| QF01/0408-4.0E | Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Artificial Intelligence Department |
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| **Study plan No.** | **2025/2026** | | **University Specialization** | Artificial Intelligence | |
| **Course No.** | **0135222** | | **Course name** | Information Retrieval | |
| **Credit Hours** | **3** | | **Prerequisite Co-requisite** | Introduction into Data Science | |
| **Course type** | ☐ MANDATORY UNIVERSITY REQUIREMENT | ☐ UNIVERSITY ELECTIVE REQUIREMENTS | ☐ FACULTY MANDATORY REQUIREMENT | ☐ Support course family requirements | ☐ Mandatory requirements ☑ Elective requirements |
| **Teaching style** | ☐ Full online learning | | ☐ Blended learning | Traditional learning | |
| **Teaching model** | ☐ **2Synchronous: 1asynchronous** | | ☐ **2 face to face : 1synchronous** | **3 Traditional** | |

## Faculty member and study divisions information (to be filled in each semester by the subject instructor)

| Name | Academic rank | Office No. | Phone No. | E-mail | |
|---|---|---|---|---|---|
| **Eyad Hailat** | **Assistant professor** | **230** | | **e.hailat@zuj.edu.jo** | |
| | | | | | |
| **Division number** | **Time** | **Place** | **Number of students** | **Teaching style** | **Approved model** |
| **1** | **Sun. 9:30-11:00** | **348** | | **Blended** | |
| **2** | **Mon. 14:00-15:30** | **204** | | **Blended** | |
| **3** | **Wed 12:30-14:00** | **203** | | **Blended** | |

## Brief description

This course includes the following topics:
Introduction to Information Retrieval, Basic Techniques of information retrieval, Tokens and Terms, Static Inverted Indices, Query Processing, Index Compression, Dynamic Inverted Indices, Probabilistic Retrieval , Measuring Effectiveness, Web Search, Advanced Information Retrieval Topics.

## Learning resources

| | | | | |
|---|---|---|---|---|
| Course book information (Title, author, date of issue, publisher ... etc) | 1- Stefan Buttcher, Charles Clarke, and Gordon Cormack. Information Retrieval: Implementing and Evaluating Search Engines. MIT press, **2016**. | | | |
| Supportive learning resources (Books, databases, periodicals, software, applications, others) | 1-Winfried Gödert , Jessica Hubrich , Matthias Nagelschmidt. Semantic Knowledge Representation for Information Retrieval. De Gruyter Saur. **2014**<br><br>2-Louis Rosenfeld and Peter Morville. Information Architecture: For the web and beyond. O'Reilly Media; **2015**. | | | |
| Supporting websites | | | | |
| The physical environment for teaching | Class room | ☐ labs | ☐ Virtual educational platform | ☐ Others |

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| Necessary equipment and software | |
| Supporting people with special needs | |
| For technical support | |

**Course learning outcomes (S** *= Skills, C= Competences K= Knowledge,)*

| No. | Course learning outcomes | The associated program learning output code |
|---|---|---|
| | **Knowledge** | |
| **K1** | To be able to show a good comprehension to the basic concepts of IR. | **MK3** |
| **K2** | To be able to show a good understanding of the different types of retrieval. | MK3 |
| **K3** | | |
| | **Skills** | |
| **S1** | To be able to demonstrate how inverted index works. | **MS3** |
| **S2** | To be able to draw the basic types of indexes | **MS3** |
| **S3** | | |
| | **Competences** | |
| **C1** | To use the concepts of indexing in solving real life problems | **MC1** |

**Mechanisms for direct evaluation of learning outcomes**

| Type of assessment / learning style | Fully electronic learning | Blended learning | Traditional Learning (Theory Learning) | Traditional Learning (Practical Learning) |
|---|---|---|---|---|
| First exam | 0 | **0** | %20 | 0 |
| Second / midterm exam | %30 | **%30** | %30 | 30% |
| Participation / practical applications | 0 | **%10** | 10% | 10% |
| Asynchronous interactive activities | %30 | **%20** | 0 | 20% |
| final exam | %40 | **%40** | %40 | 40% |

**Note:** Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, work within student groups ... etc, which the student carries out on his own, through the virtual platform without a direct encounter with the subject teacher.

**Schedule of simultaneous / face-to-face encounters and their topics**

| Week | Subject | learning style* | Reference ** |
|---|---|---|---|
| **1** | Introduction To information Retrieval, IR systems, Test | Lectures | **1-33** |

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|---|---|---|---|
| | collections. | | |
| **2** | Inverted Indices, Retrieval and Ranking, Evaluation. | Lectures | **33-84** |
| **3** | Characters, N-Grams, European Languages. | Lectures | **84-104** |
| **4** | Index Components and Index life cycle, The dictionary, Interleaving Dictionary, Index Construction. | Lectures | **104-137** |
| **5** | Query processing for ranked retrieval, Lightweight structure. | Lectures | **137-171** |
| **6** | Mid Exam Estimated (30%) + Revision | learning through problem solving | |
| **7** | General purpose data compression, symbol wise compression, compressing posting lists, compressing dictionaries. | Lectures | **174-228** |
| **8** | Batch Updates, Incremental Index Update, Document Deletion, Document Modification. | Lectures | **228-254** |
| **9** | Modeling Relevance, Robertson Weighting Formula, Term Frequency, Field weighting. | Lectures | **258-282** |
| **10** | Generating queries from documents, language models and smoothing, ranking with language models, passage retrieval and ranking. | Lectures | **286-306** |
| **11** | Various types of classifiers. | Lectures | **310-371** |
| **12** | Traditional effectiveness measures, TREC, Using statistics, Nontraditional measures | Lectures | **406-463** |
| **13** | Web structure, web crawler, Page Rank Algorithm, Evaluating Web Search | Lectures | **507-522** |
| **14** | **Case Study 1+Project** | learning through problem solving | |
| **15** | **Project Presentations (10%)** | participatory learning | |
| **16** | **Final Exam (40%)** | | |

*** Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.**
**** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.**

**Grade Distribution:**
**Homework and activities 20%**
**Midterm 30%**
**Project 10%**
**Final Exam 40%**

## Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

| QF01/0408-4.0E | **Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Artificial Intelligence Department** |
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| Week | Task / activity | Reference | Expected results |
|---|---|---|---|
| 1 | Term Document Matrix | | To be able to create the term document matrix from a given small collection |
| 2 | Inverted Index | | To draw the inverted index of a given small collection |
| 3 | Preprocessing 1 | | To apply preprocessing techniques on a given collection |
| 4 | Preprocessing 2 | | To apply preprocessing techniques on a given collection |
| 5 | Biwords and Positional Index | | To draw both byword index and positional index |
| 6 | Mid Exam | | Case studies |
| 7 | Ranked Retrieval – Jaccard | | To rank query results based on Jaccard similarity |
| 8 | Ranked Retrieval – TF.IDF | | To rank query results based on TF.IDF similarity |
| 9 | Spelling Error Correction 1 | | To demonstrate how errors are found and corrected |
| 10 | Spelling Error Correction 2 | | To demonstrate how errors are found and corrected |
| 11 | Wild Card Queries | | To use biword index and positional index in wild card queries |
| 12 | Page Rank 1 | | To apply page rank to order results |
| 13 | Page Rank 2 | | To apply page rank to order results |
| 14 | Case Study | | Case study |
| 15 | Presentations | | presentation |
| 16 | Final Exam | | |