

4/1/4. Course Specification:

## **COURSE SPECIFICATIONS**

### Form

Course Title: Data Visualization

Course Code: 14016475-3

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: Data Visualization 14016475-3

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. Murtaza Ali Khan

5. Level/year at which this course is offered: 2 or 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 is intended to cover main concepts related to data visualization.

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 course will teach state of the art theoretical and practical knowledge in the field of data visualization. Students will be assigned assignments and project to implement the visualization techniques to get hands on experience. At the end of the course, a seminar/presentation event will take place in which students will present their course projects/research work.

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

### Course Description:

Data visualization is an integral part of Artificial intelligence. It fulfills the growing need for researchers, analysts, designers, usability experts, and other data professionals to represent the data in an attractive graphical way. This course covers the underlying theory and practical concepts in creating visual representations of large amounts of data. It covers the core topics in data visualization such as data representation, visualization toolkits, scientific visualization, information visualization, flow visualization, and volume rendering techniques.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Introduction to Data visualization	1	3
Computer Graphics and Visualization	2	6
Discrete Data Representation	2	6
Visualization Applications	1	3
Visualization Pipeline	2	6
Fundamental Techniques for Scalar and vector Visualization	2	6
Tensor Visualization Techniques	2	6
Image and Volume visualization	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 fundamental mathematical and statistical principles of data visualization	Lecture, Group discussion	Exams, HWs, Quizzes
1.2	Ability to apply knowledge of computing to write data visualization code	Lecture, Group discussion	Exam, HWs, Quizzes
1.3	An ability to recognize the use of visualization modeling methods to model real life data	Lecture, Group discussion	Exam, HWs, Quizzes
1.4	Develop ability to identify current techniques, skill, and tools necessary for the development of visualization systems.	Lecture, Group discussion	Exams, HWs, Quizzes
<b>2.0</b>	<b>Cognitive Skills</b>		
2.1	Apply conceptual understanding of data visualization principles and theories	Lecture, Project	Exam, HWs
2.2	Implement and evaluate data visualization process, component, or program	Lecture, Case studies,	Exams, Reports
2.3	Investigate the real-world problems in the context of data visualization and design innovative solutions	Lecture, Project	Project Report, Project presentation
<b>3.0</b>	<b>Interpersonal Skills &amp; Responsibility</b>		
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
3.3	Act ethically and responsibly with high moral standards	Lectures, discussion	Anti-plagiarism software, paper review, 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	Use of latest data visualization tools	Lecture, Project	Project Report, Project presentation
4.3	Demonstrate the ability to use mathematical and statistical techniques in the design and analysis of visualization systems.	Lecture, Case studies, Project	Exams, Project Report, Project presentation
<b>5.0</b>	<b>Psychomotor (if any)</b>		
5.1	Ability to operate and construct necessary tools required for a visualization system	Research activities, Projects	Project, HWs, presentations

<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	HW 1	2	5%
2	Quiz 1	3	5%
3	HW 2	5	5%
4	Quiz 2	6	5%
5	Midterm Exam	8	20%
6	<b>Project</b>	<b>10</b>	<b>30%</b>
7	Final Exam	15	30%

## 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. Telea, Alexandru C. Data visualization: principles and practice. CRC Press, latest edition.
- ii. Yuk, Mico, and Stephanie Diamond. Data visualization for dummies. John Wiley & Sons, latest edition.

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

- ii. IEEE Transactions on Visualization and Computer Graphics (TVCG)
- iii. Springer, Journal of Visualization
- iv. Sage, Information Visualization journal

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

- i. <https://twitter.com/>, #datavisualization
- ii. <https://www.linkedin.com/company/data-visualization-blog>

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

- i. MATLAB, Tableau, SAS or other visualization 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. Visualization software
- ii. Whiteboard
- iii. Internet connection

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

## G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

<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. Murtaza Ali Khan

**Signature:** Murtaza Ali Khan **Date Completed:** Oct. 22, 2018

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

**Signature:** \_\_\_\_\_

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