

4/1/4. Course Specification:

## **COURSE SPECIFICATIONS**

### Form

Course Title: Automatic Speech Recognition

Course Code: 14016483-3

Date: 2018 –10 – 21.

Institution: Umm Al-Qura University

College: College of Computer and Information Systems Department: Department of Computer Science

### A. Course Identification and General Information

1. Course title and code: Automatic Speech Recognition 14016483-3

2. Credit hours: 3

3. Program(s) in which the course is offered. Master of Computer Science (Artificial Intelligence)  
(If general elective available in many programs indicate this rather than list programs)

4. Name of faculty member responsible for the course Dr. Mohsin Bilal

5. Level/year at which this course is offered: 2/3

6. Pre-requisites for this course (if any):

7. Co-requisites for this course (if any):

8. Location if not on main campus:

9. Mode of Instruction (mark all that apply):

- |                                     |                      |             |                                  |
|-------------------------------------|----------------------|-------------|----------------------------------|
| a. Traditional classroom            | <input type="text"/> | percentage? | <input type="text" value="100"/> |
| b. Blended (traditional and online) | <input type="text"/> | percentage? | <input type="text"/>             |
| c. E-learning                       | <input type="text"/> | percentage? | <input type="text"/>             |
| d. Correspondence                   | <input type="text"/> | percentage? | <input type="text"/>             |
| f. Other                            | <input type="text"/> | percentage? | <input type="text"/>             |

Comments:

## B Objectives

1. The main objective of this course

This course provides knowledge of speech recognitions and their application in real world applications.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

The contents will be prepared from globally recognized text books, web-based reference materials and latest research in the field. To provide practical knowledge, programming package or tool will be introduced to the students. Practical home works related to application of automatic speech recognition will be designed.

## C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

### Course Description:

This course covers the theory and practice of automatic speech recognition (ASR), with a focus on the statistical approaches that comprise the state of the art. The course introduces the overall framework for speech recognition, including speech signal analysis, acoustic modeling using hidden Markov models, language modeling and recognition search. Advanced topics covered will include speaker adaptation, robust speech recognition and speaker identification. The practical side of the course will involve the development of a speech recognition system.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Signal analysis for ASR	2	6
Statistical pattern recognition (Bayes decision theory, Learning algorithms, Evaluation methods, Gaussian mixture model, and EM algorithm)	2	6
Hidden Markov Models (HMM)	1	3
Context-dependent models	2	6
Discriminative training	2	6
Language models for LVCSR (large vocabulary continuous speech recognition)	1	3
Robust ASR (Robust features Noise reduction, Microphone arrays)	1	3
Adaptation (Noise adaptation, Speaker adaptation/normalization, Language model adaptation)	1	3
Speaker recognition	2	6

### 2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42					42
	Actual	42					42
Credit	Planned	3					3
	Actual	3					3

**3. Individual study/learning hours expected for students per week.**

9-12

#### 4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

**First**, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

##### Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
<b>1.0</b>	<b>Knowledge</b>		
1.1	Understand the statistical framework used for automatic speech recognition.	Lectures	Exam, Quizzes
1.2	Understand the concepts of statistical pattern recognition	Lectures	Exams, Homework, Quizzes
1.3	Understand the language models for speech recognition in real world applications	Lectures	Exam, Homework, Quizzes
1.4	Identify current tools for automatic speech recognition	Lectures, Project	Exam, Homework, Project report
<b>2.0</b>	<b>Cognitive Skills</b>		
2.1	Analyze and design methods for automatic speech recognition	Lecture, Case studies	Exams, Quizzes, Homework, Reports,
2.2	Design, implement and evaluate statistical pattern recognition methods in the context of automatic speech processing	Lecture, Case studies,	Exams, Reports
2.3	Develop a speaker recognition system for a real world problem	Group discussion, Project	Project Report, Project presentation

2.4	Ability to apply adaptation in the speech processing systems	Lecture, Project	Exams, Project Report, Project presentation
<b>3.0</b>	<b>Interpersonal Skills &amp; Responsibility</b>		
3.1	Work effectively in groups to accomplish a common goal and show leadership qualities	Small group discussion, research activities, Projects	Project Report, Group presentation
3.2	Act ethically and responsibly with high moral standards	Research activities, Project	Anti-plagiarism Presentation
<b>4.0</b>	<b>Communication, Information Technology, Numerical</b>		
4.1	Ability to communicate clearly in oral and written form with range of audiences	Project	Project Report, Project presentation
4.2	Demonstrate the ability to apply recent tools in automatic speech recognition applications	Project	Project Report, Project presentation
4.3	Demonstrate the ability to use mathematical and statistical techniques in the design and analysis of automatic speech recognition systems	Lectures, Project	Exam, Project Report, Project presentation
<b>5.0</b>	<b>Psychomotor (if any)</b>		
5.1			

<b>5. Assessment Task Schedule for Students During the Semester</b>			
	<b>Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)</b>	<b>Week Due</b>	<b>Proportion of Total Assessment</b>
1	Quiz 1	2	3.3%
2	Homework 1	3	3.3%
3	Quiz 2	4	3.3%
4	Homework 2	5	3.3%
5	Midterm Exam	7	20%
6	Quiz 3	8	3.3%
7	Homework 3	9	3.3%
8	<b>Project</b>	<b>11</b>	<b>30%</b>
9	Final Exam	14	30%

## D. Student Academic Counseling and Support

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| <p>1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)</p> <ul style="list-style-type: none"><li>i. Office Hours for student counseling and support – Three hours/week</li><li>ii. Availability of teaching Staff on e-learning resources like uqu20/Piazza</li></ul> |
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## E Learning Resources

- |   |
|---|
| <p>1. List Required Textbooks</p> <ul style="list-style-type: none"><li>i. Rabiner, Lawrence R., and Biing-Hwang Juang. "Fundamentals of speech recognition." latest edition.</li><li>ii. Jurafsky, Dan. Speech &amp; language processing. Pearson Education India, latest edition.</li></ul> |
| <p>2. List Essential References Materials (Journals, Reports, etc.)</p> <ul style="list-style-type: none"><li>i. Recent Papers in Speech Recognitions related journals</li></ul>  |
| <p>3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.</p> <ul style="list-style-type: none"><li>i.</li></ul>  |
| <p>4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.</p> <ul style="list-style-type: none"><li>i. MATLAB, Python, or similar software</li></ul>  |

## F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

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|---|
| <p>1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)</p> <ul style="list-style-type: none"><li>i. One classroom (25 seats)</li><li>ii. One lab (25 PCs)</li></ul>                     |
| <p>2. Technology resources (AV, data show, Smart Board, software, etc.)</p> <ul style="list-style-type: none"><li>i. Whiteboard</li><li>ii. Internet connection</li><li>iii. Anti-plagiarism software</li></ul> |
| <p>3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)</p>  |

## G Course Evaluation and Improvement Procedures

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| <p>1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching</p> <ul style="list-style-type: none"><li>i. At the end of semester, course evaluation forms will be filled by the students electronically or on paper. The evaluation forms will be anonymous.</li></ul> |
| <p>2. Other Strategies for Evaluation of Teaching by the Instructor or the Department</p>  |

<ul style="list-style-type: none"> <li>i. Course file of the course will be maintained and evaluated by some senior faculty member.</li> <li>ii. Instructor evaluation is performed for every semester</li> </ul>
<p>3. Procedures for Teaching Development</p> <ul style="list-style-type: none"> <li>ii. Constant reading of new books and research papers, attending related conferences and workshops, participation in the research groups and blogs etc.</li> </ul>
<p>4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)</p> <ul style="list-style-type: none"> <li>i. A random sample from the marked papers may be evaluated by an independent senior faculty member.</li> <li>ii. Departmental quality assurance committee can review the students grades and course files to make sure that high standard of teaching is maintained.</li> </ul>
<p>5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.</p> <ul style="list-style-type: none"> <li>i. Department has curriculum committee that periodically review courses.</li> <li>ii. Faculty council review offer program as per need.</li> </ul>

**Name of Course Instructor:** Dr Muhammad Arif

**Signature:** Dr Muhammad Arif **Date Completed:** Oct. 22, 2018

**Program Coordinator:** \_\_\_\_\_

**Signature:** \_\_\_\_\_ **Date Received:** \_\_\_\_\_