



Course Specifications

Course Title:	Mathematical Modeling
Course Code:	MTH 311
Program:	BS-Mathematics
Department:	Mathematics
College:	College of Sciences, AlZulfi
Institution:	Majmaah University, Saudi Arabia

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A. Course Identification

1. Credit hours: 2(2+0)
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input type="checkbox"/> Elective <input checked="" type="checkbox"/>
3. Level/year at which this course is offered: 1 st Semester /3 rd year
4. Pre-requisites for this course (if any): Basic Mathematics (MTH 231)
5. Co-requisites for this course (if any):

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	26	90%
2	Blended	0	0%
3	E-learning	4	10%
4	Distance learning	0	0%
5	Other	0	0%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	26
2	Laboratory/Studio	0
3	Tutorial	0
4	Others (specify)	4
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description :

This course will cover:

Construction of mathematical models, Modeling using proportionality, modeling using geometric similarity, model fitting, difference equations: Modeling change with difference equations, approximating change with difference equations, dynamical systems, systems of difference equations, discrete optimization model, differential equations: population growth, prescribing drug dosage.

2. Course Main Objective

- This course has been designed as an introduction to Mathematical Modeling. This course aims to
- Studying construction, solving, and interpreting of mathematical models.
- Have the knowledge of appreciate the power and limitations of mathematics in solving practical real-life problems.
- Have the knowledge of the basic mathematical modeling skills.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Interpretation and appropriate presentation of results.	K1
1.2	Outline of the mathematical formulation of a different mathematical models.	K1
1.3		
1...		
2	Skills :	
2.1	Knows how to work the mathematical formulation of some actual problems	S3
2.2	Compare and classify to formulate models through different tools.	S3
2.3		
2...		
3	Values:	
3.1	Understand how numerical methods work to solve problems of mathematical modeling in realistic setting.	C3
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Construction of mathematical models	4
2	Modeling using proportionality	4
3	Modeling using geometric similarity	4
4	Model fitting	2
5	Difference equations: Modeling change with difference equations, approximating change with difference equations, dynamical systems, systems of difference equations,	8
6	Discrete optimization model	2

7	Differential equations: population growth, prescribing drug dosage.	6
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Recognize the mathematical modeling meaning.	<p>Direct teaching: lectures and discussions</p> <p>Aimed teaching: Discovery and oral questions</p>	<ul style="list-style-type: none"> • Homework • Quiz • Midterms • Final Exams • E-exam • Presentation •
1.2			
1.3			
2.0	Skills		
2.1	Compare and classify models as deterministic, probabilistic, linear, nonlinear.	<p>Direct teaching: Lectures</p> <p>Aimed teaching: Discovery and oral questions</p> <p>Indirect teaching: Peer Learning</p>	<ul style="list-style-type: none"> • Quiz • Midterms • Final Exams
2.2	Understand how numerical methods work to solve problems of mathematical modeling in realistic setting.	<p>Direct teaching: Lectures</p> <p>Aimed teaching: Discovery and oral questions</p> <p>Indirect teaching: Peer Learning</p>	<ul style="list-style-type: none"> • Homework • Quiz • Midterms • Final Exams •
2.3			
3.0	Values		
3.1	Recognize logical justification of the modeling results.	<p>Direct teaching: Lectures</p> <p>Aimed teaching: Discovery and oral questions</p>	<ul style="list-style-type: none"> • Homework • Quiz • Midterms • Final Exams
3.2			
...			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm 1	7th week	20 %
2	Midterm 2	12th week	20 %
3	Homework	Through of semester	5 %
4	Quizzes	Through of semester	5 %
5	Electronic Test	13th week	5 %
6	Presentation	Through of semester	5 %
7	Final exam	End of semester	40 %
8	Total		100 %
9			

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Department of mathematics has “**Student Academic Advisory Committee**”. This committee is responsible for students counseling and advising works in synchronization and collaboration with the Deanship of Admissions and Registration and Student Affairs. Department of mathematics Alzulfi has a continuous and standardized procedure that be associated with the student's progress until completion of degree and includes psychological, social and behavioral guidance. This advisory committee also maintain the student's files. The students with GPA below than 50 % in Mid 1 and Mid 2 are stayed under serious observation and continuous consultations with respective course instructor about their performing. The course teacher will commit to a minimum scheduled time for student consultation equivalent to 4 HOURS PER WEEK.

The contact with students by e-mail and website.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	1) Frank R. Giordano, William P. Fox, Steven B. Horton. A First Course in Mathematical Modeling, 5 th edition. Brooks/cole, 2014.
Essential References Materials	Sandip Banerjee. Mathematical Modeling: Models, Analysis and Applications, Chapman and Hall/CRC, 2014.
Electronic Materials	https://study.com/academy/lesson/using-mathematical-models-to-solve-problems.html

	https://study.com/academy/lesson/types-of-mathematical-models.html
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> - The size of the room should be proportional to the number of students - Provide enough seats for students. - The number of students do not exceed on 30 in the classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> - Mathematics Lab is equipped with a computer. - Provide overhead projectors and related items i.e smart Board, Wi-Fi, AV. - Updated Math Software i. e Mathematica, Matlab, Maple. etc
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students/ internal committee	Direct (Students evaluation electronically organized by Deanship of registration and admission)/ Verification of students' papers
Extent of achievement of course learning outcomes	Staff members (Peer Reviewer)	Indirect (Frequent meetings consultation among the teaching staffs)
Quality of learning resources.	Staff members (course coordinators)	Direct (Meeting between course coordinators and the tutors)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	