



**ATTACHMENT 2 (e)**

**Course Specifications**

**Kingdom of Saudi Arabia**

**The National Commission for Academic Accreditation & Assessment**

**Course Specifications  
(CE)**



### Course Specifications

Institution:	Umm Al-Qura University	Date of Report: 10/06/1437
College/Department: Computer Engineering Department		

#### A. Course Identification and General Information

1. Course title and code: Numerical Methods – 14032401-4			
2. Credit hours: 3 + 1			
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Computer Engineering			
4. Name of faculty member responsible for the course Dr. Lo'ai A. Tawalbeh			
5. Level/year at which this course is offered: Level 7 / Year 3			
6. Pre-requisites for this course (if any) Engineering Maths-II or Linear Algebra and Computer Programming			
7. Co-requisites for this course (if any) N/A			
8. Location if not on main campus Umm Al-Qura University, Abidiyyah, Makkah Al-Mukarammah			
9. Mode of Instruction (mark all that apply)			
a. Traditional classroom	<input checked="" type="checkbox"/>	What percentage?	<input type="text" value="100"/>
b. Blended (traditional and online)	<input type="checkbox"/>	What percentage?	<input type="text"/>
c. e-learning	<input type="checkbox"/>	What percentage?	<input type="text"/>
d. Correspondence	<input type="checkbox"/>	What percentage?	<input type="text"/>
f. Other	<input type="checkbox"/>	What percentage?	<input type="text"/>
Comments: N/A			

## B Objectives

1. What is the main purpose for this course?
<ul style="list-style-type: none"> <li>Roots of nonlinear equations. Solutions of systems of linear algebraic equations. Numerical differentiation and integration. Interpolation. Least squares and regression analysis. Numerical solution of ordinary and partial differential equations. Introduction to error analysis. Engineering case studies.</li> </ul>
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)
<ul style="list-style-type: none"> <li>Use of web based resources.</li> <li>Use of e-learning system.</li> <li>User of power point slides.</li> </ul>

## C. Course Description (Note: General description in the form to be used for the Bulletin or handbook should be attached)

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact Hours
Introductory material (absolute and relative errors, rounding and chopping, computer errors in representing numbers, review of Taylor series	1-3	9
Locating roots of algebraic equations and systems of linear equations	4-6	9
The method of least squares and interpolation	7-9	9
Numerical integration and differentiation	10-12	9
Ordinary differential equations and Partial differential equations	13-14	6

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory	Practical	Other:	Total
Contact Hours	42	N/A	42	N/A	N/A	84
Credit	42	N/A	14	N/A	N/A	56

3. Additional private study/learning hours expected for students per week.

06

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

Course Learning Outcomes, Assessment Methods, and Teaching Strategy work together and are aligned. They are joined together as one, coherent, unity that collectively articulate a consistent agreement between student learning, assessment, and teaching.

The *National Qualification Framework* provides five learning domains. Course learning outcomes are required. Normally a course has should not exceed eight learning outcomes which align with one or more of the five learning domains. Some courses have one or more program learning outcomes integrated into the course learning outcomes to demonstrate program learning outcome alignment. The program learning outcome matrix map identifies which program learning outcomes are incorporated into specific courses.

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 intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. **Fourth**, if any program learning outcomes are included in the course learning outcomes, place the @ symbol next to it.

Every course is not required to include learning outcomes from each domain.

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
<b>1.0</b>	<b>Knowledge</b>		
1.1	Learning and applying various numerical methods and of different Numerical Analysis techniques used to solve problems.	Lectures, tutorials and independent study assignments. Tutorials review the content of each lecture and clarify any matters not understood.	The assessment of the programming assignments. One midterm and one final will be conducted.
<b>2.0</b>	<b>Cognitive Skills</b>		
2.1	Understand, analyse errors and identify appropriate numerical methods.	Explanations and examples given in lectures and practiced under supervision in tutorials. Transfer of learning encouraged by use of MatLAB tools in different applications and through discussion of potential application in other areas. Assignment tasks include some open ended tasks designed to apply predictive, analytical and problem solving skills.	Problem solving questions on tests given at the end of each topic and on end of semester examination. Solving the individual programming assignments also indicates cognitive skills of the students.
<b>3.0</b>	<b>Interpersonal Skills &amp; Responsibility</b>		
3.1	Written communication skills and ability to carry out tasks within time frame. Submission of the assignments on time (indicates responsibility and respect to time) along with written report (written communication skills).	Enforcing timely submission of assignments along with the submission of a quality (as possible) written reports.	Deduct marks for late submissions and poor reports.
<b>4.0</b>	<b>Communication, Information Technology, Numerical</b>		
4.1	Use of Matlab to find numeral solutions.	Student assignments require the use of Matlab.	Test questions and assignments require obtaining, interpreting and documenting the numerical solutions.

<b>5.0</b>	<b>Psychomotor</b>		
5.1	Description of the psychomotor skills to be developed and the level of performance required.	Teaching strategies to be used to develop these skills.	Methods of assessment of students psychomotor skills.

### Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching

NQF Learning Domains	Suggested Verbs
<b>Knowledge</b>	list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write
<b>Cognitive Skills</b>	estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise
<b>Interpersonal Skills &amp; Responsibility</b>	demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write
<b>Communication, Information Technology, Numerical</b>	demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize
<b>Psychomotor</b>	demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct



Suggested **verbs not to use** when writing measurable and assessable learning outcomes are as follows:

Consider	Maximize	Continue	Review	Ensure	Enlarge	Understand
Maintain	Reflect	Examine	Strengthen	Explore	Encourage	Deepen

Some of these verbs can be used if tied to specific actions or quantification.

**Suggested assessment methods and teaching strategies are:**

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small group work, whole group and small group discussion, research activities, lab demonstrations, projects, debates, role playing, case studies, guest speakers, memorization, humor, individual presentation, brainstorming, and a wide variety of hands-on student learning activities.

#### 5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Assignments / quizzes	Bi-weekly	10
2	Mid Term 1	6	20
3	Mid Term 2	12	20
4	Final Exam	14	40
5	Lab Work	Weekly	10

#### D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)
  - For individual student consultations and academic advice teaching staff is expected to be available 03 hours per week.

#### E. Learning Resources

##### 1. List Required Textbooks

- Steven C. Chapra and Raymond P. Canale, Numerical Methods for Engineers, 6th Edition, McGraw-Hill, 2009. ISBN: 0073401064.

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

- W. Cheney and Kincaid, Numerical Mathematics and Computing, 6th Edition, Brookes Cole, 2007. ISBN: 9780495114758.

##### 3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

- John Mathews, Kurtis Fink , Numerical Methods Using MATLAB, Prentice Hall

##### 4. List Electronic Materials (e.g. Web Sites, Social Media, Blackboard, etc.)

- N/A

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

- N/A

#### 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.)

- A Lecture room having Multimedia projector for lectures and students presentation.



2. Computing resources (AV, data show, Smart Board, software, etc.)
<ul style="list-style-type: none"> <li>Computer lab with MatLAB.</li> </ul>
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)
<ul style="list-style-type: none"> <li>N/A</li> </ul>

## G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching
<ul style="list-style-type: none"> <li>Confidential completion of standard course evaluation questionnaire. Focus group discussion with small groups of students.</li> </ul>
2. Other Strategies for Evaluation of Teaching by the Program/Department Instructor
<ul style="list-style-type: none"> <li>Observations and assistance from colleagues, independent assessment of standards achieved by students, independent advice on assignment tasks,</li> </ul>
3. Processes for Improvement of Teaching
<ul style="list-style-type: none"> <li>Check marking of a sample of examination papers or assignment tasks.</li> </ul>
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)
<ul style="list-style-type: none"> <li>Check marking by an independent member teaching staff of a sample of student work.</li> <li>Periodic exchange and remarking of tests or a sample of assignments with staff at another institution.</li> </ul>



5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- End of semester review.

Faculty or Teaching Staff: \_\_\_\_\_

Signature: \_\_\_\_\_ Date Report Completed: \_\_\_\_\_

Received by: \_\_\_\_\_ Dean/Department Head

Signature: \_\_\_\_\_ Date: \_\_\_\_\_