



ATTACHMENT 2 (e)

Course Specifications

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

**Course Specifications
(CS)**

**MATH 280 (Real Analysis)
1439/2018**



Course Specifications

Institution: King Saud University	Date of Report: 01/01/2018
College/Department : College of Science / Mathematics Department	

A. Course Identification and General Information

1. Course title and code: Real Analysis (MATH 280)			
2. Credit hours: 4 (3+2)			
3. Program(s) in which the course is offered: Bachelor of Financial and Actuary Mathematics			
4. Name of faculty member responsible for the course:			
5. Level/year at which this course is offered: Level 4/ Second year			
6. Pre-requisites for this course: MATH 206			
7. Co-requisites for this course: None			
8. Location if not on main campus: -			
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:			



B Objectives

What is the main purpose for this course?	
The main purpose for this course is to introduce:	
Natural Numbers, Integers, Rational Numbers, Completeness Property	
Sequences and their Limits, Limit Theorems	
Monotone Sequences, the Cauchy Criterion, the Bolzano-Weierstrass Theorem	
Subsequences, Open and Closed Sets	
Limits of Functions, Limit Theorem, Some Extensions of the Limit Concept	
Monotone Functions	
Mean-Value Theorem, L'Hospital's Rule, Taylor theorem	
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)	
<ol style="list-style-type: none"> 1. Advising students to use updated references. 2. Advising the students to use the Internet. 	

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
Natural Numbers, Integers, Rational Numbers, Completeness Property	10	9
Sequences and their Limits, Limit Theorems	10	10
Monotone Sequences, the Cauchy Criterion, the Bolzano-Weierstrass Theorem	9	9
Subsequences, Open and Closed Sets	6	6
Limits of Functions, Limit Theorem, Some Extensions of the Limit Concept	5	5
Monotone Functions	4	5
Continuous Functions, Continuous Functions on Intervals, Uniform Continuity	11	12



The Derivative and its Properties	5	4
Mean-Value Theorem, L'Hospital's Rule, Taylor theorem	10	10

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory	Practical	Other:	Total
Contact Hours	42	28	None	None	None	70
Credit	3	1	None	None	None	3 while it is actually 4

3. Additional private study/learning hours expected for students per week.	6
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4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy
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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
1.0	Knowledge		
	After studying this course, the student is expected to be able to:		
1.1	Natural Numbers, Integers, Rational Numbers, Completeness Property	1. Lectures: - Build on what students already know. - Present new concepts and principles in a systematic way. - use questioning to involve students actively in the lecture. 2. Elicit practice through tutorials and provide feedback. 3. Give an introductory 2-hours lecture on using MATLAB to solve linear algebra problems.	- Questioning in classes - Quizzes - Two mid-terms - Final Exam - Homework assignments.
1.2	Sequences and their Limits, Limit Theorems		
1.3	Monotone Sequences, the Cauchy Criterion, the Bolzano-Weierstrass Theorem		
1.4	Subsequences, Open and Closed Sets		
1.5	Limits of Functions, Limit Theorem, Some Extensions of the Limit Concept		
1.6	Monotone Functions		
1.7	Continuous Functions, Continuous Functions on Intervals, Uniform Continuity		
2.0	Cognitive Skills		
	After studying this course, the student is expected to be able to:		
2.1	Calculate the Limits of Functions,	-Ask students to prepare for and present short lectures. -Give students exercises with graded difficulties. -Give students homework assignments with the purpose of extending some theoretical parts of the course. -Give quizzes.	- Questioning in classes - Quizzes - Two mid-terms - Final Exam - Homework assignments.
2.2	Find if function has Uniform Continuity		
2.3	Decide whether Continuous Functions, or Continuous Functions on Intervals,		
2.4	Use Mean-Value Theorem,		
2.5	Compute L'Hospital's Rule for functions		
2.6	Find the derivatives of functions		
2.7	Compute the Sequences and their Limits,		
3.0	Interpersonal Skills & Responsibility		



After studying this course, the student is expected to be able to:			
3.1	Study, learn and work independently.	Encourage students to: - participate in class discussion. - participate in college and university activities. - be members of department committees and college committees.	
3.2	Work effectively in teams.		
3.3	Meet deadlines and manage time properly.		
3.4	Exhibit ethical behavior and respect different points of view.		
4.0	Communication, Information Technology, Numerical After studying this course, the student is expected to be able to:		
4.1	Present mathematics to others, both in oral and written form clearly and in a well-organized manner.	Encourage students to: - participate in competitions. - use department and college computing facilities. - use e-mail, internet, college and department websites, and central library.	
4.2	Use IT facilities as an aid to mathematical processes and for acquiring available information.		
4.3	Use library to locate mathematical information.		
5.0	Psychomotor		
	Not Applicable	Not Applicable	Not Applicable

Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching

NQF Learning Domains	Suggested Verbs
Knowledge	list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write
Cognitive Skills	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
Interpersonal Skills & Responsibility	demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write
Communication, Information Technology, Numerical	demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize
Psychomotor	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	First Midterm Exam	9	20%
2	Second mid term	14	20%
3	Tutorial Activities	Weekly	15%
4	Quizzes and Assignment	Weeks 3+10	5%
5	Final examination	18	40%

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)

1. 10 office hours weekly.
2. Encouraging students to get in touch with the instructor via e-mail.

E. Learning Resources



1. List Required Textbooks: Principles of Mathematical Analysis, by Walter Rudin			
2. List Essential References Materials (Journals, Reports, etc.): 1- Real Analysis by S.K.Mapa .			
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc): (Attach List)			
Title of the book	Author's name	Publisher's name	Date of publication
4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.): 1. Internet sites relevant to the course. 2. Math280 instructor's site.			
5. Other learning material such as computer-based programs/CD, professional standards or regulations and 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.): <ul style="list-style-type: none"> • A classroom which accommodates at least 30 students. • Computer laboratory equipped with hardware and software
2. Computing resources (AV, data show, Smart Board, software, etc.): <ul style="list-style-type: none"> • Computers connected to internet and equipped with required software. Printers.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list):

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching: 1. An evaluation sheet for the course to be filled by the students at the end of each semester. 2. Take the students' opinion about the course under consideration. 3. Discussing the course with instructors who teach the same course.
2. Other Strategies for Evaluation of Teaching by the Program/Department Instructor: 1. The level of the students in solving homework and quizzes 2. Colleagues' opinions about students' performance in this course.



3. Processes for Improvement of Teaching:

1. Encouraging students to get involved in the lecture.
2. Getting the use of tutorial classes.
3. Encouraging the students to read about the subject.

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):

1. Common Examination
2. Team grading.
3. Exchanging experience by comparing students' results in other departments.
4. Students who believe they are under graded can have their papers checked by a second reader.



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

1. Providing reviews to develop the assigned book content.
2. Providing a discussion for the course subject by a specialized committee.
3. View other math departments in well-known universities and getting help from them.
4. Consulting some course specialists for course evaluation.

Faculty or Teaching Staff:

Signature: _____ Date Report Completed: 01/02/2018

Received by: _____ Dean/Department Head

Signature: _____ Date: _____