PHY5505: DATA ACQUISITION AND PROCESSING SKILLS FOR PHYSICISTS II

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Data Acquisition and Processing Skills for Physicists II

Subject Code
PHY - Physics
Course Number
5505

Academic Unit
Physics (PHY)

College/School
College of Science (SI)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This course is second part of Data Acquisition and Processing Skills for Physicists I and II. The primary aim of this course is to equip physics students with fundamental skills in data acquisition and processing, thereby enhancing their ability to confidently handle diverse data sources. These skills are essential for modern physicists who must be adept not only in theoretical calculations but also in the practical aspects of data handling. Students will learn basic data analysis methods and utilize various programming languages, with a focus on Python, to process and visualize data. Additionally, the course will cover the use of various hardware tools for data collection, including but not limited to microcontrollers like Arduino, sensors, and real-time data processing units. The students are expected to finish several mini-projects on data acquisition and processing. This course is implemented based on student projects.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Be able to acquire and understand data from different sources	50	x	x	
2	Be able to process big data sets	50	x	x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Projects	The students will complete several mini-projects related to data acquisition and processing.	1, 2	
2	Presentations/exhibition	The students will showcase projects.	1, 2	3 Hours

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Presentations/ exhibition	1, 2	100	-	Yes

Continuous Assessment (%)

100

Assessment Rubrics (AR)

Assessment Task
Presentations/exhibition (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Demonstrating the capability in data acquisition and processing.

Excellent
(A+, A, A-) High
(excellent accomplishment with creativity and correct understanding)

Good
(B+, B, B-) Significant
(good accomplishment with mostly correct understanding)

Fair
(C+, C, C-) Moderate
(fair accomplishment with some correct understanding)

Marginal
(D) Basic
(essential accomplishment with basic understanding)

Failure
(F) Not reaching marginal level

Assessment Task
Presentations/exhibition (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Demonstrating the capability in data acquisition and processing.

Excellent
(A+, A, A-) High
(excellent accomplishment with creativity and correct understanding)

Good
(B+, B) Significant
(good accomplishment with mostly correct understanding)

Marginal
(B-, C+, C) Moderate
(fair accomplishment with some correct understanding)

Failure
(F) Not reaching marginal level

Part III Other Information

Keyword Syllabus
- Introduction to data
- Data acquisition
- Data structure, database, data acquisition hardwires, e.g., Arduino.

- Data analysis methods, e.g., linear regression, bootstrap and jackknife
- Data processing, e.g., Markov chain Monte Carlo
- Data processing program languages, e.g., Python, Matlab, Jupyter, Data Visualization, e.g., Matplotlib.

Reading List

Compulsory Readings

	Title
1	None

Additional Readings

	Title
1	Z. Ivezic, A. Connolly, J. T. VanderPlas, and A. Gray, Statistics, Data Mining, and Machine Learning in Astronomy, Princeton University Press, 2014
2	D. W. Hogg, Data analysis recipes, arXiv:0807.4820, 1008.4686, 1205.4446, 1710.06068, 2005.14199