



Course Specifications

Course Title:	Differential Equations
Course Code:	Math 318
Program:	Biomedical Technology
Department:	Mathematics Department
College:	College of Sciences
Institution:	King Saud University

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A. Course Identification

1. Credit hours:		4 (4,0,2)	
2. Course type			
a.	<input type="checkbox"/>	College <input type="checkbox"/>	Department <input checked="" type="checkbox"/>
b.		Required <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>
3. Level/year at which this course is offered:		5th Level /3rd Year	
4. Pre-requisites for this course (if any):		Math 228	
5. Co-requisites for this course (if any):		NA	
6. Mode of Instruction (mark all that apply)			
No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	6	100
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		
7. Actual Learning Hours (based on academic semester)			
No	Activity	Learning Hours	
Contact Hours			
1	Lecture	56	
2	Laboratory/Studio		
3	Tutorial	28	
4	Others (specify)		
	Total	84	
Other Learning Hours*			
1	Study	56	
2	Assignments	56	
3	Library		
4	Projects/Research Essays/Theses		
5	Others (specify)		
	Total	112	

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

Math 318 covers topics on ordinary differential equations, including linear equations, mathematical models and involving differential equations, equations with variable coefficients, existence and uniqueness of solutions, series solutions, singular points, transform methods, and boundary value problems; application of differential equations to real world problems.

2. Course Main Objective

Upon completion of Math 318, the student will be able to classify differential equations as to ordinary, linear, non-linear, order and degree, and to construct differential equations under given conditions. They will be able to solve linear homogeneous and non-homogeneous differential equations and their related applied problems which are linear in form. They will be able to find the Laplace Transform of specified functions and solving linear ordinary differential equations using the Laplace Transform.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge:	
1.1	Define the basic concepts of the ordinary differential equations and classify differential equations as to ordinary, partial, linear, non-linear, order and degree, and to construct differential equations under given conditions.	K1
2	Skills:	
2.1	Apply appropriate analytical and numerical methods to solve linear differential equations.	S2
2.2	Competence in finding the Laplace Transform of specified functions and solving linear ordinary differential equations using the Laplace Transform.	S2
2.3	Appreciate the relevance of mathematics as an effective tool in solving real-life problems and present solutions to engineering problems orderly and accurately.	S4
3	Competence:	

C. Course Content

No.	List of Topics	Contact Hours
1	First-order differential equations, solutions and initial value problems, separable equations, linear equations, existence and uniqueness of solution, exact equations, exact differential form, special integrating factors, substitutions and transformations, Bernoulli equations, Mathematical models involving first-order equations, compartmental analysis, improved Euler's method, Taylor and Runge-Kutta, direction field, the approximation method of Euler.	24
2	Linear differential equations of order n. General solution of a homogeneous and nonhomogeneous linear equation, the general solution of differential equations with constants coefficients, auxiliary equation with different cases, nonhomogeneous equations, the method of undetermined coefficients. Linear differential with variable-coefficient, Reduction of order, Cauchy-Euler 's equations. Series solutions of second linear differential equations with Polynomial coefficients, solutions of linear system.	24
3	Definition of the Laplace transform, properties of the Laplace transform, inverse Laplace transform, solving initial value problems, transforms of discontinuous and periodic functions, convolution, impulses, and the Dirac delta function, solving Linear system with Laplace transform.	24
4	Fourier series, standard formulae, periodic functions, even and odd functions, Fourier sine and cosine series.	12
Total		84

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	Knowledge		
1.1	Define the basic concepts of the ordinary differential equations and classify differential equations as to ordinary, partial, linear, non-linear, order and degree, and to construct differential equations under given conditions.	Lectures and tutorials	Quizzes
2	Skills		
2.1	Apply appropriate analytical methods to solve linear differential equations.	Lectures and tutorials	Periodicals and Final Exam
2.2	Competence in finding the Laplace Transform of specified functions and solving linear ordinary differential equations using the Laplace Transform.		Periodicals and Final Exam
2.3	Appreciate the relevance of mathematics as an effective tool in solving real-life problems and present solutions to engineering problems orderly and accurately.		Assignments
3	Competence		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1 in the class. Assignments/Participation/Assiduity	3	10%
2	Midterm exam	8	30%
3	Quiz 2 in the class	9	10%
4	Tutorial	-	10%
	Final exam	12	40%

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

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

Eight (8) office hours per week are dedicated to students (the detailed timetable and organizer for the faculty is posted on the office's door).

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	R. K. Nagle, E. B. Saff, and A. D. Snider, Fundamentals of Differential Equations, 8th Edition.
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	
Technology Resources (AV, data show, Smart Board, software, 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.	Peer Reviewer and students	Indirect
Extent of achievement of CLOs.	Faculty	Direct and indirect
Quality of learning resources.	Program Leader	Direct and indirect

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	Development and Quality Committee
Reference No.	
Date	01/03/2021