Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

Course Specification

Institution: **University of Dammam**

College/Department: **Collegeof Sciences /Department of Mathematics**

A. Course Identification and General Information

1. Course title and code:**Real Analysis (2), Math 342**
2. Credit hours: **4**
3. Program(s) in which the course is offered: **Mathematics program**
4. Name of faculty member responsible for the course: **A specific team from the mathematics department**
5. Level/year at which this course is offered: **6th level/3th year**
6. Pre-requisites for this course (if any): **Math 242**
7. Co-requisites for this course (if any): **N/A**
8. Location if not on main campus: **College of Sciences – Girls Campus – Rayan City**

9. Mode of Instruction (mark all that apply)			
a. traditional classroom	√	What percentage?	75%
b. blended (traditional and online)		What percentage?	
c. e-learning	√	What percentage?	25%
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:**The e-learning concerns flip teaching, online assessment, ...**

B Objectives

1. What is the main purpose for this course?

On successful completion of this course students will be able to:

recognizetheLebesgue measure and Lebesgue-measurable sets

recognize the Lebesgue-measurable functions and their basic properties recognize the Lebesgue-spaces of integrable functions
apply the monotone and dominated convergence theorems

remember the rules of integration on product spaces

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)

- **Create, improve and complete (beamer or power point) presentations.**
- **Update the course by comparing to the contents at other universities.**
- **Follow up on the latest books to select the most appropriate to update the contents.**
- **Create a question bank.**
- **Find web sites related to the topic.**

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Outer Lebesgue measure Lebesgue-measurable sets Lebesgue measure	3	12
Lebesgue-measurable functions Lebesgue-integrable-functions	3	12
The Fatou Lemma The monotone convergence theorem The dominated convergence theorem	3	12
Lebesgue spaces Holder inequality Minkowski inequality	3	12
The Lebesgue measure on R^d Tonelli theorem Fubini theorem	3	12

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

	Lecture	Tutorial	Laboratory or Studio	Practical	Other: Office hours	Total
Contact Hours	**2*15=30**	**0**	**0**	**2*15=30**	**3*15=45**	**105**
Credit	**2*15**	**0**	**0**	**2*15**	**0**	**60**

3. Additional private study/learning hours expected for students per week.
45

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

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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. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
	know the construction of the Lebesguemesure realize the notion of measurable sets and functions recognizethe Lebesgue integrals of functions know the main convergence theorems for the Lebesgue integrals identifythe Lebesgue spaces of p-integrable functions know the construction of the Lebesgue measure on R^d	**Interactive learning process through questions and answers in class. Worked examples through a sequential delivery of surveying lectures. Homework consisting in solving selected exercises.**	**Exams and homework are used to assess the acquired knowledge on the subject.**
2.0	**Cognitive Skills**		
	To integrate functions in the sense of Lebesgue To apply the monotone and dominated convergence theorems for computing limits involving integrals To estimate integrals using Holder and Minkowski inequalities To compute multiple integrals viaTonelli and Fubini theorems	**Lectures are covered by different worked examples. Engage students in discussions with questions and answers. Homework consisting in solving selected exercises. Encourage and develop self education.**	**Homework include problems, solution of which requires scientific thinking, and applications of essential theorems and results of the course Oral and written tests. Explain and communicate the corrected answers of the exams and quizzes. Research projects.**

3.0	**Interpersonal Skills & Responsibility**		
	Punctual attendance of classes is required. Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time. **Students learn to manage their time.** **Accustom students to take responsibility of self learning**	**Discussion.** **Explanation.** **Guidance and supervision of the group assignments for research projects.** **Assignments are given to the students at regular intervals for them to solve and submit on time.**	**Class attendance of students at the beginning of the lecture is recoded.** **Recording of submission of assignment** **Observations, interviews, and peer evaluations.**
	Students should act responsibly and ethically in carrying out individual as well as group projects.		
4.0	**Communication, Information Technology, Numerical**		
	Ability to communicate in written and in oral. Ability to write reports in English **Ability to explain each step in the problem solving process.** **Ability to apply course concepts to mathematical problem solving model.** **Ability to use information technology in communication and research projects.** **Interact with life problems using different methods of thinking and problem solving.**	**Research projects.** **Oral presentations.**	**Periodic written and oral tests.** **Discussion.** **Observation.**
5.0	**Psychomotor**		
	N/A	N/A	N/A

Course LOs #	**Measurable sets and functions**	**Lebesgue integrable functions**	**Convergenc theorems for the Lebesgue integral**	**Lebesgue spaces**	**The product Lebesgue measure**	
Knowledge	**Recall**	**Recall**	**Recall**	**Remember**	**Remember**	
Comprehension	**Discuss**	**Discuss**	**Discuss**	**Summarize**	**Summarize**	
Application	**Assess**	**Assess**	**Assess**	**Use**	**Use**	
Analysis	**Conclude**	**Conclude**	**Conclude**	**Conclude**	**Conclude**	
Synthesis	**Categorize**	**Categorize**	**Categorize**	**Validate**	**Validate**	
Evaluation	**Judge**	**Judge**	**Judge**	**Judge**	**Judge**	

6. 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	**Quizz1**	**4**	**5%**
2	**Mid-term1**	**6**	**20%**
3	**Quizz2**	**8**	**5%**
4	**Mid-term2**	**11**	**20%**
5	**Homework**	**Every week**	**5%**
6	**Research project**	**15**	**5%**
7	**Final exam**	**As scheduled**	**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)

4 hrs/week for students' consultation and academic advice.

E Learning Resources

1. List Required Textbooks **1. W. Rudin, "Real and Complex Analysis" Third Edition.McGraw-hill 1987.** 1. **2. G. Bartle, "The Elements of Real Analysis ."John Wiley & Sons 1976.**
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
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.) **Lecture room with 20 seats. Smart class.**
2. Computing resources (AV, data show, Smart Board, software, etc.) **Computer room with at least 10 systems** **Computer room with 20 seats**
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

Student course evaluation at the conclusion of the course. Sample of assignments and tests. Observations and discussions during the semester.

2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department

Faculty assessment of the course and effectiveness of teaching delivery. Periodic self-assessment of the program.

3 Processes for Improvement of Teaching

Participate to workshops on evaluation approaches and effective teaching methods to enable instructors to improve their teaching skill.
Teaching method will focus on students' learning and on course learning outcomes.

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)

A Committee reviews samples of student work in this course to check on the standard of grades and achievements.
An external faculty member evaluates the course material and the students' work to compare the standard of grades and achievements with those at his university.

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

Carry out Self- assessment at every two years and external assessment invited faculty members every four years. The feedback received from these assessments will be used to plan for further improvement in the course syllabus, teaching method, and delivery of course materials.