



SULTAN QABOOS UNIVERSITY

COURSE OUTLINE

PROGRAM: Mathematics

1. Course Code	MATH3302	
2. Course Title	Ordinary Differential Equations	
3. Credits	3	
4. Pre-requisite Course(s)	Math2108(Calculus 2)	
5. Co-requisite Course(s)		
6. Equivalent Course(s)		
7. Incompatible Course(s)		
8. Course Category	<input type="checkbox"/> University Requirement	<input type="checkbox"/> University Elective
	<input type="checkbox"/> College Requirement	<input type="checkbox"/> College Elective
	<input checked="" type="checkbox"/> Department Requirement	<input type="checkbox"/> Department Elective
	<input type="checkbox"/> Specialization Requirement	<input type="checkbox"/> Specialization Elective
	<input type="checkbox"/> Other (specify):	
9. Course Owner	College: Science	Department: Mathematics and Statistics
10. Course Type	<input type="checkbox"/> Lecture	<input type="checkbox"/> Lecture/Lab
	<input type="checkbox"/> Lecture/Seminar	<input type="checkbox"/> Lecture/Studio
	<input checked="" type="checkbox"/> Lecture/Tutorial	<input type="checkbox"/> Lecture/Lab/Tutorial or Seminar
	<input type="checkbox"/> Tutorial	<input type="checkbox"/> Laboratory (Practical)
	<input type="checkbox"/> Field or Work Placement	<input type="checkbox"/> Studio
	<input type="checkbox"/> Seminar	<input type="checkbox"/> Internship
	<input type="checkbox"/> Workshop	<input type="checkbox"/> Project
11. Language of Instruction	English	
12. Course Description		
This is an introductory course in ordinary differential equations dealing with basic theory as well as applications. The topics to be covered will include first and second order differential equations and their various solution techniques and applications: reduction of order, homogeneous equations with constant and variable coefficients, Cauchy-Euler equations, method of undetermined coefficients, and variation of parameters. Applications of second order equations will also be given. Power series solutions will be also discussed.		
13. Teaching/Learning Strategies		
(a) Problem solving and practice exercises. (b) Lecture-Discussion method. (c) Peer tutoring. (d) Cooperative learning. (e) Organize formative and summative assessment. (f) Analyze students' performance and provide feedback. .		
14. Assessment Components and Weight [%]		
<input type="checkbox"/> Quizzes 15%	<input type="checkbox"/> Practical	<input type="checkbox"/> Other (specify):
<input type="checkbox"/> Homework assignments 5%	<input type="checkbox"/> Project	
<input type="checkbox"/> In-term examination(s) 30%	<input type="checkbox"/> Final examination 50%	
15. Grading Method		
<input checked="" type="checkbox"/> A-F Scale <input type="checkbox"/> Pass/Not passed		
16. Textbook(s) and Supplemental Material		

Fundamentals of Differential Equations

Authors: R. K. Nagle, E. B. Saff and A. D. Snider Publisher: Addison-Wesley, 8th.edition (2012).

Supplementary Materials: On Moodle

17. Matching Course Objectives with Program Outcomes and SQU Graduate Attributes

SQU Graduate Attributes

A. SQU graduates should be able to: <ol style="list-style-type: none"> 1. apply the knowledge and skills relevant to the specialization 2. communicate effectively and use information and communication technologies 3. critically analyze complex information and present it in simple clear manner 	B. SQU graduates possess <ol style="list-style-type: none"> 1. interpersonal communication skills and alignment with culture of international labour market to assist them in practical life and in living successfully 2. skills and motivation for independent learning and engagement in lifelong learning and research 3. work ethics and positive values, and intellectual independence and autonomy 4. teamwork skills and display potential leadership qualities 	C. SQU graduates should <p>relish good citizenship qualities, be conscious of their national identity and be socially responsible, engage in community affairs and be mindful of contemporary issues.</p>
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#	Intended Student Learning Outcome /Course Learning Objective	Relevant Program Outcome(s)	Applicable Attribute(s)
1.	Distinguish between ordinary differential and partial differential equations, linear and nonlinear differential equations, and initial value and boundary value problems.	The ability to identify, think critically and to engage in innovative applications of mathematics and statistics in diverse area.	A1,A3,B2
2.	State and apply the existence and uniqueness theorem for first order and second order linear differential equation	The ability to identify, think critically and to engage in innovative applications of mathematics and statistics in diverse area.	A1,A3,B2
3.	Determine the interval of existence of solutions to initial value problems.	The ability to identify, formulate and solve mathematical and/or statistical problems	A1,A3
4.	Identify and Solve Separable, linear, homogeneous, and nonhomogeneous, Bernoulli, Exact, and non-exact first order Differential equations.	The ability to identify, formulate and solve mathematical and/or statistical problems	A1,A3
5.	Use appropriate transformations and reduce other types of equations to separable and/or linear first order differential equations.	The ability to identify, formulate and solve mathematical and/or statistical problems	A1,A3
6.	Solve first order differential equations	The ability to identify, formulate and solve mathematical and/or statistical problems	A1,A3
7.	Use one compartment system to develop mathematical model for mixing and population problems into first order differential equations, determine the solution, and interpret the result.	The ability to identify, think critically and to engage in innovative applications of mathematics and statistics in diverse area.	A1,A3,B2
8.	Solve homogeneous second order linear differential equations with constant and non-constant coefficients.	The ability to identify, think critically and to engage in innovative applications of mathematics and statistics in diverse area.	A1,A3
9.	Use the reduction of order formula to find a linearly independent solution for linear second order differential equations	The ability to identify, think critically and to engage in innovative applications of mathematics and statistics in diverse area.	A1,A3
10.	Show an understanding of the concept of solutions, linearly independent solutions, fundamental solutions, and general solution of homogeneous/nonhomogeneous second order differential equations.	The ability to identify, think critically and to engage in innovative applications of mathematics and statistics in diverse area.	A1,A3
11.	Identify the connection between Wronskian and linearly dependent or independent solutions to a differential equation.	The ability to identify, think critically and to engage in innovative applications of mathematics and statistics in diverse area.	A1,A3

12.	Relate solutions of homogeneous and nonhomogeneous equations, and solve non homogeneous equations using undetermined coefficients, variations of parameters, and the principle of superposition.	The ability to identify, think critically and to engage in innovative applications of mathematics and statistics in diverse area.	A1,A3
13.	Develop mathematical model for damped and undamped, and free and forced vibration problems, determine its motion and demonstrate the ability to interpret the system behavior physically and graphically	The ability to identify, think critically and to engage in innovative applications of mathematics and statistics in diverse area.	A1,A3,B2
14.	Use the method of power series solutions to solve first and higher order linear differential equations including the method of Frobenius	The ability to identify, think critically and to engage in innovative applications of mathematics and statistics in diverse area.	A1,A3,B2
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16. Student Responsibilities

It is the student's responsibility to know and comply with all University Academic Regulations relevant to participation in this course. These regulations specifically include attendance requirement and students' academic code of conduct.

For attendance, it is the student's responsibility to be punctual and to attend all classes.

Students are expected to perform their work with honesty and avoid any academic misconduct, which is defined as the use of any dishonest or deceitful means to gain some academic advantage or benefit. This can take many forms, including but not limited to, the following: copying, plagiarism, collusion and forging documents. For full details, please refer to the Undergraduate Academic Regulations and to the Student Academic Misconduct Policy.

Additionally, this course requires that you:

- Students should be aware of and abide by all University Regulations.
- Attendance: Attendance is compulsory. A student missing 10% of the total allocated course hours will be sent a warning notice and a student missing more than 20% may (in accordance with the University Rules) be barred from taking the final exam.
- Office Hours: The office hours of the course team will be posted on the Moodle. However, students may also see the course instructors by prior appointment.
- Moodle: Students are strongly advised to consult Moodle regularly for the MATH 3302 course in order to get all updated course information. The key word for Moodle is: MATH3302.
- Academic Dishonesty: All forms of academic dishonesty are prohibited and penalties are. For more details, please see the latest edition of SQU Undergraduate Academic Regulations.

COURSE INFORMATION			
Course Code	MATH3302	Course Title	Ordinary Differential Equations
Semester/ Year	Fall2022	Section	2
Day, Time, and Place	See Appendix A		
Course Coordinator	Prof. Qamar Jalil Ahmad Khan		
Office Location	0079	Office Hours	Sun10:00-11:50 Mon.:11:00-11:50
Office Tel. Ext.	1429	Email	qjalil@squ.edu.om

Tentative Schedule			
Week	Lecture/ Topic	Material to be covered	Assessment
1	Section 1.1	Background Exercise/Tutorial:2, 3, 4, 6, 7, 8, 9, 11, 15, 16	
2	Section 1.2 Section 2.2	Solutions and Initial Value Problems Examples:1,2,3,4,5,6,7,8,9;Exercises/Tutorials:1b, 2c, 4, 5, 6, 9, 11, 13, 16, 19, 20, 21, 22, 23, 27 Separable Equations Examples:1,2,3;Exercises/Tutorials:1, 4, 6, 9, 11, 12, 13, 16, 18, 19, 20, 21, 23, 26, 34, 38	
3	Sections 2.3&2.4	Linear Equations Examples:1,2;Exercises/Tutorials:1, 2, 3, 4, 5, 6,7, 8, 10,11,13, 14, 15,17, 19, 22, 30, 37 Exact Equations Examples:2,3,4;Exercises/Tutorials:2, 3, 4 ,7 ,10, 12, 15, 16, 19, 21, 24, 26, 27(a), 29	
4	Section 2.5	Special Integrating Factors Examples:1,2;Exercises/Tutorials:2, 4, 6, 7, 8, 9, 11, 13, 18, 20	Quiz-I Tutorial class 1.1, 1.2,2.2,2.3
5	Section 2.6	Substitutions and Transformations Examples:1,2,3,4;Exercises/Tutorials:1,4,6,7,10,12,13,17,20, 21,23,26,30,31, 33, 41, 42, 43b	
6	Section 3.2	Compartmental Analysis Examples:1,2,3;Exercises/Tutorials:1, 2, 4, 8, 9, 14, 21, 22, 23, 24	(Tutorial class) Quiz-II Sections:To be announced
7	Section 4.2	Homogeneous Linear Equations: The General Solutions Examples:1,2,3,4;Exercises/Tutorials:1,2,4,7,10,14,15,19,20, 21,22,23, 30, 31, 34(a) &(c),35, 37	
8	Section 4.3	Auxiliary Equations with Complex Roots Examples:1,2,3;Exercises/Tutorials:1, 3, 5, 7, 12, 13, 15, 21, 23, 25, 29 (a)& (c)	
9	, Section 4.4 Section 4.5	Nonhomogeneous Equations:The Method of Undetermined Coefficients Examples:1,2,3,4,5,6,7;Exercises/Tutorialds:1, 3, 5, 6, 7, 8, 10, 11, 15, 18, 19, 23, 27,30, 31 The Superposition Principle and Undetermined Coefficients Reviseted Examples:1,2,4,5;Exercises/Tutorials:1, 4, 8, 9, 11, 14, 20, 21, 26, 27, 28, 31, 32, 33	Test Sections: To be announced 10 th Nov. Thursday,Time: 6:15-7:30 ,E10,E11
10	Section 4.6	Variation of Parameters Examples:1,2;Exercises/Tutorials:4, 6, 7, 11, 12, 14, 17, 18 Variable-Coefficient Equations	

11	Section 4.7 Section 4.1	Examples:1,2,3, Exc. 42, 4 (using formula);Exercises/Tutorials:1, 4, 5, 6, 10, 13, 14, 15, 20, 38 ,39, 41, 46, 48 Introduction:The Mass-Spring Oscillator Examples:1.2,3;Exercises/Tutorials:1,3,4 A Closer Look at Free Mechanical Vibrations	Homework Posted Quiz-3 Tutorial class Sections: To be announced
12	Section 4.9 Section 4.10 (self study) Sect.8.2	Examples1,2,3;Exercises/Tutorials: 2, 3, 7, 8, 9, 10, 11 A Closer Look at Forced Mechanical Vibrations Examples:1,2;Exercises/Tutorials:3,4, 11 (equation of motion only) Power Series and Analytical Functions Examples:3,4,5;Exercises/Tutorials:23, 24, 25, 26, 27, 28 Power Series Solutions to Linear Differential Equations Examples:1,2,3,4;Exercises/Tutorials:3, 5, 10, 11, 15, 21, 23	
13	Section 8.3 Section 8.4	Power Series and Analytical Functions Examples:3,4,5;Exercises/Tutorials:23, 24, 25, 26, 27, 28 Power Series Solutions to Linear Differential Equations Examples:1,2,3,4;Exercises/Tutorials:3, 5, 10, 11, 15, 21, 23 Equations with Analytic Coefficients Examples:2,3,4;Exercises/Tutorials:1, 3, 7, 9, 11, 14, 15, 19	Tutorial class Quiz-4 Sections:To be announced
14	Section 8.6	Method of Frobenius Examples:1,2,3;Exercises/Tutorials:2, 3,7, 9, 10, 11, 13, 15, 19, 23, 25, 26, 30	(Tutorial class) Homework Quiz
15	Sections 8.6	Method of Frobenius Examples:1,2,3;Exercises/Tutorials:2, 3,7, 9, 10, 11, 13, 15, 19, 23, 25, 26, 30	

APPENDIX A: INSTRUCTORS OF MULTIPLE SECTIONS

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APPENDIX B: ADDITIONAL INFORMATION

- 1) Students must NOT share pencils,erasers,calculators,.....during Quizzes,Tests and Final exam.
- 2). There will be NO make-up Quizzes or Tests if you missed any sheduled quiz or test.If a student misses a Quiz or Test without a valid excuse, the mark in that Quiz or Test will be ZERO. If within ONE week after a Test, a student (who misses a Test) brings a valid excuse supported by proper documents that proves the reason of absence.his/her grade will be based on the remaining part of the assessment components.
- 3) Model solutions of the testshould have been posted on the Moodle page by the time Test papers are returned during a class. Students should check their totals and that all their answers have been marked. Any request to review the answers must be made immediately to their instructor while in the classroom. NO request will be accepted after it leaves the classroom.