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Undergraduate Programme in Physics

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MODULE HANDBOOK

Module Name	Neural Network Modelling
Module level, if applicable	Bachelor
Code, if applicable	FIS425042
Subtitle, if applicable	-
Courses, if applicable	Neural Network Modelling
Semester(s) in which the module is taught	6th (sixth)
Person responsible for the module	Anis Yuniati, M.Si., Ph.D.
Lecturer(s)	Anis Yuniati, M.Si., Ph.D.
Language	Indonesia
Relation to curriculum	elective course in the fourth year (7th semester) Bachelor Degree
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week.
Workload	Total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total is 16 weeks per semester, including mid exam and final exam
Credit points	3
Requirements according to the examination	Minimum attendance 75% All assignments submitted Attendance on time
Recommended prerequisites	-
Module objectives/intended learning outcomes	After completing this course, the students: CO 1. Mastering network theory and writing programmes for simulation CO 2. Understand the patterns of firing and the process of occurrence and the nature of synaptic plasticity CO 3. Understand the concept of neuron models and be able to simulate their potential membrane
Content	1. Single Neuron Model 2. Network Theory: Graph theory, Random networks, Ordered networks, Wattz and Strogatz model, Small World, Brain as a complex network 3. Neuron Spike Population 4. Synaptic Plasticity Model 5. Firing Patterns in Mammalian Cortex 6. Electrophysiology and Firing Patterns in Thalamus 7. Cases with different patterns: Hippocampal, Mitral Cells, Basal Ganglia, Neostriatum 8. Neuronal models : Integrate&Fire, Resonate&Fire, Hodgkin-Huxley, Fitzhugh-Nagumo, Morris-Lecar, Izhikevich, Hindmarsh-Rose, Wilson, BVP, SRM, etc.

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<table>
<tr><td>Study and examination requirements and forms of examination</td><td>The final mark will be weighted as follows:
<table>
<tr><th>NO</th><th>Assessment methods (components, activities)</th><th>Weight (percentage)</th></tr>
<tr><td>1</td><td>Final Examination</td><td>40%</td></tr>
<tr><td>2</td><td>Mid-Term Examination</td><td>30%</td></tr>
<tr><td>3</td><td>Class Activities : Quiz, Homework, etc.</td><td>30%</td></tr>
</table>
The final assessment is expressed in the form of a letter value converted from a number value with the following categories:
<table>
<tr><th>NO</th><th>Number Value</th><th>Letter Value</th><th>NO</th><th>Number Value</th><th>Letter Value</th></tr>
<tr><td>1</td><td>≥ 95</td><td>A</td><td>7</td><td>65-69.99</td><td>B/C</td></tr>
<tr><td>2</td><td>90-94.99</td><td>A-</td><td>8</td><td>60-64.99</td><td>C+</td></tr>
<tr><td>3</td><td>85-89.99</td><td>A/B</td><td>9</td><td>55-59.99</td><td>C</td></tr>
<tr><td>4</td><td>80-84.99</td><td>B+</td><td>10</td><td>50-54.99</td><td>C-</td></tr>
<tr><td>5</td><td>75-79.99</td><td>B</td><td>11</td><td>55-34.99</td><td>D</td></tr>
<tr><td>6</td><td>70-74.99</td><td>B-</td><td>12</td><td><35</td><td>E</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Whiteboard, markers, LCD projector, laser pointer, power point presentation, laptop/PC</td></tr>
<tr><td>Reading list</td><td>1. Dynamical System in Neuroscience, T.S.Gilani and T.Hovel, Berlin University
2. Matlab for Neuroscientists, Pascal Wallisch et.al, 2nd edition, Academic Press
3. Spiking Neuron Model, W.Gerstner and W.Kistler</td></tr>
</table>

PLO and CO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9
CO 1			√						
CO 2				√					
CO 3							√		