

# MODULE HANDBOOK REHABILITATION ENGINEERING



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

**INSTITUT TEKNOLOGI SEPULUH NOPEMBER**

## ENDORSEMENT PAGE



**MODULE HANDBOOK**  
**Rehabilitation Engineering**  
**DEPARTMENT OF BIOMEDICAL ENGINEERING**  
INSTITUT TEKNOLOGI SEPULUH NOPEMBER  
Number : B/21385/IT2.IX.5.1.2/PP.03.00.00/2020

Proses <i>Process</i>	Penanggung Jawab <i>Person in Charge</i>			Tanggal <i>Date</i>
	Nama <i>Name</i>	Jabatan <i>Position</i>	Tandatangan <i>Signature</i>	
Perumus <i>Preparation</i>	Dr. Achmad Arifin, S.T., M.Eng.	Dosen <i>Lecturer</i>		November 23, 2019
Pemeriksa dan Pengendalian <i>Review and Control</i>	Ir. Josaphat Pramudijanto, M.Eng.	Tim kurikulum <i>Curriculum team</i>		February 14, 2020
Persetujuan <i>Approval</i>	Ir. Josaphat Pramudijanto, M.Eng.	Koordinator RMK <i>Course Cluster Coordinator</i>		March 06, 2020
Penetapan <i>Determination</i>	Dr. Achmad Arifin, S.T., M.Eng.	Kepala Departemen <i>Head of Department</i>		March 13, 2020

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# MODULE HANDBOOK

## REHABILITATION ENGINEERING

Module name	<b>Rehabilitation Engineering</b>	
Module level	Undergraduate	
Code	EB184906	
Course (if applicable)	Rehabilitation Engineering	
Semester	Specialization	
Person responsible for the module	Dr. Achmad Arifin, S.T., M.Eng.	
Lecturer		
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program, <b>Specialization.</b>	
Type of teaching, contact hours	Lectures, <60 students Tuesdays, 11.00-12.50 (GMT+7)	
Workload	<ol style="list-style-type: none"> <li>1. Lectures : 3 x 50 = 150 minutes per week.</li> <li>2. Exercises and Assignments : 3 x 50 = 150 minutes per week.</li> <li>3. Private learning : 3 x 50 = 150 minutes per week.</li> </ol>	
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	-	
Learning outcomes and their corresponding PLOs	<p>Course Learning Outcome (CLO) after completing this module,</p> <p>CLO 1: Students are able to understand the history of rehabilitation engineering.</p> <p>CLO 2: Students are able to explain and analyze aspects of the human movement system between healthy and disabled and discuss their use in designing rehabilitation engineering.</p> <p>CLO 3: Students are able to understand and analyze the physiology of human muscles using biomechanical methods so that they can diagnose movement disorders, assess rehabilitation outcomes, and design rehabilitation technologies</p>	<p>PLO-02</p> <p>PLO-02</p> <p>PLO-06</p>

	<p>CLO 4: Students are able to analyze and design one type of rehabilitation technique that is functional electrical stimulation.</p> <p>CLO 5: Students understand and analyze the effects of drugs on rehabilitation and advocacy of the use of these drugs</p>	<p>PLO-05</p> <p>PLO-08</p>
Content	<p>The Rehabilitation Engineering course is a course that discusses basic concepts, types, how to work, and other things related to the restoration process of the human body. Rehabilitation engineering itself is an engineering method to return the human body to its original condition. This course aims to make students understand the concepts and methods of rehabilitation engineering available in medicine and their impact on the human body system</p>	
Study and examination requirements and forms of examination	<ul style="list-style-type: none"> <li>● In-class exercises</li> <li>● Assignment 1, 2, 3, 4, 5</li> <li>● Mid-term examination</li> <li>● Final examination</li> </ul>	
Media employed	<p>LCD, whiteboard, websites (myITS Classroom), zoom.</p>	
Reading list	<p>Main :</p> <ol style="list-style-type: none"> <li>1. Cooper, Rory A. "An Introduction to Rehabilitation Engineering." CRC Press.</li> <li>2. Bronzino, Joseph D. "The Biomedical Engineering Handbook," CRC Press.</li> </ol> <p><b>Supporting :</b></p> <ol style="list-style-type: none"> <li>1. Mark L Latash, Neurophysiological basis of movement. Human Kinetics, USA, 1998.</li> <li>2. Robert M Enoka, Neuromechanics of human movement, 3rd Ed. Human Kinetics, USA, 2002.</li> </ol>	

**I. Rencana Pembelajaran Semester / Semester Learning Plan**

		<b>INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS)</b> <b>FACULTY OF INTELLIGENT ELECTRICAL AND INFORMATICS TECHNOLOGY</b> <b>DEPARTMENT OF BIOMEDICAL ENGINEERING</b>				<b>Document Code</b>
<b>SEMESTER LEARNING PLAN</b>						
<b>MATA KULIAH (MK)</b> <b>COURSE</b>	<b>KODE</b> <b>CODE</b>	<b>Rumpun MK</b> <b>Course Cluster</b>	<b>BOBOT (sks)</b> <b>Credits</b>		<b>SEMESTER</b>	<b>Tgl Penyusunan</b> <b>Compilation Date</b>
<b>Teknik Rehabilitasi</b> <i>Rehabilitation Engineering</i>	EB184906	<i>Biocybernetics</i> <i>Biocybernetics</i>	T=3	P=0	III	Feb 27, 2020
<b>OTORISASI / PENGESAHAN</b> <b>AUTHORIZATION / ENDORSEMENT</b>	<b>Dosen Pengembang RPS</b> <i>Developer Lecturer of Semester Learning Plan</i>		<b>Koordinator RMK</b> <i>Course Cluster Coordinator</i>		<b>Ka DEPARTEMEN</b> <i>Head of Department</i>	
	(Dr. Achmad Arifin, S.T., M.Eng.)		(Ir. Josaphat Pramudijanto, M.Eng.)		(Dr. Achmad Arifin, S.T., M.Eng.)	
<b>Capaian Pembelajaran</b>	<b>CPL-PRODI yang dibebankan pada MK</b> <b>PLO Program Charged to The Course</b>					
<b>Learning Outcomes</b>	CPL-02  PLO-02	Mampu <b>menemukan, memahami, menjelaskan, merumuskan</b> , dan <b>menyelesaikan</b> 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 special problems in the field of Biomedical Engineering which includes intelligent biomedical instrumentation, medical rehabilitation techniques, imaging and processing of medical images, and medical informatics</i>				
	CPL-05  PLO-05	Mampu mendesain komponen, sistem, dan proses dalam bidang Teknik Biomedika yang sistematis, logis, dan realistis sesuai dengan spesifikasi yang ditentukan dengan mempertimbangkan aspek keselamatan, sosial, budaya, lingkungan, dan ekonomi dengan mengenali/memanfaatkan sumber daya lokal dan nasional dengan wawasan global <i>Able to design components, systems, and processes in the field of Biomedical Engineering that are systematic, logical, and realistic appropriate with specified specifications by considering aspects of safety, social, cultural, environmental, and economic by recognizing / utilizing local and national resources with global insight</i>				

CPL-06 PLO-06	Mampu menerapkan ilmu pengetahuan, keterampilan, dan metode terkini dalam menyelesaikan permasalahan di bidang Teknik Biomedika <i>Able to apply the latest knowledge, skills and methods in solving problems in the field of Biomedical Engineering.</i>
CPL-08 PLO-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 interdisciplinary and intercultural teams and be responsible to the community and comply with legal and professional ethics in solving Biomedical Engineering problems</i>
<b>Capaian Pembelajaran Mata Kuliah (CPMK)</b> <b>Course Learning Outcome (CLO) - If CLO as description capability of each Learning Stage in the course, then CLO = LLO</b>	
<b>CP MK 1</b> <b>CLO 1</b>	Mahasiswa mampu memahami sejarah adanya teknik rehabilitasi. <i>Students are able to understand the history of rehabilitation engineering.</i>
<b>CP MK 2</b> <b>CLO 2</b>	Mahasiswa mampu menjelaskan dan menganalisa aspek-aspek sistem gerak manusia antara yang sehat dan cacat dan mendiskusikan penggunaannya dalam merancang teknik rehabilitasi. <i>Students are able to explain and analyze aspects of the human movement system between healthy and disabled and discuss their use in designing rehabilitation engineering.</i>
<b>CP MK 3</b> <b>CLO 3</b>	Mahasiswa mampu memahami dan menganalisa fisiologi dari otot manusia menggunakan metode biomekanik sehingga dapat mendiagnosa movement disorder, menilai hasil rehabilitasi, dan mendesain teknologi rehabilitasi. <i>Students are able to understand and analyze the physiology of human muscles using biomechanical methods so that they can diagnose movement disorders, assess rehabilitation outcomes, and design rehabilitation technologies.</i>
<b>CP MK 4</b> <b>CLO 4</b>	Mahasiswa mampu menganalisa dan mendesain salah satu jenis teknik rehabilitasi yaitu functional electrical stimulation <i>Students are able to analyze and design one type of rehabilitation technique that is functional electrical stimulation</i>
<b>CP MK 5</b> <b>CLO 5</b>	Mahasiswa memahami dan menganalisa efek obat-obatan pada rehabilitasi serta advocacy dari penggunaan obat-obatan tersebut <i>Students understand and analyze the effects of drugs on rehabilitation and advocacy of the use of these drugs</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
<i>Map of PLO - CLO</i>	CPMK 1 / SUB CPMK 1 <i>CLO 1 / LLO 1</i>												
	CPMK 2 / SUB CPMK 2 <i>CLO 2 / LLO 2</i>												
	CPMK 3 / SUB CPMK 3 <i>CLO 3 / LLO 3</i>												
	CPMK 4 / SUB CPMK 4 <i>CLO 4 / LLO 4</i>												
	CPMK 5 / SUB CPMK 5 <i>CLO 5 / LLO 5</i>												
<b>Diskripsi Singkat MK</b>	Mata kuliah Teknik Rehabilitasi merupakan mata kuliah yang membahas tentang konsep dasar, jenis, cara kerja, dan hal-hal lain yang berhubungan dengan proses restorasi tubuh manusia. Teknik rehabilitasi sendiri merupakan suatu metode rekayasa / engineering untuk mengembalikan kondisi tubuh manusia kepada kondisi semula. Mata kuliah ini bertujuan agar mahasiswa memahami konsep dan metode teknik rehabilitasi yang telah tersedia di dunia kedokteran dan dampaknya pada sistem tubuh manusia.												
<b>Short Description of Course</b>	<i>The Rehabilitation Engineering course is a course that discusses basic concepts, types, how to work, and other things related to the restoration process of the human body. Rehabilitation engineering itself is an engineering method to return the human body to its original condition. This course aims to make students understand the concepts and methods of rehabilitation engineering available in medicine and their impact on the human body system.</i>												
<b>Bahan Kajian:</b> Materi pembelajaran  <b>Course Materials:</b>	<ol style="list-style-type: none"> <li>1. Sejarah Teknik Rehabilitasi / <i>Rehabilitation Engineering History</i></li> <li>2. Pengukuran dan analisa gerak tubuh / <i>Measurement and analysis of body movements</i></li> <li>3. Fisiologi otot / <i>Muscle Physiology : muscle strength, muscle power, adaptation to reduced use, motor recovery after nervous system injury, adaptation with age.</i></li> <li>4. <i>Functional Electrical Stimulation : fatigue, aging, rehabilitasi motorik.</i></li> </ol>												

		<i>5. Rehabilitation Medicine and Advocacy</i>					
<b>Pustaka</b>  <i>References</i>	<b>Utama / Main:</b>						
	<ol style="list-style-type: none"> <li>Cooper, Rory A. "An Introduction to Rehabilitation Engineering." CRC Press.</li> <li>Bronzino, Joseph D. "The Biomedical Engineering Handbook," CRC Press.</li> </ol>						
	<b>Pendukung / Supporting:</b>						
	<ol style="list-style-type: none"> <li>Mark L Latash, Neurophysiological basis of movement. Human Kinetics, USA, 1998.</li> <li>Robert M Enoka, Neuromechanics of human movement, 3rd Ed. Human Kinetics, USA, 2002.</li> </ol>						
<b>Dosen Pengampu</b> <i>Lecturers</i>							
<b>Matakuliah syarat</b> <i>Prerequisite</i>		-					
Mg ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / <i>Final ability of each learning stage (LLO)</i>	Penilaian / <i>Assessment</i>		Bantuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [ <i>Estimasi Waktu</i> ] / <i>Form of Learning; Learning Method; 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 &amp; Techniques</i>	Tatap Muka / <i>In-class</i> (5)	Daring / <i>Online</i> (6)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)



1	<p>Mahasiswa mampu memahami sejarah adanya teknik rehabilitasi.</p> <p><i>Students are able to understand the history of rehabilitation engineering.</i></p>	<ul style="list-style-type: none"> <li>● Kelengkapan dan kerapian hasil resume</li> <li>● Ketepatan waktu pengumpulan tugas.</li> <li>● Kebenaran melaksanakan tugas.</li> <li>● Keberhasilan menjelaskan tugas dengan baik</li> <li>● <i>Completeness and neatness of the resume results.</i></li> <li>● <i>On time submission of assignments.</i></li> <li>● <i>Tasks performed correctly</i></li> <li>● <i>Success in completing assignments well.</i></li> </ul>	<p><b>Non-tes :</b>  <b>Tugas 1:</b>  Resume mengenai sejarah teknik rehabilitasi dan jenis-jenis teknik rehabilitasi  <b>Non-test :</b>  <b>Task 1:</b>  <i>Resume on the history of rehabilitation engineering and types of rehabilitation engineering</i></p>	<ul style="list-style-type: none"> <li>● Kuliah dan brainstorming, tanya jawab.  [TM : 3 x 50"]  [BM : 3 x 50"]  [PT : 3 x 50"]</li> <li>● <i>Presentation and brainstorming, ask and answer.</i>  [FF : 3 x 50"]  [SA : 3 x 50"]  [SS : 3 x 50"]</li> </ul>	<ul style="list-style-type: none"> <li>● Chatting dan diskusi dalam forum platform ITS.</li> <li>● <i>Chat and discussion in ITS platform forum.</i></li> </ul>	<ul style="list-style-type: none"> <li>● Kontrak kuliah: <ul style="list-style-type: none"> <li>- Motivasi belajar</li> <li>- Rencana pembelajaran</li> <li>- Aturan-aturan perkuliahan</li> <li>- Tujuan perkuliahan</li> <li>- Sistem penilaian, buku ajar/sumber pustaka</li> </ul> </li> <li>● Definisi rehabilitasi</li> <li>● Teknik rehabilitasi</li> <li>● Sejarah teknik rehabilitasi</li> <li>● Konsep teknik rehabilitasi</li> </ul> <p><b>[Link materi di MyITSClassroom]</b></p> <ul style="list-style-type: none"> <li>● <i>Course contract:</i> <ul style="list-style-type: none"> <li>- Motivation to learn</li> <li>- Lesson plan</li> <li>- Lecture rules</li> <li>- Course objective</li> <li>- Assessment system, textbooks / library resources</li> </ul> </li> <li>● <i>Definition of rehabilitation</i></li> <li>●</li> </ul>	5
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						<ul style="list-style-type: none"> <li>• <i>Rehabilitation Engineering</i></li> <li>• <i>History of rehabilitation engineering</i></li> <li>• <i>The concept of rehabilitation engineering</i></li> </ul>	
2-4	<p>Mahasiswa mampu menjelaskan dan menganalisa aspek-aspek sistem gerak manusia antara yang sehat dan cacat dan mendiskusikan penggunaannya dalam merancang teknik rehabilitasi.</p> <p><i>Students are able to explain and analyze aspects of the human movement system between healthy and disabled and discuss their use in designing rehabilitation techniques..</i></p>	<ul style="list-style-type: none"> <li>• Kebenaran pemahaman, jawaban dan analisa</li> <li>• Keberhasilan menjelaskan tugas</li> <li>• Ketepatan waktu pengumpulan tugas</li> <li>• <i>Correct in understanding, answers and analysis</i></li> <li>• <i>Able to explain the assignments</i></li> <li>• <i>On time submission of assignments.</i></li> </ul>	<p><b>Non-tes :</b> <b>Tugas 2:</b> Mengerjakan soal-soal yang berhubungan dengan sistem, pengukuran, dan analisa gerak manusia.</p> <p><b>Non-test :</b> <b>Task 2:</b> Solving the problems related to systems, measurements, and analysis of human motion.</p>	<ul style="list-style-type: none"> <li>• Kuliah, diskusi, tanya jawab, latihan soal, tugas. 3x[TM: 3 x 50"] 3x[BM: 3 x 50"] 3x[PT: 3 x 50"]</li> <li>• <i>Presentation, discussion, ask and answer, exercise, assignment</i> 3x[FF: 3 x 50"] 3x[SA: 3 x 60"] 3x[SS: 3 x 60"]</li> </ul>		<ul style="list-style-type: none"> <li>• Sistem gerak manusia</li> <li>• Pengukuran gerak manusia</li> <li>• Analisa gerak manusia</li> <li>• <i>Human motion system</i></li> <li>• <i>Measurement of human motion</i></li> <li>• <i>Human motion analysis</i></li> </ul>	5


5 - 7	<p>Mahasiswa mampu memahami dan menganalisa fisiologi dari otot manusia menggunakan metode biomekanik sehingga dapat mendiagnosa movement disorder, menilai hasil rehabilitasi, dan mendesain teknologi rehabilitasi.</p> <p><i>Students are able to understand and analyze the physiology of human muscles using biomechanical methods so that they can diagnose movement disorders, assess rehabilitation outcomes, and design rehabilitation technologies.</i></p>	<ul style="list-style-type: none"> <li>• Kebenaran pemahaman, jawaban dan analisa</li> <li>• Keberhasilan menjelaskan tugas</li> <li>• Ketepatan waktu pengumpulan tugas</li> <li>• <i>Correct in understanding, answers and analysis</i></li> <li>• <i>Able to explain the assignments</i></li> <li>• <i>On time submission of assignments.</i></li> </ul>	<p><b>Non-tes :</b></p> <p><b>Tugas 3:</b></p> <ul style="list-style-type: none"> <li>- Mengerjakan soal yang berhubungan dengan: <ul style="list-style-type: none"> <li>• Contoh konsep pada fisiologi otot manusia</li> <li>• Pengaruh intensitas penggunaan otot terhadap kekuatan otot.</li> </ul> </li> </ul> <p><b>Non-test :</b></p> <p><b>Task 3:</b></p> <ul style="list-style-type: none"> <li>- <i>Work on problems related to:</i> <ul style="list-style-type: none"> <li>• <i>Examples of concepts on human muscle physiology</i></li> <li>• <i>Effect of intensity of use of muscles on muscle strength</i></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Kuliah, diskusi, tanya jawab, latihan soal, tugas 3x[TM: 3 x 50"] 3x[BM: 3 x 50"] 3x[PT: 3 x 50"]</li> <li>• <i>Presentation, discussion, ask and answer, exercise, assignment</i> 3x[FF: 3 x 50"] 3x[SA: 3 x 50"] 3x[SS: 3 x 50"]</li> </ul>		<ul style="list-style-type: none"> <li>• Dasar fisiologi otot manusia</li> <li>• Muscle strength</li> <li>• Muscle power</li> <li>• Adaptation to reduced use</li> <li>• Motor recovery after nervous system injury</li> <li>• Adaptation with age</li> <li>• <i>Basic physiology of human muscles</i></li> <li>• <i>Muscle strength</i></li> <li>• <i>Muscle power</i></li> <li>• <i>Adaptation to reduced use</i></li> <li>• <i>Motor recovery after nervous system injury</i></li> <li>• <i>Adaptation with age</i></li> </ul>	5
8	<b>EVALUASI TENGAH SEMESTER MID-SEMESTER EXAM</b>						25
9 - 12	<p>Mahasiswa mampu menganalisa dan mendesain salah satu jenis teknik rehabilitasi yaitu functional electrical stimulation</p>	<ul style="list-style-type: none"> <li>• Kebenaran pemahaman, jawaban dan analisa</li> <li>• Keberhasilan menjelaskan tugas</li> </ul>	<p><b>Non-tes :</b></p> <p><b>Tugas 4:</b></p> <ul style="list-style-type: none"> <li>- Mengerjakan soal tentang</li> </ul>	<ul style="list-style-type: none"> <li>• Kuliah, diskusi, tanya jawab, latihan soal, tugas 4x[TM: 3 x 50"]</li> </ul>		<ul style="list-style-type: none"> <li>• Definisi functional electrical stimulation</li> </ul>	15

	<p><i>Students are able to analyze and design one type of rehabilitation technique that is functional electrical stimulation</i></p>	<ul style="list-style-type: none"> <li>● Ketepatan waktu pengumpulan tugas</li> <li>● Correct in understanding, answers and analysis</li> <li>● Able to explain the assignments</li> <li>● On time submission of assignments.</li> </ul>	<p>aplikasi statika pada persendian tubuh manusia.</p> <p><b>Non-test :</b></p> <p><b>Task 4:</b></p> <ul style="list-style-type: none"> <li>- Solving the problems about the application of statics to the joints of the human body.</li> </ul>	<p>4x[BM: 3 x 50"] 4x[PT : 3 x 50"]</p> <ul style="list-style-type: none"> <li>● Presentation, discussion, ask and answer, exercise, assignment 4x[FF : 3 x 50"] 4x[SA : 3 x 50"] 4x[SS : 3 x 50"]</li> </ul>		<ul style="list-style-type: none"> <li>● Desain functional electrical stimulation</li> <li>● Rehabilitasi motorik</li> <li>● Fatigue</li> <li>● Aging</li> <li>● Definition of functional electrical stimulation</li> <li>● Desain functional electrical stimulation</li> <li>● Rehabilitasi motorik</li> <li>● Fatigue</li> <li>● Aging</li> </ul>	
<b>13 -14</b>	<p>Mahasiswa memahami dan menganalisa efek obat-obatan pada rehabilitasi serta advocacy dari penggunaan obat-obatan tersebut</p> <p><i>Students understand and analyze the effects of drugs on rehabilitation and advocacy of the use of these drugs</i></p>	<ul style="list-style-type: none"> <li>● Kelengkapan dan kerapian hasil resume</li> <li>● Ketepatan waktu pengumpulan tugas</li> <li>● Kebenaran melaksanakan tugas</li> <li>● Keberhasilan menjelaskan tugas dengan baik.</li> <li>● Kebenaran isi presentasi</li> <li>● Kelancaran dan keberhasilan</li> </ul>	<p><b>Non tes:</b></p> <p><b>Tugas 5:</b></p> <ul style="list-style-type: none"> <li>- Resume tentang advocacy pada penggunaan obat-obatan untuk rehabilitasi</li> <li>- Presentasi tentang obat-obatan pada</li> </ul>	<ul style="list-style-type: none"> <li>● Kuliah, diskusi, tanya jawab, latihan soal, tugas 2x[TM: 3 x 50"] 2x[BM: 3 x 50"] 2x[PT : 3 x 50"]</li> <li>● Presentation, discussion, ask and answer,</li> </ul>		<ul style="list-style-type: none"> <li>● Obat-obatan pada rehabilitasi</li> <li>● Advokasi dari penggunaan obat-obatan untuk rehabilitasi</li> <li>● Medicines on rehabilitation</li> <li>● Advocacy of the use of drugs for rehabilitation</li> </ul>	<b>15</b>

		<p>menyampaikan materi</p> <ul style="list-style-type: none"> <li>● Laporan tertulis</li> <li>● <i>Completeness and neatness of the resume results</i></li> <li>● <i>Timeliness of submitting assignments</i></li> <li>● <i>Truth does the job</i></li> <li>● <i>Success in defining assignments well.</i></li> <li>● <i>Correctness of presentation content</i></li> <li>● <i>Smoothness and success in delivering material</i></li> <li>● <i>Written report.</i></li> </ul>	<p>jenis rehabilitasi tertentu.</p> <p><b>Non-test:</b></p> <p><b>Task 5:</b></p> <ul style="list-style-type: none"> <li>- <i>Resumes about advocacy on the use of drugs for rehabilitation</i></li> <li>- <i>Presentations about drugs in certain types of rehabilitation.</i></li> </ul>	<p><i>exercise, assignment</i></p> <p>2x[FF : 3 x 50"]</p> <p>2x[SA : 3 x 50"]</p> <p>2x[SS : 3 x 50"]</p>			
15-16	<b>EVALUASI AKHIR SEMESTER FINAL-SEMESTER EXAM</b>						30

TM=Tatap Muka, PT=Penugasan Terstruktur, BM=Belajar Mandiri.  
FF = Face to Face, SA = Structured Assignment, SS = Self Study.

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

	<b>ASSESSMENT &amp; EVALUATION PLAN</b> <b>BACHELOR DEGREE PROGRAM OF BIOMEDICAL ENGINEERING - FTEIC ITS</b> <b>Course : Rehabilitation Engineering</b>		<b>RA&amp; E</b>
			Write Doc Code
Kode/code: <b>EB184906</b>	Bobot sks/credits (T/P): <b>3/0</b>	Rumpun MK: <b>Biocybernetics</b> Course Cluster: <b>Biocybernetics</b>	Peminatan <i>Specialization</i>
OTORISASI <i>AUTHORIZATION</i>	Penyusun RA & E <i>Compiler A&amp;EP</i>  <b>Nada Fitriyatul H, S.T, M.T</b>	Koordinator RMK <i>Course Cluster Coordinator</i>  <b>Ir. Josaphat Pramudijanto, M.Eng.</b>	Ka DEP <i>Head of DEP</i>  <b>Dr. Achmad Arifin, S.T., M.Eng.</b>

Mg ke/ Week (1)	Sub CP-MK / <i>Lesson Learning Outcomes (LLO)</i> (2)	Bentuk Asesmen (Penilaian) <i>Form of Assessment</i> (3)	Bobot / Load (%) (4)
1	<b>Sub CP-MK 1:</b> Mahasiswa mampu memahami sejarah adanya teknik rehabilitasi.  <b>LLO 1:</b> <i>Students are able to understand the history of rehabilitation engineering..</i>	<b>Non-tes :</b> <b>Tugas 1:</b> Resume mengenai sejarah teknik rehabilitasi dan jenis-jenis teknik rehabilitasi  <b>Tes:</b> ETS Soal 1 (10.38% dari ETS 25%)  <b>Non-test :</b> <b>Task 1:</b> <i>Resume on the history of rehabilitation engineering and types of rehabilitation engineering</i>  <b>Test:</b> <i>Question 1 in Mid Exam (10.38% of Mid Exam 25%)</i>	5
2-4	<b>Sub CP-MK 2:</b> Mahasiswa mampu menjelaskan dan menganalisa aspek-aspek sistem gerak manusia antara	<b>Non-tes :</b> <b>Tugas 2:</b> Mengerjakan soal-soal yang berhubungan dengan sistem, pengukuran, dan analisa gerak manusia.  <b>Tes:</b> ETS Soal 2 dan 3 (12.95% dari ETS 25%)	5

	<p>yang sehat dan cacat dan mendiskusikan penggunaannya dalam merancang teknik rehabilitasi.</p> <p><b>LLO 2:</b>  <i>Students are able to explain and analyze aspects of the human movement system between healthy and disabled and discuss their use in designing rehabilitation techniques.</i></p>	<p><b>Non-test :</b>  <b>Task 2:</b>  <i>Solving the problems related to systems, measurements, and analysis of human motion.</i></p> <p><b>Test:</b>  <i>Question 2 and 3 in Mid Exam (12.95% of Mid Exam 30%)</i></p>	
5-7	<p><b>Sub CP-MK 3:</b>  Mahasiswa mampu memahami dan menganalisa fisiologi dari otot manusia menggunakan metode biomekanik sehingga dapat mendiagnosa movement disorder, menilai hasil rehabilitasi, dan mendesain teknologi rehabilitasi.</p> <p><b>LLO 3:</b>  Students are able to understand and analyze the physiology of human muscles using biomechanical</p>	<p><b>Non-tes :</b>  <b>Tugas 3:</b></p> <ul style="list-style-type: none"> <li>- Mengerjakan soal yang berhubungan dengan contoh konsep pada fisiologi otot manusia</li> <li>- Mengerjakan soal yang berhubungan dengan pengaruh intensitas penggunaan otot terhadap kekuatan otot.</li> </ul> <p><b>Tes:</b>  ETS Soal 4 dan Soal 5 (1.67% dari ETS 25%)  EAS Soal 1 (13.84% dari EAS 30%)</p> <p><b>Non-test :</b>  <b>Task 3:</b></p> <ul style="list-style-type: none"> <li>- <i>Solving the problems related to examples of concepts on human muscle physiology</i></li> <li>- <i>Solving the problems related to effect of intensity of use of muscles on muscle strength</i></li> </ul> <p><b>Test:</b>  <i>Questions 4 and 5 in Mid Exam (1.67% of Mid Exam 25%)</i>  <i>Question 1 in Final Exam (13.84% of Final Exam 30%)</i></p>	5

	methods so that they can diagnose movement disorders, assess rehabilitation outcomes, and design rehabilitation technologies.		
8	<b>Evaluasi Tengah Semester</b>  <i>Mid Exam</i>	<b>Tes:</b> Ujian Tulis/Ujian Daring  <b>Test:</b> <i>Writing Exams / Online Exams</i>	25
9-12	<b>Sub CP-MK 4:</b> Mahasiswa mampu menganalisa dan mendesain salah satu jenis teknik rehabilitasi yaitu functional electrical stimulation  <b>LLO 4:</b> <i>Students are able to analyze and design one type of rehabilitation technique that is functional electrical stimulation</i>	<b>Non-tes :</b> <b>Tugas 4:</b> - Mengerjakan soal tentang aplikasi statika pada persendian tubuh manusia  <b>Tes:</b> EAS Soal No 2 dan 3 (2.95% dari EAS 30%)  <b>Non-test :</b> <b>Task 4:</b> - <i>Solving the problems about the application of statics to the joints of the human body.</i>  <b>Test:</b> <i>Question 2 and 3 in Final Exam (2.95% of Final Exam 30%)</i>	15
13-14	<b>Sub CP-MK 5:</b> Mahasiswa memahami dan menganalisa efek obat-obatan pada rehabilitasi serta advocacy dari penggunaan obat-obatan tersebut  <b>LLO 5:</b>	<b>Non-tes :</b> <b>Tugas 5:</b> - Resume tentang advocacy pada penggunaan obat-obatan untuk rehabilitasi (5 % ) - Presentasi tentang obat-obatan pada jenis rehabilitasi tertentu.(10% )  <b>Tes:</b> EAS Soal No 4 dan 5 (13.21% dari EAS 30%)  <b>Non-test:</b> <b>Task 5:</b>	15



	<i>Students understand and analyze the effects of drugs on rehabilitation and advocacy of the use of these drugs</i>	<ul style="list-style-type: none"> <li>- <i>Resumes about advocacy on the use of drugs for rehabilitation(5%)</i></li> <li>- <i>Presentations about drugs in certain types of rehabilitation.(10%)</i></li> </ul> <p><b>Test:</b> <i>Question 4 and 5 in Final Exam (13.21% of Final Exam 30%)</i></p>	
<b>15-16</b>	<b>Evaluasi Akhir</b>  <b>Final Exam</b>	<p><b>Tes:</b> Ujian Tulis/Ujian Daring</p> <p><b>Test:</b> <i>Writing Exams / Online Exams</i></p>	30
<b>Total bobot penilaian</b> <b>Total assessment load</b>			<b>100%</b>

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

<b>CPL yang dibebankan pada MK / <i>PLO charged to the course</i></b>	<b>CPMK / <i>Course Learning Outcome (CLO)</i></b>	<b>Minggu ke / <i>Week</i></b>	<b>Bentuk Asesmen / <i>Form of Assessment</i></b>	<b>Bobot / <i>Load (%)</i></b>
CPL-02 / PLO-02	CPMK 1 / CLO 1	Week- 1	Task 1	5
		Week- 8	Mid Exam Question 1	10.38
	CPMK 2 / CLO 2	Week- 2-4	Task 2	5
		Week- 8	Mid Exam Question 2 and 3	12.95
CPL-05 / PLO-05	CPMK 4 / CLO 4	Week- 9-12	Task 4	5
		Week- 16	Final Exam Question 2 and 3	2.95
CPL-06 / PLO-06	CPMK 3 / CLO 3	Week- 5-7	Task 3	5
		Week- 8	Mid Exam Question 4 and 5	1.67
		Week- 16	Final Exam Question 1	13.84
CPL-08 / PLO-08	CPMK 5 / CLO 5	Week- 13-14	Task 5	5
		Week- 13-14	Presentation	10
	CPMK 6 / CLO 6	Week- 16	Final Exam Question 4 and 5	13.21
				<b>∑ = 100%</b>

<b>No</b>	<b>Form of Assessment</b>	<b>PLO-01</b>	<b>PLO-02</b>	<b>PLO-03</b>	<b>PLO-04</b>	<b>PLO-05</b>	<b>PLO-06</b>	<b>PLO-07</b>	<b>PLO-08</b>	<b>PLO-09</b>	<b>PLO-10</b>	<b>PLO-11</b>	<b>PLO-12</b>	<b>Total</b>
1	Task 1		0.05											0.05
2	Task 2		0.05											0.05
3	Task 3						0.05							0.05
4	Task 4					0.15								0.15

5	<i>Task 5</i>								0.05					<b>0.05</b>
6	<i>Presentation</i>								0.1					<b>0.1</b>
7	<i>Mid Exam</i>		0.2333				0.0167							<b>0.25</b>
8	<i>Final Exam</i>					0.0295	0.1384		0.1321					<b>0.4</b>
	<i>Total</i>		0.3333			0.1795	0.2051		0.2821					<b>1</b>