

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Pattern Recognition

Course Code: 14016476-3

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: Pattern Recognition 14016476-3

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. Muhammad Arif

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 theoretical and practical knowledge of pattern recognition.

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. Practical home works and a term project related to latest tools and techniques will also be designed. At the end of the course, a seminar day can be announced in which students can present their course projects and literature review.

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

Course Description:

By successful completion of the course, the students will have solid understanding of the principles of pattern recognition, main methods for model performance estimation, have a good grasp of different parametric and non-parametric methods for classification; clustering algorithms, have hands-on experience of using pattern recognition methods in computer vision and biomedical applications and graphical models.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Classifiers Based on Bayes Decision Theory	1	3
Linear Classifiers	1	3
Feature Selection	1	3
Feature Generation: Data Transformation and Dimensionality Reduction	1	3
Template Matching	1	3
Supervised Learning: The Epilogue	1	3
Clustering Algorithms I: Sequential Algorithms	1	3
Clustering Algorithms II: Hierarchical Algorithms	1	3
Clustering Algorithms III: Schemes Based on Function Optimization	1	3
Cluster Validity indices	1	3
Learning with tree (Decision tree, Boosting, Bagging, Random forest)	2	6
Graphical Models (Bayesian networks, Hidden markov model, Kalman filter)	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
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4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies			
<p>On the table below are the five NQF Learning Domains, numbered in the left column.</p> <p>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.)</p>			
Curriculum Map			
Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	Knowledge		
1.1	Understand the mathematical and statistical foundation of pattern recognition	Lectures	Exam, Quizzes
1.2	Recognize the design and implementation of supervised and unsupervised Classifiers	Lectures	Exams, Homework, Quizzes
1.3	Understand the importance of feature generation and selection	Lectures	Exam, Homework, Quizzes
1.4	Recognize applications of pattern recognition in real world applications	Lectures, Case studies, Project	Exam, Homework, Project Report
2.0	Cognitive Skills		
2.1	Analyze and design methods for automatic training of classifiers	Lecture, Case studies	Exams, Quizzes, Homework, Reports,
2.2	Design, implement and evaluate supervised and unsupervised classifiers	Lecture, Case studies,	Exams, Reports

2.3	Develop a pattern recognition system for a real world problem	Group discussion, Project	Project Report, Project presentation
3.0	Interpersonal Skills & Responsibility		
3.1	Demonstrate own learning and professional development	Group discussion, Project	Project Report, Project presentation
3.2	Work effectively in groups to accomplish a common goal and show leadership qualities	Group discussion, Project	Project Report, Project presentation
4.0	Communication, Information Technology, Numerical		
4.1	Ability to communicate clearly in oral and written form with range of audiences	Project	Project Report, Project presentation
4.2	Use of latest information technologies	Project	Project Report, Project presentation
4.3	Demonstrate the ability to use mathematical and statistical techniques in the design and analysis classifiers	Lecture, Case studies, Project	Exams, Project Report, Project presentation
5.0	Psychomotor (if any)		
5.1			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
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	Project	11	30%
9	Final Exam	14	40%

D. Student Academic Counseling and Support

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)

- i. Office Hours for student counseling and support – Three hours/week
- ii. Availability of teaching Staff on e-learning resources like uqu20/Piazza

E Learning Resources

1. List Required Textbooks

- i. Sergios Theodoridis and Konstantinos Koutroumbas Pattern Recognition, Academic Press; latest edition.
- ii. Fukunaga, Keinosuke. Introduction to statistical pattern recognition. Academic press, latest edition.
- iii. Devroye, Luc, László Györfi, and Gábor Lugosi. A probabilistic theory of pattern recognition. Vol. 31. Springer Science & Business Media, latest edition.
- iv. Watanabe, Satoshi, ed. Methodologies of pattern recognition. Academic Press, latest edition.

2. List Essential References Materials (Journals, Reports, etc.)

- i. Recent Papers in Pattern Recognition related journals

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

- ii.

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

- i. MATLAB, Python or similar software

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.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

- i. One classroom (25 seats)
- ii. One lab (25 PCs)

2. Technology resources (AV, data show, Smart Board, software, etc.)

- i. Whiteboard
- ii. Internet connection
- iii. Anti-plagiarism software

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

<p>1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching</p> <p>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.</p>
<p>2. Other Strategies for Evaluation of Teaching by the Instructor or the Department</p> <p>i. Course file of the course will be maintained and evaluated by some senior faculty member.</p> <p>ii. Instructor evaluation is performed for every semester</p>
<p>3. Procedures for Teaching Development</p> <p>i. Constant reading of new books and research papers, attending related conferences and workshops, participation in the research groups and blogs etc.</p>
<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> <p>i. A random sample from the marked papers may be evaluated by an independent senior faculty member.</p> <p>ii. Departmental quality assurance committee can review the students grades and course files to make sure that high standard of teaching is maintained.</p>
<p>5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.</p> <p>i. Department has curriculum committee that periodically review courses.</p> <p>ii. Faculty council review offer program as per need.</p>

Name of Course Instructor: Dr Muhammad Arif

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

Program Coordinator: _____

Signature: _____

Date Received: _____