SEMESTER LEARNING ACTIVITY PLANS (SLAP)
SEMESTER EVEN 2022/2023

Time Series Analysis

MFF5052 / 3 Credits

Lecturer Coordinator:

Dr. Sudarmaji, M.Si.

UNIVERSITAS GADJAH MADA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
2022

	Universitas Gadjah Mada Faculty of Mathematics and Natural Science Physics Department / Study Program Master Physics Semester Even 2022/2023

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (credits)	Semester	Status	Prerequisite
MFF5052	*Time Series Analysis*	*3*	*Even*	*Elective*	*None*

Short Description

Time Series Analysis course is Elective course 3 credits (Theory) in the 2022 Curriculum Master Physics Study Program, Faculty of Mathematics and Natural Science UGM.

The syllabus of this course is as follows:
The relationship between inputs and outputs in the frequency and time domain, convolution, correlation, Fourier series, digital Fourier transformation (DFT), rapid Fourier transformation (FFT), and digital filter theory. Z-transformation: system switching function, reverse Z-transformation, and system flow chart.

The courses are held in class for 14 weeks, each week's session last for 3 x 50 minutes. Four weeks of course period is used for Midterm Exam and Final Exam, each held for two weeks as scheduled.

Student evaluation for course assessments is performed summative and formative. The summative evaluation is implemented as written exams, both Midterm and Final Exam, which take a maximum of 120 minutes. The formative evaluation is implemented as individual assignments for each student in the form of completing an assignment individually. Monitoring is carried out by observing student activities during the course, such as attendance, Q&A and discussion about the material presented, and student performance in completing individual assignments.

Program Learning Outcomes (PLO) Imposed on the Course

PLO 3	Mastering further knowledge of classical and modern physics theory, and its relationship with other disciplines, and has mastered an advanced field of physics specialization that allows him to keep up with the latest international research developments.
PLO 4	Mastering various mathematical disciplines related to an advanced field of physics, and able to develop physical models using various mathematical and computational tools with an inter or multidisciplinary approach to solving problems related to an advanced field of physics.
PLO 6	Able to apply knowledge to analyze, synthesize, formulate problems and solve problems comprehensively in one of advanced field of physics, through experimental or theoretical research, then be able to classify and draw conclusions about their findings for the development of science and technology.

Course Outcomes (CO)

Upon completion of this course, students should be able to:	
CO1	Understand and model discrete signals and systems in the time domain.
CO2	Understand and model discrete signals and systems in the frequency domain.
CO3	Designing FIR and IIR filters.

	CO4			
	CO5			
	CO6			
	CO7			
	CO8			
The Correlation of CO to Learning Materials and Methods, and Time Allocation		**Learning Materials**	**Learning Methods**	**Time Allocation**
	CO1	Definition and signal characteristic and discrete signal	Lecture, discussion	3 x 50 minutes
	CO1	Sampling theory and analog to digital (A/DC) conversion.	Lecture, discussion	3 x 50 minutes
	CO1	Physical modeling of discrete linear time invariant systems.	Lecture, discussion	3 x 50 minutes
	CO2	Differential equations and transfer functions.	Lecture, discussion	3 x 50 minutes
	CO2	Z Transformation	Lecture, discussion	3 x 50 minutes
	CO2	Z transform back	Lecture, discussion	3 x 50 minutes
	CO2	Application of the Z transformation in the analysis of discrete physical systems.	Lecture, discussion	3 x 50 minutes
	CO3	Discrete Fourier Transform (DFT) and discrete inverse Fourier transform (Invert).	Lecture, discussion	3 x 50 minutes
	CO3	Fast Fourier Transform (FFT) and Fast Fourier Transform (IFFT).	Lecture, discussion	3 x 50 minutes
	CO3	Discrete filter and windowing system.	Lecture, discussion	3 x 50 minutes
	CO4	Design and use of FIR filters for low pass, band pass, high pass and multi band.	Lecture, discussion	3 x 50 minutes
	CO4	Discrete Butterword method IIR filter design (low pass, high pass and bandpass).	Lecture, discussion	3 x 50 minutes
	CO4	Bilinear transformation and impulse invariant.	Lecture, discussion	3 x 50 minutes
	CO4	IIR filter design with discrete chebyshev method (low pass, high pass and bandpass).	Lecture, discussion	3 x 50 minutes
	Final Exam/ Project Task Results/ Case Analysis Results			
Learning Methods	Lecture, discussion			
Student Learning Experience	Learn to analyze and review: Definition and signal characteristic and discrete signal, Sampling theory and analog to digital (A/DC) conversion., Physical modeling of discrete linear time invariant systems., Differential equations and transfer functions., Z Transformation, Z transform back, Application of the Z transformation in the analysis of discrete physical systems., Discrete Fourier Transform (DFT) and discrete inverse Fourier transform (Invert)., Fast Fourier Transform (FFT) and Fast Fourier Transform			

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<tr><td></td><td>(IFFT)., Discrete filter and windowing system., Design and use of FIR filters for low pass, band pass, high pass and multi band., Discrete Butterword method IIR filter design (low pass, high pass and bandpass)., Bilinear transformation and impulse invariant., IIR filter design with discrete chebyshev method (low pass, high pass and bandpass)..</td></tr>
<tr><td>Access to Learning Media/ LMS and Offline and Online Percentage</td><td>Powerpoint</td></tr>
<tr><td>Assessment Methods and Synchronization with CO</td><td>
<table>
<tr><th>Assessment Methods</th><th>Assessment Percentage</th><th>Criteria/Indicators</th><th>CO1</th><th>CO2</th><th>CO3</th><th>CO4</th></tr>
<tr><td>Participatory Activity*</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Project Results/ Case Study Results/ PBL Results*</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="7">Cognitive</td></tr>
<tr><td>Assignment</td><td>30%</td><td></td><td>7,5%</td><td>7,5%</td><td>7,5%</td><td>7,5%</td></tr>
<tr><td>Quiz</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Midterm Exam</td><td>35%</td><td></td><td>17,5%</td><td>17,5%</td><td></td><td></td></tr>
<tr><td>Final Exam</td><td>35%</td><td></td><td></td><td></td><td>17,5%</td><td>17,5%</td></tr>
<tr><td colspan="7">*) can also be obtained from the Midterm or Final Exam as the result of participatory activities or project/ case study results. According to IKU 7, the percentage of project results/ case study/ PBL results is at least 50%.</td></tr>
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</td></tr>
<tr><td>References</td><td>Main references:
1. Brigham, E.O., 1974, The Fast Fourier Transform, Prentice Hall, Inc.
2. Brustle, W., 1987, Advanced Digital Signal Processing, Lab. Geophysics, FMIPA UGM.
3. Proakis, J.G., and Manolakis, D.G., 1993, Digital Signal Processing: Principles, Algorithms, and Applications, McMillan.
4. Alkin, O., 1994, Digital Signal Processing: A Laboratory Approach using PC-DSP, Prentice Hall.</td></tr>
<tr><td>Lecturers (Team Teaching)</td><td>1. Dr. Sudarmaji, M.Si.
2. Dr. Budi Eka Nurcahya, M.Si.
3.
4.</td></tr>
<tr><td>Authorization</td><td>
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<tr><th>Date of Drafting</th><th>Lecturer Coordinator</th><th>Head of Curriculum Committee</th><th>Head of Study Program</th></tr>
<tr><td></td><td>Dr. Sudarmaji, M.Si.</td><td>Dr.Ing. Ari Setiawan</td><td>Mirza Satriawan, M.Si., Ph.D</td></tr>
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