



Course Specifications

Course Title:	Data Science
Course Code:	445CIS-3
Program:	Information Systems
Department:	Information Systems
College:	Computer Science and Information Systems
Institution:	Najran University



Table of Contents

A. Course Identification	3
6. Mode of Instruction (mark all that apply)	3
B. Course Objectives and Learning Outcomes	4
1. Course Description	4
2. Course Main Objective	4
3. Course Learning Outcomes	4
C. Course Content	4
D. Teaching and Assessment	5
1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods	5
2. Assessment Tasks for Students.....	6
E. Student Academic Counseling and Support	6
F. Learning Resources and Facilities	6
1. Learning Resources.....	6
2. Facilities Required	7
G. Course Quality Evaluation	7
H. Specification Approval Data	7



A. Course Identification

1. Credit hours:	3(2,2,1)
2. Course type	
a.	University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b.	Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered:	Level 8, year 4
4. Pre-requisites for this course (if any):	N/A
5. Co-requisites for this course (if any):	N/A

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100%
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	15
4	Others (specify)	
	Total	75
Other Learning Hours*		
1	Study	20
2	Assignments	10
3	Library	
4	Projects/Research Essays/Theses	10
5	Others (Presentations)	5
	Total	45

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times



B. Course Objectives and Learning Outcomes

1. Course Description

Data Science is the study of the generalizable extraction of knowledge from data. Being a data scientist requires an integrated skill set spanning mathematics, statistics, machine learning, databases and other branches of computer science along with a good understanding of the craft of problem formulation to engineer effective solutions. This course will introduce students to this rapidly growing field and equip them with some of its basic principles and tools as well as its general mindset. Students will be able learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication. The focus in the treatment of these topics will be on breadth, rather than depth, and emphasis will be placed on integration and synthesis of concepts and their application to solving problems. To make the learning contextual, real datasets from a variety of disciplines will be used.

2. Course Main Objective

Demonstrate the knowledge of data analysis techniques and statistical analysis tools to support business decision making.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge:	
1.1	Describe the role of data science and big data in business	K1
1.2	Describe the process of analysing dataset including data collection, modeling, integration, exploratory analysis, prediction, and evaluation	K1
1.3	Identify the differences between classification and regression problems	K1
1.4	Interpretation of a real dataset	K1
2	Skills:	
2.1	Demonstrate skills in data management	S1, S2
2.2	Develop relevant programming abilities to solve data science problems	S1, S2
2.3	Demonstrate proficiency with statistical analysis of data	S4
2.4	Develop the ability to build and assess data-based models	S1, S2
2.5	Execute statistical analyses with professional statistical software (e.g., R, Python, Minitab, SQL)	S4
3	Competence:	
	Practice communication skills in analyzing dataset and presenting the result within a team	C2

C. Course Content

No	List of Topics	Contact Hours
1	What is Data Science?	5
2	Statistical Inference	6
3	Exploratory Data Analysis and the Data Science Process	6
4	Three Basic Machine Learning Algorithms	6



5	One More Machine Learning Algorithm and Usage in Applications	6
6	Feature Generation and Feature Selection (Extracting meaning from Data)	6
7	Recommendation Systems: Building a User-Facing Data Product	6
8	Mining Social-Network Graphs	6
9	Data Visualization	6
10	Data Science and Ethical Issues	5
11	Lab	12
12	Project	5
Total		75

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge		
1.1	Describe the role of data science and big data in business	Lectures	Quiz Midterm Examination Final Examination
1.2	Describe the process of analysing dataset including data collection, modeling, integration, exploratory analysis, prediction, and evaluation	Lectures, Labs	Quiz Midterm Examination Lab assignment Final Examination Project
1.3	Identify the differences between classification and regression problems	Lectures, Labs	Midterm Examination Lab assignment Final Examination Project
1.4	Interpretation of a real dataset	Lectures, Labs	Lab assignment Project
2.0	Skills		
2.1	Demonstrate skills in data management	Lectures, Labs	Midterm Examination Lab assignment Final Examination Course project
2.2	Develop relevant programming abilities to solve data science problems	Lectures, Labs	Quiz, Assignments Midterm Examination Lab assignment Final Examination
2.3	Demonstrate proficiency with statistical analysis of data	Lectures, Labs	Assignments Midterm Examination Lab assignment Final Examination



2.4	Develop the ability to build and assess data-based models	Lectures, Labs	Assignments Midterm Examination Lab assignment Final Examination
2.5	Execute statistical analyses with professional statistical software (e.g., R, Python, Minitab, SQL)	Lectures, Labs	Quiz, Assignments Midterm Examination Lab assignment Final Examination Course project
3.0	Competence		
3.1	CLO6: Apply data science concepts and methods to solve problems in real-world contexts and	Lectures, Group work, Project	Course project

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes	4	10%
2	Theory Assignment	7 & 11	06%
3	Midterm Exam-I	7	12%
4	Midterm Exam-2	10	12%
5	Labs	5 & 12	20% (10% lab exam final + 10% mid lab exam)
6	Final Examination	16	40%

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

- weekly office hours + appointments
- weekly academic advising hours
- Extra weekly 2 office hours prior to exams.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	<ul style="list-style-type: none"> • Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly. 2014.
Essential References Materials	<ul style="list-style-type: none"> • Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online) • Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013. • Foster Provost and Tom Fawcett. Data



	<p>Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.</p> <ul style="list-style-type: none"> • Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online) • Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science. (Note: this is a book currently being written by the three authors. The authors have made the first draft of their notes for the book available online. The material is intended for a modern theoretical course in computer science.) • Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014. • Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.
Electronic Materials	https://www.w3schools.com/sql/
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Room Laboratory
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, PCs.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Online course survey	Students	Indirect
Focus group discussion with small groups of students.	Instructor	Direct
Extent of achievement of course learning outcomes	instructor	Direct
Peer consultation on teaching	Faculty	Direct

H. Specification Approval Data

Council / Committee	Department Council
Reference No.	Session No. 10 (441-38-43300)
Date	17/02/2020

