Title (Units): **COMP7065 Innovative Laboratory (3,0,3)**

Course Aims: This course covers laboratory works and mini-projects on data analytics and artificial intelligence. It provides students hands-on experience by applying programming skills and software tools to solve problems in data analytics and artificial intelligence.

Prerequisite: COMP7035 Python for Data Analytics and Artificial Intelligence
COMP7015 Artificial Intelligence
COMP7990 Principles and Practices of Data Analytics

Course Intended Learning Outcomes (CILOs):
Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
	Knowledge
1	Characterize the process and importance of each topic in data analytics and artificial intelligence.
2	Analyze a real-world data-related problem and provide solutions to handle it.
	Professional Skill
3	Apply programming skills and software tools to solve some classic problems in data analytics and artificial intelligence.

Calendar Description: This course provides opportunities for students to apply programming skills and software tools for solving data analytics and artificial intelligence (AI) problems. The students will be given a series of discovery laboratory exercises and problem-solving exercises. Each exercise is accompanied by a short briefing lecture. A discovery laboratory exercise allows students to get familiar with the basics and the syntax of a particular tool, plug-in, or library. A problem-solving exercise asks students to apply single or multiple tools/plug-ins/libraries to solve some real-world problems. Students will be learning skills for data management and preprocessing, quantitative analysis, data mining, modeling and training, and data visualization. Some mini-projects will be given to students as capstone assessments so that they will be approaching problems with skills they have learned and practiced in the course.

Teaching and Learning Activities (TLAs):

CILOs	Type of TLA
1	Short briefing lectures. These lectures cover the basic concepts of various data analytics and AI tools.
1,3	Discovery laboratory exercises. Students will familiarize themselves with the basics and syntax of various tools, plug-ins, and libraries for various topics in data analytics and AI.
2,3	Problem-solving exercises. Students will apply a mixture of multiple tools, plug-ins, and libraries to solve some real-world problems.

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
1	Laboratory Reports	40%	1-3	Reflection questions of laboratory reports are designed to assess whether a student is familiar with various tools, plug-ins, and libraries.
2	Mini-projects	60%	1-3	Students are expected to form groups to devise a solution for a real-world problem with real-world data. It assesses how well a student can analyze a real-world problem and how well can he/she apply the techniques to devise a solution.

Assessment Rubrics:

	Excellent (A)	Good (B)	Satisfactory (C)	Fail (F)
Programming skills for classic data analytics and AI problems	Fully capable of using programming skills to solve classic data analytics and AI problems	Capable of using programming skills to solve classic data analytics and AI problems	Capable of using programming skills to solve some classic data analytics and AI problems	Incapable of using programming skills to solve classic data analytics and AI problems
The ability to analyze problems and apply data analytics and/or artificial intelligence to devise suitable solutions	Excellent in analyzing problems and devising a comprehensive solution. All steps in the solution have been fine-tuned to optimize the solution.	Good at analyzing problems and devising a comprehensive solution. Some steps in the solution have been fine-tuned to optimize the solution.	Capable of analyzing problems and devising a reasonable solution. Some key steps of the solution may be missing or suboptimal.	Bad in analyzing problems and failing to devise a reasonable solution.

Course Content and CILOs Mapping:

Content		**CILO No.**
I	Background topics in data analytics and artificial intelligence for the laboratory exercises and problem-solving exercises	1-3

References:

- Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, O'Reilly, 3rd ed., October 2022.
- Rajagopalan, Gayathri. A Python Data Analyst's Toolkit. Berkeley, CA: Apress L. P, 2020.
- Porcu, Valentina. Python for Data Mining Quick Syntax Reference. Berkeley CA: Apress, 1st ed. 2018., 2018.
- Raschka Sebastian, and Vahid Mirjalili. Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow 2. Packt Publishing, 3rd ed., 2019.
- Pajankar, Ashwin. Practical Python Data Visualization. Berkeley, CA: Apress L. P, 2020.

Course Content:

Topic

Students will engage in discovery laboratory exercises and problem-solving exercises to reinforce their learning. These exercises may require background knowledge in data analytics and/or artificial intelligence, such as the topics listed in the following. To ensure all students are adequately prepared, briefing lectures will be provided to introduce and solidify the necessary background knowledge.

I. Background topics in data analytics and artificial intelligence for the laboratory exercises and problem-solving exercises
   - Data management and preprocessing: database access, data scraping, data preprocessing
   - Quantitative analytics: Python Pandas and NumPy, statistical data analytics

- Data mining: association rule mining, similarity matching
- Artificial intelligence and machine learning: regression, classification and clustering, deep learning, generative AI
- Data visualization: Matplotlib, visualizing Images and 3D shapes, visualizing graphs and networks