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Undergraduate Programme in Physics

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MODULE HANDBOOK

Module Name	Computational Biophysics
Module level, if applicable	Bachelor
Code, if applicable	FIS425063
Subtitle, if applicable	-
Courses, if applicable	Computational Biophysics
Semester(s) in which the module is taught	5th (fifth)
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 third year (5th 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. Able to understand the computational principles of Biophysics and apply its theories to the simulation process CO 2. Mastering the theoretical, mathematical, and mechanism concepts of a process in neural networks CO 3. Understand the concepts and phenomena of bifurcation, bursting, and synchronisation and their simulation processes
Content	1. Definition and introduction to computational biophysics 2. Models, Phenomena, Levels of Analysis Theory and Computation (Neuroscience) 3. Numerical methods of solving differential equations 4. Neuron Electrophysiology and Conductance-based Models 5. Mechanism and Plasticity of Synapses 6. Membrane Equations: Passive membrane structure, RC circuits 7. Linear wiring theory: Steady state solution, Time dependent solution, Time delay, Velocity of propagation 8. Passive dendrite tree mechanism: Methods of solving linear equations, Measurement of synapse efficiency, Signal delay 9. Synapse inputs: Neurotransmitter, Receptor, Electrical gap junction

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<table>
<tr><td></td><td>10. Hodgkin-Huxley model
11. System dynamics : Bifurcation, Bursting, Synchronisation</td></tr>
<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. Biophysics of Computation, C.Koch, Oxford University Press
2. Dynamical System In Neuroscience, E.M.Izhikevich
3. Fundamentals of Computational Neuroscience, T.Trappenberg, 2nd edition, Oxford University Press</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							√		