

Philadelphia University	 PHILADELPHIA UNIVERSITY THE WAY TO THE FUTURE	Approval date:
Faculty of Science		Issue:
Department of Math		Credit hours: 3
Academic year 2021/2022		Course Syllabus

Course information

Course#	Course title	Prerequisite
250372	Computer Aided Mathematics	ODEs 250203
Course type		Class time
<input type="checkbox"/> University Requirement <input type="checkbox"/> Faculty Requirement <input checked="" type="checkbox"/> Major Requirement <input type="checkbox"/> Elective <input checked="" type="checkbox"/> Compulsory		MW 11:15-12:05
		Room #
		2827

Instructor Information

Name	Office No.	Phone No.	Office Hours	E-mail
Feras Awad	822	2132	ST 11:15–12:30 MW 09:45–11:00	fawad@philadelphia.edu.jo

Course Delivery Method

Course Delivery Method			
<input type="checkbox"/> Physical	<input type="checkbox"/> Online	<input checked="" type="checkbox"/> Blended	
Learning Model			
Precentage	Synchronous	Asynchronous	Physical
	0%	33%	67%

Course Description

What is Mathematica? The structure of Mathematica, Notebook interfaces, editing Cells and Text, Palettes. Mathematica as a Calculator: Basic Arithmetic, precedence, Built-in Constants: Built-in functions. Numerical Notation: prefix, postfix, infix forms for Built-in functions, Mathematica help. Variables and functions: Rules for Names, immediate Assignment, functions, substitution rule, anonymous functions. Lists: what is a list? Functions producing lists, working with elements of list, listable functions, useful functions. Logic and set theory: being logical, truth tables, element handling sets, Quantifiers. number theoretic functions, numerical functions, Fibonacci sequence, digits in Numbers, selecting from lists. Computer algebra: working with polynomials and powers. Working with rational functions. working with transcendental functions. Solving equations: equations and their solutions, inequalities, single variable calculus: function domain and range, limits, differentiation, implicit differentiation, Maximum and minimum, integration. Sums and products: sequences, the sum command, Taylor polynomials, the product command, vectors and matrices: vectors, Matrices, the conditional function if. Special types of matrices. Basic matrix operations, solving linear systems.

Course Learning Outcomes

Number	Outcomes	Corresponding Program outcomes
Knowledge		
K1	Understand the basic principles of the Wolfram Language.	K_p1
K2	Learn the use of commands and functions for solving and visualizing mathematical problems.	K_p3
Skills		
S1	Use Wolfram Language to solve problems graphically, numerically and analytically.	S_p4
Competencies		
C1	Thinking reasonably and the ability to make decisions.	C_p1
C2	Work in a team to implement one of the tasks of the course.	C_p2

Learning Resources

Course textbook	Feras Awad (2018) A Glimpse to Mathematica [Wolfram Language] (3 rd ed.). Instructor Lectures and Notes.
Supporting References	<ul style="list-style-type: none"> • Wellin, P. (2013) Programming with Mathematica: An Introduction (1st ed.). Cambridge University Press. • Hastings, C., Mischo, K., Michael M. (2015) Hands-on start to Wolfram Mathematica (1st ed.). Champaign: Wolfram Media, Inc.
Supporting websites	WolframCloud: www.wolframcloud.com/
Teaching Environment	<input type="checkbox"/> Classroom <input checked="" type="checkbox"/> laboratory <input checked="" type="checkbox"/> Learning platform <input type="checkbox"/> Other

Meetings and Subjects Timetable

Week	Topic	Learning Methods	Tasks	Learning Material
1	Explanation of the study plan for the course, and what is expected to be accomplished by the students. WolframCloud: Sign-in, usage, mobile app.	Lecture		Course Syllabus Webpage Application
2	Introduction: What is Mathematica? The Structure of Mathematica. Common Kinds of Interfaces to Mathematica. Notebook Interfaces. Editing Cells and Text. Palettes.	Lecture		Chapter 1
3	Mathematica as a Calculator: Commands for Basic Arithmetic. Precedence. Built-in Constants. Built-in Functions. Numerical and Scientific Notations. Prefix, Postfix, Infix Forms for Built-in Functions. Mathematica Help.	Lecture		Chapter 2

4	Variables and Functions: Rules for Names. Immediate Assignment. Functions. Substitution Rule. Anonymous Functions.	Lecture	Quiz	Chapter 3
5	Lists: What is a List? Functions Producing Lists. Working with Elements of a List. Listable Functions. Useful Functions.	Lecture		Chapter 4
6	Logic and Set Theory: Being Logical. Truth Tables. Element \in . Handling Sets. Quantifiers.	Lecture	Quiz	Chapter 5
7	Number Theory Primes. Integer Factorization. Number Theoretic Functions. Numerical Functions. Fibonacci Sequence. Digits in Numbers.	Lecture		Chapter 6
8	Selecting from Lists.	Lecture	Midterm Exam	Chapter 6
9	Computer Algebra: Working with Polynomials and Powers. Working with Rational Functions. Working with Transcendental Functions. The FullSimplify Command.	Lecture		Chapter 7
10	Solving Equations: Equations and Their Solutions. Inequalities.	Lecture		Chapter 8
11	Single Variable Calculus: Function Domain and Range. Limits. Differentiation. Implicit Differentiation. Maximum and Minimum. Integration	Lecture	Quiz	Chapter 9
12	Sums and Products: Sequences. The Sum Command. Taylor Polynomials. The Product Command.	Lecture		Chapter 10
13	Vectors and Matrices: Vectors. Matrices. The Conditional Function If. Special Types of Matrices. Basic Matrix Operations.	Lecture		Chapter 11
14	Ordinary Differential Equations: Analytic Solutions of an ODE. Equations with Initial or Boundary Conditions. Numerical Solutions of ODEs. Laplace Transform.	Lecture	Quiz	Chapter 12
15	Review	Lecture		
16	Final Exam			

* Includes: Lecture, flipped Class, project- based learning, problem solving based learning, collaborative learning

Course Contributing to Learner Skill Development

Using Technology
<ul style="list-style-type: none"> • Use Wolfram Language to solve mathematical problems.
Communication Skills
<ul style="list-style-type: none"> • Choose a mathematical problem and present it to the students and explaining its solution method using Wolfram Language.
Application of Concepts Learnt
<ul style="list-style-type: none"> • Choose a famous math problem on YouTube and solve it using Wolfram Language.

Assessment Methods and Grade Distribution

Assessment Methods	Grade Weight	Assessment Time (Week No.)	Link to Course Outcomes
Mid Term Exam	30%	8	K1, K2
Various Assessments *	30%	Continuous	S1, C1, C2
Final Exam	40%	16	K1, K2
Total	100%		

* Includes: quiz, in class and out of class assignment, presentations, reports, videotaped assignment, group or individual projects.

Alignment of Course Outcomes with Learning and Assessment Methods

Number	Learning Outcomes	Learning Method*	Assessment Method**
Knowledge			
K1	Understand the basic principles of the Wolfram Language.	Lecture	Exam
K2	Learn the use of commands and functions for solving and visualizing mathematical problems.	Lecture	Exam
Skills			
S1	Use Wolfram Language to solve problems graphically, numerically and analytically.	Lecture	Computer Assignment
Competencies			
C1	Thinking reasonably and the ability to make decisions.	Discussion	Quiz
C2	Work in a team to implement one of the tasks of the course.	Project	Group Project

* Includes: Lecture, flipped Class, project- based learning, problem solving based learning, collaborative learning

** Includes: quiz, in class and out of class assignment, presentations, reports, videotaped assignment, group or individual projects.

Course Policies

Policy	Policy Requirements
Passing Grade	The minimum passing grade for the course is (50%) and the minimum final mark recorded on transcript is (35%).
Missing Exams	<ul style="list-style-type: none"> • Missing an exam without a valid excuse will result in a zero grade to be assigned to the exam or assessment. • A Student who misses an exam or scheduled assessment, for a legitimate reason, must submit an official written excuse within a week from an exam or assessment due date. • A student who has an excuse for missing a final exam should submit the excuse to the dean within three days of the missed exam date.
Attendance	The student is not allowed to be absent more than (15%) of the total hours prescribed for the course, which equates to six lectures days (M, W) and seven lectures (S, T, T). If the student misses more than (15%) of the total hours prescribed for the course without a satisfactory excuse accepted by the dean of the faculty, s/he will be prohibited from taking the final exam and the grade in that course is considered (zero), but if the absence is due to illness or a compulsive excuse accepted by the dean of the college, then withdrawal grade will be recorded.

Academic Honesty	Philadelphia University pays special attention to the issue of academic integrity, and the penalties stipulated in the university's instructions are applied to those who are proven to have committed an act that violates academic integrity, such as: cheating, plagiarism (academic theft), collusion, and violating intellectual property rights.
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Program Learning Outcomes to be Assessed in this Course

Number	Learning Outcome	Course Title	Assessment Method	Target Performance level
Sp4	The use of technology and software in the various fields of mathematics.	Computer Aided Mathematics	Project	100% of the students get 70% or more on the rubric

Description of Program Learning Outcome Assessment Method

Number	Detailed Description of Assessment
Sp4	The student is given a problem, and use Wolfram Language to write a code that solves the problem.

Assessment Rubric of the Program Learning Outcome

	Poor (1 pt.)	Fair (2 pts)	Good (3 pts)
Code Structure Structure of code, use of functions and procedures, code segmentation	Long code segments, improper usage of functions, functions with side effects.	Code structure needs work.	Code structure has perfectly followed guidelines. Short code segments, proper use of functions.
Code Reuse How well code reuse is implemented	Too much redundancy in code	Occasional code redundancy	No code redundancy
Correctness How correct is the output of the program	Program does not work correctly; output is wrong most of the time or there is no output.	Program works correctly in general in most areas but not in all areas.	Program works correctly in all areas and generates correct output.
Execution How smoothly does the program execute - are there any bugs	Program does not execute.	Program executes but crashes in some areas.	Program executes perfectly.