	Daring / <i>Online (6)</i>		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		<ul style="list-style-type: none"> • <i>Able to represent the data obtained for the application of the decision support system</i> • <i>Able to perform knowledge-based and non-knowledge-based computing for CDSS applications</i> 	Soal ETS (masuk dalam penilaian ETS) Non-test: Task 2 stage 3 : <i>Final CDSS application project with knowledge-based or nonknowledge-based computing</i> Test: <i>ETS questions (included in the ETS assessment)</i>	<i>[SA : 2x3x6 0 "]</i> <i>[SS : 2 x 3x6 0 "]</i>			
15-16	EVALUASI AKHIR SEMESTER FINAL-SEMESTER EXAM						25

TM=Tatap Muka, PT=Penugasan Terstruktur, BM=Belajar Mandiri.

II. Rencana Asesmen & Evaluasi (RAE)/ *Assessment & Evaluation Plan*

	ASSESSMENT & EVALUATION PLAN BACHELOR DEGREE PROGRAM OF BIOMEDICAL ENGINEERING - FTEIC ITS Course : Clinical Decision Support System		RA&E
			Write Doc Code
Kode/code: EB234903	Bobot sks /credits (T/P): 3/0	Rumpun MK: Teknik Biomedik Course Cluster: Biomedical Engineering	Smt: Peminatan Specialization
OTORISASI AUTHORIZATION	Penyusun RA & E Compiler A&EP Nada Fitriyatul H, S.T, M.T	Koordinator RMK Course Cluster Coordinator Ir. Josaphat Pramudianto, M.Eng	Ka DEP Head of DEP Dr. Achmad Arifin, S.T., M.Eng.

Mg ke / Week (1)	Sub CP-MK / Lesson Learning Outcomes (LLO) (2)	Bentuk Asesmen (Penilaian) Form of Assessment (3)	Bobot / Load (%) (4)
1	Sub CP-MK 1: Mahasiswa memahami fase untuk pengambilan keputusan dan prosesnya dengan berbagai kondisi sesuai ketersediaan informasi LLO 1: <i>Students understand the phase for decision making and the process with various conditions according to the availability of information</i>	Tes : ETS Soal 2 (5% dari ETS 35%) Test: <i>Question 2 in Mid Exam (5% of Mid Exam 35%)</i>	
2	Sub CP-MK 2: Mahasiswa memahami konsep algoritma matematika yang	Non-tes : Tugas 1 tahap 1: - Mencari case study pada paper dengan metode algoritma matematika untuk penerapan CDSS - Melakukan komputasi terkait dengan konsep algoritma matematika pada CDSS	5

Mg ke / Week (1)	Sub CP-MK / Lesson Learning Outcomes (LLO) (2)	Bentuk Asesmen (Penilaian) Form of Assessment (3)	Bobot / Load (%) (4)
	<p>melibatkan komputasi set theory, boolean logic, probabilitas, dan Bayes.</p> <p>LLO 2: <i>Students understand the concept of mathematical algorithms which involve computational set theory, boolean logic, probability, and Bayes</i></p>	<p>Tes : ETS Soal 1 (10% dari ETS 35%)</p> <p>Non-test: Task 1 stage 1 : - <i>Looking for case studies on papers with mathematical algorithm methods for the application of CDSS</i> - <i>Perform computations related to the concept of mathematical algorithms on CDSS</i></p> <p>Test: Question 1 in Mid Exam (10% of Mid Exam 35%)</p>	
4	<p>Sub CP-MK 3: Mahasiswa mampu memahami desain CDSS yang baik dan implementasinya pada sistem healthcare</p> <p>LLO 3: <i>Students are able to understand good CDSS design and its implementation in healthcare systems</i></p>	<p>Non-tes : Tugas 1 tahap 2: Resume paper dan presentasi mengenai implementasi CDSS pada sistem healthcare</p> <p>Tes : ETS Soal 4 (10% dari ETS 35%)</p> <p>Non-test: Task 1 stage 2 : <i>Resume papers and presentations on CDSS implementation in healthcare systems</i></p> <p>Test: Question 4 in Mid Exam (10% of Mid Exam 35%)</p>	5
6	<p>Sub CP-MK 4: Mahasiswa memahami masalah klinis dan teknik yang berkaitan dengan usability CDSS</p> <p>LLO 4: <i>Students understand clinical and technical problems related to CDSS reusability</i></p>	<p>Non-tes : Tugas 1 tahap 1: Resume paper dan presentasi mengenai masalah klinis dan teknik yang berkaitan dengan usability CDSS.</p> <p>Tes : ETS Soal 3 (10% dari ETS 35%)</p> <p>Non-test: Task 1 stage 3 : <i>Resume papers and presentations on clinical and technical issues related to CDSS reusability .</i></p> <p>Test: Question 3 in Mid Exam (10% of Mid Exam 35%)</p>	5

Mg ke / Week (1)	Sub CP-MK / Lesson Learning Outcomes (LLO) (2)	Bentuk Asesmen (Penilaian) Form of Assessment (3)	Bobot / Load (%) (4)
8	Evaluasi Tengah Semester <i>Mid Exam</i>	Tes: Ujian Tulis/Ujian Daring Test: <i>Writing Exams / Online Exams</i>	35
9	Sub CP-MK 5: Mahasiswa mampu menghitung estimasi interval dari rata-rata dan proporsi suatu populasi dari satu atau dua grup sampel. LLO 5 : <i>Students are able to calculate interval estimates from the mean and proportion of a population from one or two sample groups.</i>	Non-tes : Tugas 2 tahap 1: Mencari study case terkini mengenai masalah etika dan hukum dalam perkembangan CDSS Tes : EAS Soal 1 (5% dari EAS 25%) Non-test: Task 2 stage 1 : <i>Looking for the latest case study on ethical and legal issues in the development of CDSS</i> Test: <i>Question 1 in Final Exam (5% of Final Exam 25%)</i>	5
11	Sub CP-MK 6: Mahasiswa mampu menafsirkan skema clinical decision support system (CDSS) berdasarkan knowledge dan nonknowledge LLO 6 : <i>Students are able to interpret the clinical decision support system (CDSS) scheme based on knowledge and non-knowledge</i>	Non-tes : Tugas 2 tahap 2: Resume paper mengenai knowledge dan nonknowledge-based CDSS Tes : EAS Soal 2 (10% dari EAS 25%) Non-test: Task 2 stage 2 : <i>Resume paper on knowledge and non-knowledge-based CDSS</i> Test: <i>Question 2 in Final Exam (10% of Final Exam 25%)</i>	5
13	Sub CP-MK 7: Mahasiswa mampu mengaplikasikan secara komputasi sistem CDSS dengan biomedical data	Non-tes : Tugas 2 tahap 3: Final project aplikasi CDSS dengan komputasi knowledge-based atau nonknowledge-based Tes :	15

Mg ke / Week (1)	Sub CP-MK / Lesson Learning Outcomes (LLO) (2)	Bentuk Asesmen (Penilaian) Form of Assessment (3)	Bobot / Load (%) (4)
	<p>LLO 7: <i>Students are able to computationally apply the CDSS system with biomedical data</i></p>	<p>EAS Soal 3 (10% dari EAS 25%)</p> <p>Non-test: Task 2 stage 3 : <i>Final CDSS application project with knowledge-based or nonknowledge-based computing</i></p> <p>Test: <i>Question 3 in Final Exam (10% of Final Exam 25%)</i></p>	
16	<p>Evaluasi Akhir</p> <p>Final Exam</p>	<p>Tes: Ujian Tulis/Ujian Daring</p> <p>Test: <i>Writing Exams / Online Exams</i></p>	25
Total bobot penilaian Total assessment load			100%

Indikator Pencapaian CPL Pada MK / *Indicator of PLO achievement charged to the course*

CPL yang dibebankan pada MK / <i>PLO charged to the course</i>	CPMK / <i>Course Learning Outcome (CLO)</i>	Minggu ke / <i>Week</i>	Bentuk Asesmen / <i>Form of Assessment</i>	Bobot / <i>Load (%)</i>
CPL-02 / PLO-02	CPMK 1 / CLO-01	Week- 8	<i>Mid Exam Question 2</i>	5
	CPMK 2 / CLO-02	Week-2	<i>Task 1 stage 1</i>	5
		Week-8	<i>Mid Exam Question 1</i>	10
	CPMK 3 – CLO-03	Week-4	<i>Task 1 stage 2</i>	5
CPL-08 / PLO-08		Week-8	<i>Mid Exam Question 4</i>	10
	CPMK 4 – CLO-04	Week-6	<i>Task 1 stage 3</i>	5
		Week-8	<i>Mid Exam Question 3</i>	10
	CPMK 5 / CLO-05	Week-9	<i>Task 2 stage 1</i>	5
CPL-09		Week-16	<i>Final Exam Question 1</i>	5
	CPMK 6 / CLO-06	Week-11	<i>Task 2 stage 2</i>	5
		Week-16	<i>Final Exam Question 2</i>	10
	CPMK 7 / CLO-7	Week-13	<i>Task 2 stage 3</i>	15
	Week-16	<i>Final Exam Question 3</i>	10	
				Σ = 100%

No	Form of Assessment	PLO-01	PLO-02	PLO-03	PLO-04	PLO-05	PLO-06	PLO-07	PLO-08	PLO-09	PLO-10	PLO-11	PLO-12	Total
1	<i>Task 1</i>		0.1						0.05					0.15
2	<i>Mid Exam</i>		0.25						0.1					0.35
3	<i>Task 2</i>								0.05	0.2				0.25
4	<i>Final Exam</i>								0.05	0.2				0.25
	<i>Total</i>		0.35						0.25	0.40				1

