



## Course Specifications (Postgraduate Degree)

<b>Course Title:</b>	<b>Information Retrieval and Web Search Engines</b>
<b>Course Code:</b>	<b>510PMAI-3</b>
<b>Program:</b>	<b>Professional Master of Data Science</b>
<b>Department:</b>	<b>Computer Science</b>
<b>College:</b>	<b>Computer Science and Information Systems</b>
<b>Institution:</b>	<b>Najran University</b>

## Table of Contents

<b>A. Course Identification</b> .....	<b>3</b>
6. Mode of Instruction (mark all that apply) .....	3
<b>B. Course Objectives and Learning Outcomes</b> .....	<b>4</b>
1. Course Description .....	4
2. Course Main Objective.....	4
3. Course Learning Outcomes .....	4
<b>C. Course Content</b> .....	<b>5</b>
<b>D. Teaching and Assessment</b> .....	<b>5</b>
1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods .....	5
2. Assessment Tasks for Students .....	7
<b>E. Student Academic Counseling and Support</b> .....	<b>7</b>
<b>F. Learning Resources and Facilities</b> .....	<b>7</b>
1. Learning Resources .....	7
2. Facilities Required.....	8
<b>G. Course Quality Evaluation</b> .....	<b>8</b>
<b>H. Specification Approval Data</b> .....	<b>8</b>

## A. Course Identification

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

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	50	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	20
3	Tutorial	
4	Others (specify)	
	<b>Total</b>	<b>50</b>

## B. Course Objectives and Learning Outcomes

### 1. Course Description

This course introduces the student to information retrieval and web search. The information retrieval (IR) is the process through which a computer system can respond to a user's query for text-based information on a specific topic. IR was one of the first and remains one of the most important problems in the domain of natural language processing (NLP). Web search is the application of information retrieval techniques to the largest corpus of text anywhere — the web — and it is the context where many people interact with IR systems most frequently. In this course, we will cover basic and advanced techniques for building text-based information systems, including the following topics: efficient text indexing, boolean and vector-space retrieval models, evaluation and interface issues, IR techniques for the web, including crawling, link-based algorithms, and metadata usage, document clustering and classification, traditional and machine learning-based ranking approaches.

### 2. Course Main Objective

The purpose of this course is to provide the students with a comprehensive introduction to the recent developments in basic and advanced techniques, practical text indexing applications and the hands-on experiences with information retrieval. Upon completion of this course, the students will be able to: 1. Understand the IR basics techniques, 2. Acquire knowledge of text indexing approaches, practical skills such as crawling data from the web and document clustering and classification. 3. Learn how to apply machine learning techniques efficiently on retrieved information from the web.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge</b>	
1.1	Describe Information Retrieval Methods and Applications	K1
1.2	Acquire knowledge of text indexing approaches.	K1, K2
		K1
<b>2</b>	<b>Skills</b>	
2.1	Learn practical skills such as crawling data from the web and document clustering and classification	S1, S2
2.2	Apply machine learning techniques efficiently on retrieved information from the web.	S3
2.3		
2.4		
2.5		
<b>3</b>	<b>Competences:</b>	

CLOs		Aligned PLOs
3.1	Work cooperatively in a small group environment	C1
3.2		
3.3		
3...		

## C. Course Content

No	List of Topics	Contact Hours
1	Introduction and overview	3
2	Information retrieval introduction	7
3	Dictionary and postings lists, Boolean querying	7
4	Document Encoding	7
5	Index Construction	7
6	Algorithms for postings list compression	7
7	Dictionaries and Tolerant Retrieval	3
8	Scoring, term weighting and the vector space model	3
9	Probabilistic IR: the binary independence model, BM25, BM25F	7
10	Evaluation methods & NDCG	3
11	Systems issues in efficient retrieval and scoring	3
12	Classification and clustering in vector spaces (Naive Bayes, kNN, decision boundaries)	3
13	Final Exam	
<b>Total</b>		<b>50</b>

## D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge</b>		
1.1	Understand Information Retrieval Methods and Applications	TS-1: Relate Course Learning Outcomes (CLOs) to the topics TS-2: Giving Lectures in PPT, recalling the lecture through asking Questions. Clarifying doubts on Lecture. TS-3: Conducting a discussion of real life problems, among teacher, students.	Quiz Assignments Midterm Examination Final Examination
1.2	Acquire knowledge of text indexing approaches.		
...			
		These learning outcomes will be taught in a combined form of seminars and	

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		lab sessions. Readings will be assigned every week and students are expected to participate in discussion during the seminars. Students are also expected to participate in lab sessions and complete lab exercises on computers.	
<b>2.0</b>	<b>Skills</b>		
2.1	Learn practical skills such as crawling data from the web and document clustering and classification.	TS-1: Relate Course Learning Outcomes (CLOs) to the topics TS-2: Giving Lectures in PPT, recalling the lecture through asking Questions. Clarifying doubts on Lecture. TS-3: Conducting a discussion of real life problems, among teacher, students TS-4: Cooperative learning among the students. Encourage students to browse different journals, seminars or websites at their leisure time to have a better understanding about the course. These learning outcomes will be taught in a combined form of seminars and lab sessions. Readings will be assigned every week and students are expected to participate in discussion during the seminars. Students are also expected to participate in lab sessions and complete lab exercises on computers.	Quiz Assignments Midterm Examination Final Examination,
2.2	Learn how to apply machine learning techniques efficiently on retrieved information from the web.		Quiz, Assignments Final Examination
2.3			Quiz Assignments Final Examination
2.4			Lab Assignments, Midterm Examination, Final Examination
2.5			
<b>3.0</b>	<b>Competences</b>		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.1	Work cooperatively in a small group environment		Final Project
3.2			
...			

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz1	3 <sup>rd</sup> week	5%
2	Midterm	6 <sup>th</sup> week	20%
3	Project	5 <sup>th</sup> week	10%
4	Theory Assignments	2 <sup>th</sup> , 5 <sup>th</sup> , 8 <sup>th</sup> , 10 <sup>th</sup> weeks	10%
5	Lab Assignments	7 <sup>th</sup> week	10%
6	Quiz2	10 <sup>th</sup> week	5%
8	Final Exam	12 <sup>th</sup> or 13 <sup>th</sup> week	40%

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## 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.
- Tutorials are also provided to the students

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<p><b>Artificial Intelligence for Business</b></p> <ul style="list-style-type: none"> <li>• by Doug Rose</li> <li>• Publisher: Pearson FT Press; 2nd edition (December 9, 2020)</li> <li>• Publication date: December 9, 2020</li> </ul> <p><b>Artificial Intelligence for Business: A Modern Business Approach</b></p> <ul style="list-style-type: none"> <li>• by John Medicine</li> <li>• Publication date: September 11, 2019</li> </ul>
<b>Essential References Materials</b>	
<b>Electronic Materials</b>	

<b>Other Learning Materials</b>	<p>The students will study how Information Retrieval is used in practice by crawling web pages and apply machine learning.</p> <p>The resources include:</p> <ol style="list-style-type: none"> <li>1. <i>Introduction to Information Retrieval</i>, by C. Manning, P. Raghavan, and H. Schütze (Cambridge University Press, 2008)..</li> </ol>
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## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Room B-58 Laboratory A-16L
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Data show, PCs.
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	<ul style="list-style-type: none"> <li>• Printer is important in the lab to print reports and some snapshots.</li> <li>• Projector and PC for the lab instructor is required</li> </ul>

## 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

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

<b>Council / Committee</b>	Computer Science Departmental Council
<b>Reference No.</b>	14440203-0185-00002
<b>Date</b>	1st Sep, 2022