

# MODULE HANDBOOK

## FUNDAMENTALS OF INTELLIGENT SYSTEMS



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

**INSTITUT TEKNOLOGI SEPULUH NOPEMBER**



## ENDORSEMENT PAGE



### MODULE HANDBOOK Fundamentals of Intelligent Systems (Enrichment) DEPARTMENT OF BIOMEDICAL ENGINEERING

INSTITUT TEKNOLOGI SEPULUH NOPEMBER  
Number : B/21365/IT2.IX.5.1.2/PP.03.00.00/2020

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


# MODULE HANDBOOK

## FUNDAMENTALS OF INTELLIGENT SYSTEMS

Module name	<b>Fundamentals of Intelligent Systems</b>	
Module level	Undergraduate	
Code	EB234603	
Course (if applicable)	Fundamentals of Intelligent Systems	
Semester	First Semester (Gasal)	
Person responsible for the module	Fauzan Arrofiqi, S.T., M.T., Ph.D.	
Lecturer	Dr. Achmad Arifin, S.T., M.Eng.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program, <b>enrichment</b> , 5 <sup>th</sup> semester	
Type of teaching, contact hours	Lectures, <60 students Fridays, 07.00-09.50 (GMT+7)	
Workload	1. Lectures : 3 x 50 = 150 minutes per week 2. Exercises and Assignments : 3 x 60 = 180 minutes (3 hours) per week 3. Private learning : 3 x 60 = 180 minutes (3 hours) 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	Numerical Methods	
Learning outcomes and their corresponding PLOs	Course Learning Outcome (CLO) after completing this module: CLO 1: Students are able to understand the basics of neuroscience and neuron modeling CLO 2: Students are able to explain and analyze neural network models with supervised learning method CLO 3: Students are able to explain and analyze the neural network model with unsupervised learning method CLO 4: Students are able to explain and analyze fuzzy logic systems, fuzzy inference systems, fuzzy clustering and control CLO 5: Students are able to design evolutionary algorithm, genetic programming	PLO-02 PLO-03 PLO-03 PLO-03 PLO-05

	CLO 6: Students are able to design and implement intelligent electronic system applications	PLO-06
Content / Short Description of Course	The fundamentals of intelligent systems course is a compulsory subject which discusses the basic concepts of artificial intelligence and its development from conventional artificial intelligence to genetic algorithm. This course aims to make students understand the basic principles of the components in intelligent systems and be able to design intelligent electronic systems. The intelligent system design is expected to be able to be applied in the Biomedical Engineering discipline.	
Study and examination requirements and forms of examination	<ul style="list-style-type: none"> <li>• In-class exercises</li> <li>• Written assignment 1, 2</li> <li>• Demo and report 1,2,3,4,5,6</li> <li>• Mid-term examination</li> <li>• Final examination</li> </ul>	
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom	
Reading list	Main: <ul style="list-style-type: none"> <li>• Fredric M Ham, Ivica Kostanic, "Principles of Neurocomputing for Science &amp; Engineering," McGraw-Hill Inc., 2001</li> <li>• JSR Jang, CT Tsun, E. Mizutani, "Neuro-Fuzzy and Soft Computing," Prentice Hall Inc., 1997</li> <li>• David B Fogel," Evolutionary Computation," 3<sup>rd</sup> Ed., IEEE Press, 2006</li> </ul>	
	Supporting: <ul style="list-style-type: none"> <li>• NK Bose and P. Liang, "Neural Network Fundamental," McGraw Hill, 1996</li> <li>• Hua Li, M Gupta (Eds), "Fuzzy Logic and Intelligent Systems," Kluwer AcPress, 1995</li> </ul>	

## 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>Dasar Sistem Cerdas</b> <i>Fundamentals of Intelligent Systems</i>	<b>EB234603</b>	<b>Biocybernetics</b> <i>Biocybernetics</i>	<b>T = 3</b>	<b>P = 0</b>	<b>V</b>	<b>Nov 19, 2022</b>
<b>OTORISASI / PENGESAHAN</b> <b>AUTHORIZATION/ENDORSEMENT</b>		<b>Dosen Pengembang RPS</b> <b>Developer Lecturer of Semester Learning Plan</b>	<b>Koordinator RMK</b> <b>Course Cluster Coordinator</b>		<b>Ka DEPARTEMEN</b> <b>Head of Department</b>	
		<b>(Fauzan Arrofiqi, S.T., M.T., Ph.D.)</b>	<b>(Ir. Josaphat Pramudijanto, M.Eng.)</b>		<b>(Dr. Achmad Arifin, S.T., M.Eng.)</b>	
<b>Capaian Pembelajaran</b>	<b>CPL-PRODI yang dibebankan pada MK</b> <b>PLO Program Charged to the Course</b>					
<b>Learning Outcomes</b>	<b>CPL-02</b>  <b>PLO-02</b>	Mampu <b>menemukan, memahami, menjelaskan, merumuskan, dan 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 Able to <b>find, understand, explain, formulate, and solve</b> 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				
	<b>CPL-03</b>  <b>PLO-03</b>	Mampu <b>merancang dan melaksanakan</b> eksperimen laboratorium dan/atau lapangan, <b>menganalisa dan menginterpretasi</b> data, serta menggunakan penilaian yang obyektif untuk menarik kesimpulan Able to <b>design and implement</b> laboratory experiment and / or field experiments, <b>analyze and interpret</b> data, and use objective assessments to draw conclusions				

<p><b>CPL-05</b></p> <p><b>PLO-05</b></p>	<p>Mampu <b>mendesain</b> 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 <b>mengenal/memanfaatkan</b> sumber daya lokal dan nasional dengan wawasan global</p> <p><i>Able to <b>design</b> 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 <b>recognizing/utilizing</b> local and national resources with global insight</i></p>
<p><b>CPL-06</b></p> <p><b>PLO-06</b></p>	<p>Mampu <b>menerapkan</b> ilmu pengetahuan, keterampilan, dan metode terkini dalam menyelesaikan permasalahan di bidang Teknik Biomedika</p> <p><i>Able to <b>apply</b> the latest knowledge, skills and methods in solving problems in the field of Biomedical Engineering</i></p>
<p><b>Capaian Pembelajaran Mata Kuliah (CPMK) – Bila CP MK sebagai kemampuan pada tiap tahap pembelajaran CP MK = Sub CP MK Course Learning Outcome (CLO) - If CLO as description capability of each Learning Stage in the course, then CLO = LLO</b></p>	
<p><b>CP MK 1</b></p> <p><b>CLO 1</b></p>	<p>Mahasiswa mampu memahami dasar-dasar neuroscience dan pemodelan neuron</p> <p><i>Students are able to understand the basics of neuroscience and neuron modeling</i></p>
<p><b>CP MK 2</b></p> <p><b>CLO 2</b></p>	<p>Mahasiswa mampu menjelaskan dan menganalisis model neural network dengan metode supervised learning</p> <p><i>Students are able to explain and analyze neural network models with supervised learning method</i></p>
<p><b>CP MK 3</b></p> <p><b>CLO 3</b></p>	<p>Mahasiswa mampu menjelaskan dan menganalisis model neural network dengan metode unsupervised learning</p> <p><i>Students are able to explain and analyze the neural network model with unsupervised learning method</i></p>
<p><b>CP MK 4</b></p> <p><b>CLO 4</b></p>	<p>Mahasiswa mampu menjelaskan dan menganalisa sistem logika fuzzy, fuzzy inference sistem, fuzzy clustering dan control</p> <p><i>Students are able to explain and analyze fuzzy logic systems, fuzzy inference systems, fuzzy clustering and control</i></p>
<p><b>CP MK 5</b></p> <p><b>CLO 5</b></p>	<p>Mahasiswa mampu merancang evolutionary algorithm, genetic programming</p> <p><i>Students are able to design evolutionary algorithm, genetic programming</i></p>
<p><b>CP MK 6</b></p> <p><b>CLO 6</b></p>	<p>Mahasiswa mampu merancang dan mengimplementasikan aplikasi sistem elektronika cerdas</p> <p><i>Students are able to design and implement intelligent electronic system applications</i></p>

<p><b>Peta CPL – CP MK</b></p> <p><i>Map of PLO – CLO</i></p>	<table border="1"> <thead> <tr> <th></th> <th>CPL-01</th> <th>CPL-02</th> <th>CPL-03</th> <th>CPL-04</th> <th>CPL-05</th> <th>CPL-06</th> <th>CPL-07</th> <th>CPL-08</th> <th>CPL-09</th> <th>CPL-10</th> <th>CPL-11</th> <th>CPL-12</th> </tr> </thead> <tbody> <tr> <td>CPMK 1 / SUB CPMK 1 <i>CLO 1 / LLO 1</i></td> <td></td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CPMK 2 / SUB CPMK 2 <i>CLO 2 / LLO 2</i></td> <td></td> <td></td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CPMK 3 / SUB CPMK 3 <i>CLO 3 / LLO 3</i></td> <td></td> <td></td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CPMK 4 / SUB CPMK 4 <i>CLO 4 / LLO 4</i></td> <td></td> <td></td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CPMK 5 / SUB CPMK 5 <i>CLO 5 / LLO 5</i></td> <td></td> <td></td> <td></td> <td></td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CPMK 6 / SUB CPMK 6 <i>CLO 6 / LLO 6</i></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		CPL-01	CPL-02	CPL-03	CPL-04	CPL-05	CPL-06	CPL-07	CPL-08	CPL-09	CPL-10	CPL-11	CPL-12	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>					√								CPMK 6 / SUB CPMK 6 <i>CLO 6 / LLO 6</i>						√						
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<p><b>Diskripsi Singkat MK</b></p> <p><i>Short Description of Course</i></p>	<p>Mata kuliah Dasar Sistem Cerdas merupakan mata kuliah wajib yang membahas konsep dasar kecerdasan buatan dan perkembangannya mulai dari conventional artificial intelligence hingga algoritma genetik. Mata kuliah ini bertujuan agar mahasiswa memahami tentang prinsip-prinsip dasar dari komponen-komponen dalam sistem cerdas dan mampu mendisain sistem elektronika cerdas. Disain sistem cerdas diharapkan mampu diterapkan dalam disiplin ilmu Teknik Biomedik.</p> <p><i>The Fundamentals of Intelligent Systems course is a compulsory subject which discusses the basic concepts of artificial intelligence and its development from conventional artificial intelligence to genetic algorithm. This course aims to make students understand the basic principles of the components in intelligent systems and be able to design intelligent electronic systems. The intelligent system design is expected to be able to be applied in the Biomedical Engineering discipline.</i></p>																																																																																											
<p><b>Bahan Kajian / Materi Pembelajaran</b></p> <p><i>Course Materials</i></p>	<ol style="list-style-type: none"> <li>1. Dasar-dasar neuroscience dan pemodelan neuron / <i>Basics of neuroscience and neuron modeling</i></li> <li>2. Model neural network feedforward dan feedback / <i>Feedforward and feedback neural network models</i></li> <li>3. Metode pembelajaran neural network, competitive network : supervised, unsupervised / <i>Neural network learning methods, competitive network: supervised, unsupervised</i></li> <li>4. Sistem logika fuzzy, fuzzy inference system, fuzzy clustering &amp; control / <i>Fuzzy logic system, fuzzy inference system, fuzzy clustering &amp; control</i></li> <li>5. Algoritma evolusioner, pemrograman genetic / <i>Evolutionary algorithms, genetic programming</i></li> </ol>																																																																																											

<b>Pustaka</b>  <b>References</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"><b>Utama / Main:</b></td> <td> <ul style="list-style-type: none"> <li>• Fredric M Ham, Ivica Kostanic, "Principles of Neurocomputing for Science &amp; Engineering," McGraw-Hill Inc., 2001</li> <li>• JSR Jang, CT Tsun, E. Mizutani, "Neuro-Fuzzy and Soft Computing," Prentice Hall Inc., 1997</li> <li>• David B Fogel, "Evolutionary Computation," 3rd Ed., IEEE Press, 2006</li> </ul> </td> </tr> <tr> <td><b>Pendukung / Supporting:</b></td> <td> <ul style="list-style-type: none"> <li>• NK Bose and P. Liang, "Neural Network Fundamental," McGraw Hill, 1996</li> <li>• Hua Li, M Gupta (Eds), "Fuzzy Logic and Intelligent Systems," Kluwer AcPress, 1995</li> </ul> </td> </tr> </table>	<b>Utama / Main:</b>	<ul style="list-style-type: none"> <li>• Fredric M Ham, Ivica Kostanic, "Principles of Neurocomputing for Science &amp; Engineering," McGraw-Hill Inc., 2001</li> <li>• JSR Jang, CT Tsun, E. Mizutani, "Neuro-Fuzzy and Soft Computing," Prentice Hall Inc., 1997</li> <li>• David B Fogel, "Evolutionary Computation," 3rd Ed., IEEE Press, 2006</li> </ul>	<b>Pendukung / Supporting:</b>	<ul style="list-style-type: none"> <li>• NK Bose and P. Liang, "Neural Network Fundamental," McGraw Hill, 1996</li> <li>• Hua Li, M Gupta (Eds), "Fuzzy Logic and Intelligent Systems," Kluwer AcPress, 1995</li> </ul>
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<b>Dosen Pengampu Lectures</b>	Dr. Achmad Arifin, S.T., M.Eng.				
<b>Matakuliah syarat Prerequisites</b>	Metode Numerik <i>Numerical Methods</i>				



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; Student Assignment;</i> [ <i>Estimated Time</i> ]		Materi Pembelajaran [ <i>Pustaka</i> ] / <i>Learning Material</i> [ <i>Reference</i> ]	Bobot Penilaian / Assessment Load (%)
		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	<p>Mahasiswa mampu memahami dasar-dasar neuroscience dan pemodelan neuron</p> <p><i>Students are able to understand the basics of neuroscience and neuron modeling</i></p>	<ul style="list-style-type: none"> <li>• Kedalaman tingkat pemahaman</li> <li>• Ketepatan waktu pengumpulan tugas</li> <li>• Kebenaran mengerjakan tugas</li> <li>• Kebenaran jawaban dan penjabarannya</li> <li>• <i>The depth of understanding</i></li> <li>• <i>Punctuality of assignment submission</i></li> <li>• <i>Correctness of assignment work method</i></li> <li>• <i>Correctness of the answer and its explanation</i></li> </ul>	<ul style="list-style-type: none"> <li>• Tugas 1: Perancangan program simulasi gerbang XOR dan XNOR dengan beberapa input dengan metode NN McCulloh Pitts (Demo dan Laporan 1)</li> <li>• <i>Assignment 1: Designing a simulation program for XOR and XNOR gates with multiple inputs using the NN McCulloh Pitts method (Demo and Report 1)</i></li> </ul>	<ul style="list-style-type: none"> <li>• Kuliah dan diskusi [TM : 2 x 3 x 50'] [BM : 2 x 3 x 60'] [PT : 2 x 3 x 60']</li> <li>• <i>Lecture and discussion</i> [FF : 2 x 3 x 50'] [SA : 2 x 3 x 60'] [SS : 2 x 3 x 60']</li> </ul>	<ul style="list-style-type: none"> <li>• Belajar Mandiri – Daring atau Luring melalui Share ITS</li> <li>• Penugasan Terstruktur</li> <li>• <i>Independent Learning - Online or Offline via Share ITS</i></li> <li>• <i>Structured Assignments</i></li> </ul>	<p>Dasar-dasar neuroscience dan pemodelan neuron:</p> <ul style="list-style-type: none"> <li>• Conventional Artificial Intelligence</li> <li>• Konsep neuron secara anatomi dan fisiologi</li> <li>• Sejarah pemodelan neuron</li> <li>• McCulloh Pitts</li> </ul> <p>[<a href="#">Link materi di MyITSClassroom</a>]</p> <p><i>Neuroscience basics and neuron modeling:</i></p> <ul style="list-style-type: none"> <li>• <i>Conventional Artificial Intelligence</i></li> <li>• <i>The concept of neurons in</i></li> </ul>	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; [Estimasi Waktu] / <i>Form of Learning; Learning Method; Student Assignment;</i> [Estimated Time]		Materi Pembelajaran [Pustaka] / <i>Learning Material</i> [Reference]	Bobot Penilaian /Assessment Load (%)
		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)			<p><i>anatomy and physiology</i></p> <ul style="list-style-type: none"> <li><i>History of neuron modeling</i></li> <li><i>McCulloch Pitts</i></li> </ul> <p><i>[Course materials link at MyITSClassroom]</i></p>	
3-5	<p>Mahasiswa mampu menjelaskan dan menganalisis model neural network dengan metode supervised learning</p> <p><i>Students are able to explain and analyze neural network models with supervised learning method</i></p>	<ul style="list-style-type: none"> <li>Kedalaman tingkat pemahaman</li> <li>Ketepatan menjelaskan pemahaman materi</li> <li>Ketepatan waktu pengumpulan tugas</li> <li>Kebenaran melaksanakan tugas</li> <li>Keberhasilan menjelaskan tugas</li> <li>Kebenaran jawaban dan analisis</li> </ul>	<ul style="list-style-type: none"> <li>Tugas 2: Menurunkan persamaan delta error, update weight, dan threshold setiap layer pada suatu sistem (Tugas Tertulis 1)</li> <li>Quiz 1</li> <li>Tugas 3: Program komputer dan analisis pengenalan huruf menggunakan metode neural</li> </ul>	<ul style="list-style-type: none"> <li>Kuliah dan diskusi [TM : 3 x 3 x 50'] [BM : 3 x 3 x 60'] [PT : 3 x 3 x 60']</li> <li><i>Lecture and discussion</i> [FF : 3 x 3 x 50'] [SA : 3 x 3 x 60'] [SS : 3 x 3 x 60']</li> </ul>	<ul style="list-style-type: none"> <li>Belajar Mandiri – Daring atau Luring melalui Share ITS</li> <li>Penugasan Terstruktur</li> <li><i>Independent Learning - Online or Offline via Share ITS</i></li> <li><i>Structured Assignments</i></li> </ul>	<p>Klasifikasi neural network berdasarkan metode supervised learning:</p> <ul style="list-style-type: none"> <li>Perceptron</li> <li>Adaline (algoritma LMS)</li> <li>Backpropagation</li> </ul> <p><i>[Link materi di MyITSClassroom]</i></p> <p><i>Neural network classification based</i></p>	20

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; Student Assignment;</i> [ <i>Estimated Time</i> ]		Materi Pembelajaran [ <i>Pustaka</i> ] / <i>Learning Material</i> [ <i>Reference</i> ]	Bobot Penilaian /Assessment Load (%)
		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)	(1)	(2)
		<ul style="list-style-type: none"> <li>• <i>The depth of understanding</i></li> <li>• <i>Accuracy in explaining understanding of the material</i></li> <li>• <i>Punctuality of assignment submission</i></li> <li>• <i>Correctness of assignment work method</i></li> <li>• <i>Success of explaining assignment</i></li> <li>• <i>Correctness of answers and analysis</i></li> </ul>	<p>network supervised learning (Demo dan Laporan 2)</p> <ul style="list-style-type: none"> <li>• <i>Assignment 2: Deriving the delta error equation, weight update, and threshold for each layer in a system (Written Task 1)</i></li> <li>• <i>Quiz 1</i></li> <li>• <i>Assignment 3: Computer program and letter recognition analysis using the neural network supervised learning method (Demo and Report 2)</i></li> </ul>			<p><i>on the supervised learning method:</i></p> <ul style="list-style-type: none"> <li>• <i>Perceptron</i></li> <li>• <i>Adaline (LMS algorithm)</i></li> <li>• <i>Backpropagation</i></li> </ul> <p><i>[Course materials link at MyITSClassroom]</i></p>	
6-7	Mahasiswa mampu menjelaskan dan menganalisis model neural network dengan metode unsupervised learning	<ul style="list-style-type: none"> <li>• Ketepatan menjelaskan pemahaman materi</li> <li>• Ketepatan waktu pengumpulan tugas</li> </ul>	<ul style="list-style-type: none"> <li>• Tugas 4: Perancangan program komputer dan analisis self-organizing map</li> </ul>	<ul style="list-style-type: none"> <li>• Kuliah dan diskusi [TM : 2 x 3 x 50'] [BM : 2 x 3 x 60'] [PT : 2 x 3 x 60']</li> </ul>	<ul style="list-style-type: none"> <li>• Belajar Mandiri – Daring atau Luring melalui Share ITS</li> </ul>	Klasifikasi neural network berdasarkan metode unsupervised learning:	<b>10</b>

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; [Estimasi Waktu] / <i>Form of Learning; Learning Method; Student Assignment;</i> [Estimated Time]		Materi Pembelajaran [Pustaka] / <i>Learning Material</i> [Reference]	Bobot Penilaian /Assessment Load (%)
		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)	(1)	(2)
	<i>Students are able to explain and analyze the neural network model with unsupervised learning method</i>	<ul style="list-style-type: none"> <li>• Kebenaran melaksanakan tugas</li> <li>• Keberhasilan menjelaskan tugas</li> <li>• Accuracy in explaining understanding of the material</li> <li>• Punctuality of assignment submission</li> <li>• Correctness of assignment work method</li> <li>• Success of explaining assignment</li> </ul>	(SOM) (Demo dan Laporan 3)  <ul style="list-style-type: none"> <li>• Assignment 4: Designing a computer program and analysis of the self-organizing map (SOM) (Demo and Report 3)</li> </ul>	<ul style="list-style-type: none"> <li>• Lecture and discussion [FF : 2 x 3 x 50'] [SA : 2 x 3 x 60'] [SS : 2 x 3 x 60']</li> </ul>	<ul style="list-style-type: none"> <li>• Penugasan Terstruktur</li> <li>• Independent Learning - Online or Offline via Share ITS</li> <li>• Structured Assignments</li> </ul>	<ul style="list-style-type: none"> <li>• Self-organizing map (SOM)</li> <li>• Adaptive Resonant Theory (ART)</li> </ul> <p>[Link materi di MyITSClassroom]</p> <p>Neural network classification based on the unsupervised learning method:</p> <ul style="list-style-type: none"> <li>• Self-organizing map (SOM)</li> <li>• Adaptive Resonant Theory (ART)</li> </ul> <p>[Course materials link at MyITSClassroom]</p>	
<b>8</b>	<b>EVALUASI TENGAH SEMESTER MID-SEMESTER EXAM</b>						<b>15</b>
<b>9-11</b>	Mahasiswa mampu menjelaskan dan menganalisa	<ul style="list-style-type: none"> <li>• Ketepatan waktu pengumpulan tugas</li> </ul>	<ul style="list-style-type: none"> <li>• Tugas 5: Menyebutkan</li> </ul>	<ul style="list-style-type: none"> <li>• Kuliah dan diskusi [TM : 3 x 3 x 50']</li> </ul>	<ul style="list-style-type: none"> <li>• Belajar Mandiri – Daring atau</li> </ul>	Sistem Fuzzy: <ul style="list-style-type: none"> <li>• Fuzzy sets</li> </ul>	<b>10</b>



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; Student Assignment;</i> [ <i>Estimated Time</i> ]		Materi Pembelajaran [ <i>Pustaka</i> ] / <i>Learning Material</i> [ <i>Reference</i> ]	Bobot Penilaian / Assessment Load (%)
		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)	(1)	(2)
	<p>sistem logika fuzzy, fuzzy inference sistem, fuzzy clustering dan control</p> <p><i>Students are able to explain and analyze fuzzy logic systems, fuzzy inference systems, fuzzy clustering and control</i></p>	<ul style="list-style-type: none"> <li>• Kebenaran melaksanakan tugas</li> <li>• Keberhasilan menjelaskan tugas</li> <li>• Kebenaran jawaban dan penjabarannya</li> <li>• <i>Punctuality of assignment submission</i></li> <li>• <i>Correctness of assignment work method</i></li> <li>• <i>Success of explaining assignment</i></li> <li>• <i>Correctness of answers and its explanation</i></li> </ul>	<p>macam-macam bentuk dari membership function beserta dengan fungsi matematisnya (Tugas Tertulis 2)</p> <ul style="list-style-type: none"> <li>• Tugas 6: Tugas Pemograman mengenai aplikasi sistem Fuzzy (Demo dan Laporan 4)</li> <li>• <i>Assignment 5: Stating the various forms of membership functions along with their mathematical functions (Written Assignment 2)</i></li> <li>• <i>Assignment 6: Programming assignment about the application of</i></li> </ul>	<p>[BM : 3 x 3 x 60'] [PT : 3 x 3 x 60']</p> <ul style="list-style-type: none"> <li>• <i>Lecture and discussion</i> [FF : 3 x 3 x 50'] [SA : 3 x 3 x 60'] [SS : 3 x 3 x 60']</li> </ul>	<p>Luring melalui Share ITS</p> <ul style="list-style-type: none"> <li>• Penugasan Terstruktur</li> <li>• <i>Independent Learning - Online or Offline via Share ITS</i></li> <li>• <i>Structured Assignments</i></li> </ul>	<ul style="list-style-type: none"> <li>• Fuzzy membership functions</li> <li>• Fuzzy inference system</li> <li>• Fuzzy Decision Support System</li> <li>• Fuzzy Clustering</li> <li>• Fuzzy Control</li> </ul> <p>[<a href="#">Link materi di MyITSClassroom</a>]</p> <p><i>Fuzzy System:</i></p> <ul style="list-style-type: none"> <li>• <i>Fuzzy sets</i></li> <li>• <i>Fuzzy membership functions</i></li> <li>• <i>Fuzzy inference system</i></li> <li>• <i>Fuzzy Decision Support System</i></li> <li>• <i>Fuzzy Clustering</i></li> <li>• <i>Fuzzy Control</i></li> </ul>	

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; Student Assignment;</i> [ <i>Estimated Time</i> ]		Materi Pembelajaran [ <i>Pustaka</i> ] / <i>Learning Material</i> [ <i>Reference</i> ]	Bobot Penilaian / Assessment Load (%)
		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)	Tatap Muka / <i>In-class</i> (5)	Daring / <i>Online</i> (6)	(1)	(2)
			<i>Fuzzy system (Demo and Report 4)</i>			[ <i>Course materials link at MyITSClassroom</i> ]	
12-13	Mahasiswa mampu merancang evolutionary algorithm, genetic programming  <i>Students are able to design evolutionary algorithm, genetic programming</i>	<ul style="list-style-type: none"> <li>• Kelengkapan dan kerapian hasil laporan</li> <li>• Ketepatan waktu pengumpulan tugas</li> <li>• Kebenaran menjelaskan program</li> <li>• Kebenaran jawaban dan analisis</li> <li>• <i>Completeness and neatness of report</i></li> <li>• <i>Punctuality of assignment submission</i></li> <li>• <i>Correctness of explaining assignment</i></li> <li>• <i>Correctness of answers and analysis</i></li> </ul>	<ul style="list-style-type: none"> <li>• Tugas 7: Perancangan software pemrograman genetik (Demo dan Laporan 5)</li> <li>• Quiz 2</li> <li>• <i>Assignment 7: Designing genetic programming software (Demo and Report 5)</i></li> <li>• Quiz 2</li> </ul>	<ul style="list-style-type: none"> <li>• Kuliah dan diskusi [<i>TM : 2 x 3 x 50'</i>] [<i>BM : 2 x 3 x 60'</i>] [<i>PT : 2 x 3 x 60'</i>]</li> <li>• <i>Lecture and discussion</i> [<i>FF : 2 x 3 x 50'</i>] [<i>SA : 2 x 3 x 60'</i>] [<i>SS : 2 x 3 x 60'</i>]</li> </ul>	<ul style="list-style-type: none"> <li>• Belajar Mandiri – Daring atau Luring melalui Share ITS</li> <li>• Penugasan Terstruktur</li> <li>• <i>Independent Learning - Online or Offline via Share ITS</i></li> <li>• <i>Structured Assignments</i></li> </ul>	Evolutionary algorithm: <ul style="list-style-type: none"> <li>• Natural evolution, meliputi paradigma Neo-Darwinian, genotip dan fenotip</li> </ul> <a href="#">[Link materi di MyITSClassroom]</a>  Evolutionary algorithm: <ul style="list-style-type: none"> <li>• <i>Natural evolution, including the Neo-Darwinian paradigm, genotype and phenotype</i></li> </ul>	10

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; [Estimasi Waktu] / <i>Form of Learning; Learning Method; Student Assignment;</i> [Estimated Time]		Materi Pembelajaran [Pustaka] / <i>Learning Material</i> [Reference]	Bobot Penilaian /Assessment Load (%)
		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)				
						<i>[Course materials link at MyITSClassroom]</i>	
<b>14-15</b>	<p>Mahasiswa mampu merancang dan mengimplementasikan aplikasi sistem elektronika cerdas</p> <p><i>Students are able to design and implement intelligent electronic system applications</i></p>	<ul style="list-style-type: none"> <li>• Ketepatan waktu pengumpulan tugas</li> <li>• Kebenaran melaksanakan tugas</li> <li>• Keberhasilan menjelaskan tugas</li> <li>• Kebenaran jawaban dan analisis</li> <li>• <i>Punctuality of assignment submission</i></li> <li>• <i>Correctness of assignment work method</i></li> <li>• <i>Correctness of explaining assignment</i></li> <li>• <i>Correctness of answers and analysis</i></li> </ul>	<p>Tugas 8: Perancangan program pendulum dengan kontrol PID menggunakan metode Fuzzy dan Neural Network (Demo dan Laporan 6)</p> <p><i>Assignment 8: Designing a pendulum program with PID control using Fuzzy and Neural Network methods (Demo and Report 6)</i></p>	<ul style="list-style-type: none"> <li>• Kuliah dan diskusi [TM : 2 x 3 x 50'] [BM : 2 x 3 x 60'] [PT : 2 x 3 x 60']</li> <li>• <i>Lecture and discussion</i> [FF : 2 x 3 x 50'] [SA : 2 x 3 x 60'] [SS : 2 x 3 x 60']</li> </ul>	<ul style="list-style-type: none"> <li>• Belajar Mandiri – Daring atau Luring melalui Share ITS</li> <li>• Penugasan Terstruktur</li> <li>• <i>Independent Learning - Online or Offline via Share ITS</i></li> <li>• <i>Structured Assignments</i></li> </ul>	<p>Menerapkan metode pada sistem elektronika cerdas yang meliputi neural network, fuzzy, dan algoritma genetic dalam implementasi ilmu bidang teknik dan tau teknik biomedik</p> <p><a href="#">[Link materi di MyITSClassroom]</a></p> <p><i>Applying methods to intelligent electronic systems that include neural networks, fuzzy, and genetic algorithms in the implementation of</i></p>	<b>15</b>


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;</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 (5)</i>	Daring / <i>Online (6)</i>	(1)	(2)
(1)	(2)	(3)	(4)			engineering and / or biomedical engineering  [ <i>Course materials link at MyITSClassroom</i> ]	
16	<b>EVALUASI AKHIR SEMESTER FINAL-SEMESTER EXAM</b>						15

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

**FF** = Face to Face, **SA** = Structured Assignment, **SS** = Self Study.



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

	<p><b>ASSESSMENT &amp; EVALUATION PLAN</b>  <b>BACHELOR DEGREE PROGRAM OF BIOMEDICAL ENGINEERING - FTEIC ITS</b>  <b>Course : Fundamentals of Intelligent Systems</b></p>		<p><b>RA&amp;E</b></p>
			<p>Write Doc Code</p>
<p>Kode/code: <b>EB234603</b></p>	<p>Bobot sks/credits (T/P): <b>3/0</b></p>	<p>Rumpun MK: <b>Biocybernetics</b>          Course Cluster: <b>Biocybernetics</b></p>	<p>Smt: <b>V</b></p>
<p>OTORISASI AUTHORIZATION</p>	<p>Penyusun RA &amp; E <i>Compiler A&amp;EP</i></p> <p><b>Fauzan Arrofiqi, S.T., M.T., Ph.D.</b></p>	<p>Koordinator RMK <i>Course Cluster Coordinator</i></p> <p><b>Ir. Josaphat Pramudijanto, M.Eng.</b></p>	<p>Ka DEPARTEMEN <i>Head of Department</i></p> <p><b>Dr. Achmad Arifin, S.T., M.Eng.</b></p>

Mg ke/ Week (1)	Sub CP-MK / Lesson Learning Outcomes (LLO) (2)	Bentuk Asesmen (Penilaian) Form of Assessment (3)	Bobot / Load (%) (4)
1-2	<p><b>Sub CP-MK 1:</b> Mahasiswa mampu memahami dasar-dasar neuroscience dan pemodelan neuron</p> <p><b>LLO 1:</b> <i>Students are able to understand the basics of neuroscience and neuron modeling</i></p>	<p><b>Non-Tes:</b>  <b>Demo dan laporan 1:</b> Perancangan program simulasi gerbang XOR dan XNOR dengan beberapa input dengan metode NN McCulloh Pitts  <b>Tes:</b> 1 Soal pada Quiz 1 1 Soal pada ETS</p> <p><b>Non-Test:</b>  <b>Demo and report 1:</b> <i>Designing a simulation program for XOR and XNOR gates with multiple inputs using the NN McCulloh Pitts method</i>  <b>Test:</b> 1 Question in Quiz 1 1 Question in Mid-Exam</p>	5
3-5	<p><b>Sub CP-MK 2:</b> Mahasiswa mampu menjelaskan dan menganalisis model neural network dengan metode supervised learning</p> <p><b>LLO 2:</b> <i>Students are able to explain and analyze neural network models with</i></p>	<p><b>Non-Tes :</b>  <b>Tugas tertulis 1:</b> Menurunkan persamaan delta error, update weight, dan threshold setiap layer pada suatu sistem  <b>Demo dan laporan 2:</b> Program komputer dan analisis pengenalan huruf menggunakan metode neural network supervised learning  <b>Tes :</b> 2 Soal pada Quiz 1 1 Soal pada ETS</p>	20

Mg ke/ Week (1)	Sub CP-MK / Lesson Learning Outcomes (LLO) (2)	Bentuk Asesmen (Penilaian) Form of Assessment (3)	Bobot / Load (%) (4)
	supervised learning method	<p><b>Non Test:</b>  <b>Written Assignment 1:</b>  Deriving the delta error equation, weight update, and threshold for each layer in a system  <b>Demo and report 2:</b>  Computer program and letter recognition analysis using the neural network supervised learning method.  <b>Test:</b>  2 Questions in Quiz 1  1 Question in Mid-Exam</p>	
6-7	<p><b>Sub CP-MK 3:</b>  Mahasiswa mampu menjelaskan dan menganalisis model neural network dengan metode unsupervised learning</p> <p><b>LLO 3:</b>  Students are able to explain and analyze the neural network model with unsupervised learning method</p>	<p><b>Non-Tes:</b>  <b>Demo dan laporan 3:</b>  Perancangan program komputer dan analisis self-organizing map (SOM)  <b>Tes :</b>  1 Soal pada ETS</p> <p><b>Non-Test:</b>  <b>Demo and report 3:</b>  Designing a computer program and analysis of the self-organizing map (SOM)  <b>Test:</b>  1 Question in Mid Exam</p>	10
8	<p><b>Evaluasi Tengah Semester</b></p> <p><b>Midterm Exam</b></p>	<p><b>Tes:</b>  Ujian Tulis/Ujian Daring</p> <p><b>Test:</b>  Written Exams / Online Exams</p>	15
9-11	<p><b>Sub CP-MK 4:</b>  Mahasiswa mampu menjelaskan dan menganalisa sistem logika fuzzy, fuzzy inference sistem, fuzzy clustering dan control</p> <p><b>LLO 4:</b>  Students are able to explain and analyze fuzzy logic systems, fuzzy inference systems, fuzzy clustering and control</p>	<p><b>Non-Tes:</b>  <b>Tugas tertulis 2:</b>  Menyebutkan macam-macam bentuk dari membership function beserta dengan fungsi matematisnya  <b>Demo dan laporan 4:</b>  Perancangan software pemrograman sistem Fuzzy  <b>Tes :</b>  1 Soal pada EAS  1 Soal pada Quiz 2</p> <p><b>Non-Test:</b>  <b>Written Assignment 2:</b>  Stating the various forms of membership functions along with their mathematical functions  <b>Demo and report 4:</b></p>	10

Mg ke/ Week (1)	Sub CP-MK / Lesson Learning Outcomes (LLO) (2)	Bentuk Asesmen (Penilaian) Form of Assessment (3)	Bobot / Load (%) (4)
		<i>Designing Fuzzy system programming software</i> <b>Test:</b> 1 Question in Final Exam 1 Question in Quiz 2	
12-13	<b>Sub CP-MK 5:</b> Mahasiswa mampu merancang evolutionary algorithm, genetic programming  <b>LLO 5:</b> <i>Students are able to design evolutionary algorithm, genetic programming</i>	<b>Non-Tes:</b> <b>Demo dan laporan 5:</b> Perancangan software pemrograman genetik <b>Tes:</b> 1 Soal pada Quiz 2 1 Soal pada EAS  <b>Non-Test:</b> <b>Demo and report 5:</b> <i>Designing genetic programming software</i> <b>Test:</b> 1 Question in Quiz 2 1 Question in Final Exam	10
14-15	<b>Sub CP-MK 6:</b> Mahasiswa mampu merancang dan mengimplementasikan aplikasi sistem elektronika cerdas  <b>LLO 6:</b> <i>Students are able to design and implement intelligent electronic system applications</i>	<b>Non-Tes:</b> <b>Demo dan laporan 6:</b> Perancangan program pendulum dengan kontrol PID menggunakan metode Fuzzy dan Neural Network <b>Tes:</b> 1 Soal pada EAS  <b>Non-Test:</b> <b>Demo and report 6:</b> <i>Designing a pendulum program with PID control using Fuzzy and Neural Network methods</i> <b>Test:</b> 1 Question in Final Exam	15
16	<b>Evaluasi Akhir</b>  <b>Final Exam</b>	<b>Tes:</b> Ujian Tulis/Ujian Daring  <b>Test:</b> <i>Written Exams / Online Exams</i>	15
<b>Total bobot penilaian Total assessment load</b>			<b>100%</b>

- **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 / <i>PLO-02</i>	CPMK 1 / <i>CLO 1</i>	<i>Week 1-2</i>	<i>Demo and report 1</i>	3
			<i>1 Question in Quiz 1</i>	2
			<i>1 Question in Mid-Exam</i>	5
CPL-03 / <i>PLO-03</i>	CPMK 2 / <i>CLO 2</i>	<i>Week 3-5</i>	<i>Written assignment 1</i>	5
			<i>Demo and report 2</i>	10
			<i>2 Questions in Quiz 1</i>	5
			<i>1 Question in Mid Exam</i>	5
			<i>Demo and report 3</i>	10
CPL-04 / <i>PLO-04</i>	CPMK 3 / <i>CLO 3</i>	<i>Week 6-7</i>	<i>1 Question in Mid Exam</i>	5
			<i>Demo and report 4</i>	7
			<i>1 Question in Quiz 2</i>	1
			<i>1 Question in Final Exam</i>	5
			<i>Demo and report 5</i>	7
CPL-05 / <i>PLO-05</i>	CPMK 5 / <i>CLO 5</i>	<i>Week 12-13</i>	<i>1 Question in Quiz 2</i>	3
			<i>1 Question in Final Exam</i>	5
			<i>Demo and report 6</i>	15
CPL-06 / <i>PLO-06</i>	CPMK 6 / <i>CLO 6</i>	<i>Week 14-15</i>	<i>1 Question in Final Exam</i>	5
				<b><math>\Sigma = 100\%</math></b>

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>Demo + report 1</i>		0.03											<b>0.03</b>
2	<i>Demo + report 2</i>			0.1										<b>0.1</b>
3	<i>Demo + report 3</i>			0.1										<b>0.1</b>
4	<i>Demo + report 4</i>			0.07										<b>0.07</b>



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
5	Demo + report 5					0.07								0.07
6	Demo + report 6						0.15							0.15
7	Written Assignment 1			0.05										0.05
8	Written Assignment 2			0.02										0.02
9	Quiz 1		0.02	0.05										0.07
10	Quiz 2			0.01		0.03								0.04
11	Mid Exam		0.05	0.1										0.15
12	Final Exam			0.05		0.05	0.05							0.15
	Total		0.1	0.55		0.15	0.2							1



**BIOMEDICAL ENGINEERING ITS**

**2022-2023**