Course Specification
(Bachelor)

Course Title:	Data Science Fundamentals
Course Code:	CS1769
Program:	Computer Science
Department:	Computer Science
College:	Computer Science and Information Technology
Institution:	Al-Baha University
Version:	2
Last Revision Date:	October 03, 2023

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A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☐Required		☒ Elective		
3. Level/year at which this course is offered: (Level 12 / 4th Year)					
4. Course general Description:					
The Introduction to Data Science course is designed to provide students with a comprehensive understanding of the fundamental concepts, tools, and techniques used in the field of data science. Throughout this 11-week program, students will learn the essentials of Python programming, data manipulation, data visualization, statistical analysis, machine learning, and deep learning, equipping them with the skills necessary to tackle real-world data-driven problems. By the end of the course, students will be proficient in using popular Python libraries such as Pandas, NumPy, Matplotlib, Seaborn, and Scikit-learn, and will have experience in applying various machine learning algorithms for predictive modeling. Additionally, students will develop crucial data communication skills, enabling them to effectively present their findings and insights to both technical and non-technical audiences.					
5. Pre-requirements for this course (if any)**:**					
CS1007 – Database 1					
6. Co-requirements for this course (if any)**:**					
None					
7. Course Main Objective(s):					
1.Develop a foundational understanding of data science concepts. 2.Acquire proficiency in essential data science tools and techniques. 3.Learn to apply data science methods to real-world problems. 4.Gain experience in presenting data-driven insights to non-technical stakeholders.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	44	100%

No	Mode of Instruction	Contact Hours	Percentage
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	22
2.	**Laboratory/Studio**	22
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		44

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Understand the key concepts and principles of data science, including data collection, preprocessing, analysis, and visualization.		- Lectures - Assignments - Exercises	- Midterm exam - Final Exam
1.2	Identify various machine learning techniques, such as supervised learning, unsupervised learning, and their applications in data science.		- Lectures - Assignments - Exercises	- Midterm exam - Lab Exam - Final Exam
2.0	Skills			
2.1	Use programming languages, such as Python or R, and related libraries to preprocess, analyze, and visualize data.		- Lectures - Assignment - Lab Exercises	- Midterm exam - Lab Exam - Final Exam
2.2	Develop and implement machine learning models for tasks such as classification, regression, clustering, and recommendation systems.		- Lectures - Assignments - Lab Exercises	- Midterm exam - Lab Exam - Final Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.3	Evaluate the performance of machine learning models using appropriate metrics and validation techniques.		- Lectures - Assignments - Lab Exercises	- Midterm exam - Lab Exam - Final Exam
3.0	**Values, autonomy, and responsibility**			
3.1	Work both independently and collaboratively		- Class/Lab discussions	- Rubric

C. Course Content

No	List of Topics	Contact Hours
1.	What is Data Science? (The Data Science Process)	2
2.	Data Manipulation and Cleaning	2
3.	Exploratory Data Analysis	2
4.	Introduction to Machine Learning	2
5.	Introduction to Python	2
6.	Regression Techniques	3
7.	Classification Techniques	3
8.	Unsupervised Learning	3
9.	Deep Learning Fundamentals	3
Total		**22**

D. Lab Content

No	List of Topics	Contact Hours
1.	Getting Started with Python and Jupyter Notebooks	3
2.	Data Manipulation and Cleaning with Pandas	3
3.	Exploratory Data Analysis and Visualization	4
4.	Regression Modeling	3
5.	Classification Modeling	3
6.	Unsupervised Learning	3
7.	Deep Learning with TensorFlow or Keras.	3
Total		**22**

E. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments and exercises	Every Two Weeks	10%

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
2.	Midterm Exam	Week 6	20%
3.	Lab Report	Every Two Weeks	10%
4.	LAB Exam	Week 11	20%
5.	Final Exam	Week 12-13	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

F. Learning Resources and Facilities

1. References and Learning Resources

Essential References	▪ Grus, J. (2019). Data Science from Scratch: First Principles with Python (2nd ed.). O'Reilly Media, Inc. ▪ McKinney, W. (2017). Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython (2nd ed.). O'Reilly Media, Inc.
Supportive References	▪ Computer Science Curriculum 2013 – http://cs2013.org ▪ ACM (Association for Computer Machinery) Curricula Recommendations - http://www.acm.org/education/curricula-recommendations
Electronic Materials	▪ ACM (Association for Computer Machinery) web site - http://www.acm.org/ ▪ IEEE Computer Society web site - http://www.computer.org/portal/web/guest/home ▪ Access to the Saudi Digital Library (SDL). ▪ Using the learning management system of the university – Rafid System (https://lms.bu.edu.sa/).
Other Learning Materials	**Integrated Development Environments (IDEs) and Notebooks:** Jupyter Notebook, RStudio, PyCharm, Visual Studio Code, Google Colab **Data Manipulation and Analysis Libraries:** Pandas (Python), NumPy (Python), Dplyr (R), Tidyverse (R), DataFrames.jl (Julia) **Data Visualization Libraries:** Matplotlib (Python), Seaborn (Python), ggplot2 (R), Plotly (Python, R, and others), Bokeh (Python) **Machine Learning Libraries:** Scikit-learn (Python), TensorFlow (Python), Keras (Python), PyTorch (Python), XGBoost (Python, R, and others)

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• A classroom or lecture hall with whiteboard for 25 students. • A laboratory with 25 computers.

Items	Resources
Technology equipment (projector, smart board, software)	• All students shall have: ○ Computer or laptop with one python installed and running. ○ High speed Internet connection. ○ Power outlets for student's laptop plug-in. • The lab computers should have python and all the necessary libraries installed on them.
Other equipment (depending on the nature of the specialty)	

G. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	• Students • Course Coordinator / Program Chair	• Survey (indirect) • Review of course file (direct)
Effectiveness of Students' assessment	• Faculty • Exam Evaluation Committee • Students	• Survey (indirect)
Quality of learning resources	• Faculty • Students	• Survey (indirect)
The extent to which CLOs have been achieved	• Faculty • Course Coordinator / Program Chair	• Exams (direct)
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

H. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	