



Bachelor Program in Geophysics

Faculty of Mathematics and Natural Sciences
HASANUDDIN UNIVERSITY

16. Dynamics Systems

Module Name	:	Dynamics Systems
Module Level	:	Bachelor
Code, if applicable	:	23H06130702
Subtitle, if applicable	:	-
Courses, if applicable	:	Geophysics
Semester(s) in which the module is taught	:	V (Fifth Semester)
Module coordinator(s)	:	Dr. Samsu Arif, M.Si.
Lecturer(s)	:	• Dr. Samsu Arif, M.Si. • Dr. Muhammad Alimuddin, Eng.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective courses in the third year for Bachelor Degree in Geophysics
Type of teaching, contact hours	:	This course is delivered through Lectures (i.e., Project/Case-based learning), complemented by structured assignments (paper review, project/case evaluation) and independent study. Contact hours consist of 100 minutes lectures per week, plus 120 minutes per week for each of the following: structured assignments and independent study.
Workload	:	Total workload is 90 hours per semester, consisting of 28 hours for lectures, and 31 hours each for structured assignments and independent study.
Credit points	:	2 SKS (3.2 ECTS)
Requirements according to the examination regulations	:	Students are eligible to attend the examination if their absences are less than 20% of the lectures.
Recommended prerequisites	:	-
Module objectives/intended learning outcomes	:	After completion of this module, students will be able to: CLO 1. Able to analyze stability of linear and nonlinear dynamic systems; CLO 2. Able to simplify systems through normalization and center manifold construction; CLO3. Able to understand and prove theorems to determine bifurcation and its types



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		CLO 4. Able to analyze stability in systems with delay CLO 5. Able to identify real-world problems into dynamic system models The following is the mapping of the ILO and the CLO of this course: <table><tr><td></td><td>ILO 5</td><td>ILO 8</td><td>ILO 13</td></tr><tr><td>CLO 1</td><td>✓</td><td></td><td></td></tr><tr><td>CLO 2</td><td>✓</td><td></td><td></td></tr><tr><td>CLO 3</td><td></td><td>✓</td><td></td></tr><tr><td>CLO 4</td><td></td><td></td><td>✓</td></tr><tr><td>CLO 5</td><td></td><td></td><td>✓</td></tr></table>		ILO 5	ILO 8	ILO 13	CLO 1	✓			CLO 2	✓			CLO 3		✓		CLO 4			✓	CLO 5			✓
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CLO 5			✓																							
Content	:	1. Mathematical modeling of real-world dynamic systems 2. Parameter identification in dynamic systems 3. Stability analysis in dynamic systems 4. Bifurcation theory in dynamic systems 5. System normalization and center manifold 6. Stability analysis of systems with delay																								
Study and examination requirements		Participants are marked based on their performance in theory: Project/Case Study: 100%. Students are marked based on their percentage of points obtained and based on the following grade scale: <table><tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr><tr><td>85 – 100</td><td>A</td><td>4.00</td></tr><tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr><tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr><tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr><tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr><tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr></table>	Percentage of Achievement	Grade	Conversion Value	85 – 100	A	4.00	80 - <85	A-	3.75	75 - < 80	B+	3.5	70 - < 75	B	3.0	65 - < 70	B-	2.75	60 - < 65	C+	2.5			
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		<table> <tr> <td>50 - < 60</td><td>C</td><td>2.00</td></tr> <tr> <td>40 - < 50</td><td>D</td><td>1.00</td></tr> <tr> <td>< 40</td><td>E</td><td>0.00</td></tr> </table>	50 - < 60	C	2.00	40 - < 50	D	1.00	< 40	E	0.00
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< 40	E	0.00									
Exams and assessment formats		Assessment in this course is conducted entirely through project/case studies. The project or case study is conducted in a group and requires students to apply theoretical concepts to analyze and solve a problem. This work is developed over several weeks under instructor guidance, culminating in a written report and an oral presentation of results.									
Reading list	1.	Main References: 1. Wiggins, S. 2009, "Introduction to Applied Non Linear Dynamical System and Chaos- second edition", Springer-Verlag. Additional References: 1. Xiaoxin Liao, Wang, L. And Pei Yu, 2007, "Stability of System Dynamic", Elsevier.									
Last revision date		July 1 st , 2025									