

QFO-AP-VA-008	رمز النموذج :	اسم النموذج : خطة المادة الدراسية	 جامعة فيلادلفيا Philadelphia University
2	رقم الإصدار: (Rev)	الجهة المصدرة: نائب الرئيس للشؤون الأكاديمية	
2021-5-4	تاريخ الإصدار:	الجهة المدققة : اللجنة العليا لضمان الجودة	
4	عدد صفحات النموذج :		

Course Title: : Numerical analysis			Course code: 750272			
Course Level: 2			Course prerequisite(s) and/or corequisite(s): 750114			
Lecture Time:			Credit hours: 3			
	UR ☐	FR ☐	DR ☐	C ☒	E ☐	

Academic Staff Specifics

Name	Rank	Office Number and Location	Office Hours	E-mail Address

The Learning Style Used in Teaching the Course

The Learning Style			
Blended Learning		☐	
Electronic Learning		☐	
Face-to-Face Learning		☒	
Face-to-Face	Electronic	Blended	Percentage
100%	-	-	

Course Description:

Numerical analysis involves the design, analysis, and implementation of approximation methods for various problems. This module introduces the concepts of numerical analysis starting with the Mathematical Preliminaries then presenting the Solution of Equations in One Variable, Interpolation and Polynomial Approximation, Direct Methods of Solving Linear Systems of Equations, Iterative Methods for Solving Linear Systems of Equations, The Iterative Methods for Solving Nonlinear Systems of Equations and the Curve Fittings.

Course Objectives:

The main goal of the module is to give students a clear understanding and deep knowledge how the typical of "real life" mathematical, physical, or engineering problems are to be solved in the modern setting. As opposed to tendency in lower-level mathematical courses to teach recipes for "exact" solving particular problems fitting into very special form, this module provides the idea of approximate solving wide variety of applied standard problems on a computer by numerical methods.

Course Components

- Mathematical Preliminaries: Computer arithmetic, round-off error, source of errors
- Solution of equations in one variable: Bisection method, fixed point method, false position method, Secant method, Newton-Raphson method, Interpolation and polynomial approximation
- Introduction to interpolation
 - Direct methods for solving linear systems of equations
 - Iterative methods for solving linear systems
 - Iterative methods for solving nonlinear systems
 - Curve fitting techniques

Text book:

Richard L. Johnson and Douglas J. Faires, Numerical Analysis, 9th Edition, Brooks/ Cole 2010..

In addition to the above, the students will be provided with handouts by the lecturer.

Teaching Methods:

Duration: 16 weeks in first semester, 48 hours in total

Lectures: 32 hours, 2 per week

Tutorial: 16, 1 per week.

Laboratories: 5 hours in total, 1hour per three weeks.

Learning Outcomes:

A- Knowledge and understanding

A1-Recognize how numerical methods presented in the course work for solving various standard mathematical problems in realistic settings.

A2-Select the appropriate algorithm to solve the problem based on criterion of its suitability for present-day computers

B- Intellectual Skills.

B1-Interpret correctly machine output and provide a good understanding of the problems of error analysis and convergence of algorithms.

C- Practical skills.

C1-Apply effectively numerical algorithms presented in the course based on ready-to-use computer programs and understand issues of algorithms complexity and programmability.

A. Transferable skills

D1) Support an integrated approach to the deployment of communication skills to work effectively with others

Learning outcomes achievement:

- **Development: A1and B1are developed through the lectures.**
A2 is developed through tutorials and home works
C1 is developed through tutorials and lab sessions

- **Assessment: A1, A2 and B1 are assessed by quizzes and written exams, while C1 and D1 is assessed by assignments and labs work.**

Assessment instruments

- Short reports and/ or presentations, and Short research projects
- Quizzes.
- Home works
- Final examination: 40 marks

<u>Allocation of Marks</u>	
Assessment Instruments	Mark
Mid Exam	30
Reports, research projects, Quizzes, Home works, Projects	30
Final examination:	40
Total	100

Documentation and academic honesty

- Documentation style (with illustrative examples)
- Protection by copyright
- Avoiding plagiarism.

Documentation and academic honesty

- Documentation style (with illustrative examples)
 - Practical works reports must be presented according to the style specified in the homework and practical work guide
- Protection by copyright
- Avoiding plagiarism
 - Any stated plagiarism leads to an academic penalty

The assignments that have work to be assessed will be given to the students in separate documents including the due date and appropriate reading material.

Documentation and Academic Honesty

Submit your homework covered with a sheet containing your name, number, course title and number, and type and number of the home work (e.g. assignment, and project).

Any completed homework must be handed in the class on the due date. After the deadline “zero” will be awarded. You must keep a duplicate copy of your work because it may be needed while the original is being marked.

You should hand in with your assignments:

- A brief report to explain your findings.
- Your solution of given problem

For the research report, you are required to write a report similar to a scientific research paper. It should include:

- *Ab-stract:* It describes the main synopsis of your paper.
- *Introduction:* It provides background information necessary to understand the research and getting readers interested in your subject. The introduction is where you put your problem definition, summary of contribution, related work, and is likely where the bulk of your sources will appear.
- *Methods (Algorithms and Implementation):* Describe your methods here. Summarize the algorithms (if any) generally, highlight features relevant to your project, and refer readers to your references for further details. Information from sources must be rephrased in own words, “copy-and-paste” from documents, found for example on the Internet, is NOT allowed. It is allowed to

use short quotations, or figures, from other documents, but then the source **MUST** be clearly stated in the reference list (please check copy rights). Papers not fulfilling these rules will be failed.

- **Results and Discussion (Benchmarking and Analysis):** This section is the most important part of your paper. It is here that you demonstrate the work you have accomplished on this project and explain its significance. The quality of your analysis will impact your final grade more than any other component on the paper. You should therefore plan to spend the bulk of your project time not just gathering data, but determining what it ultimately means and deciding how best to showcase these findings.
- **Conclusion:** The conclusion should give your reader the points to “take home” from your paper. It should state clearly what your results demonstrate about the problem you were tackling in the paper. It should also generalize your findings, putting them into a useful context that can be built upon. All generalizations should be supported by your data, however; the discussion should prove these points, so that when the reader gets to the conclusion, the statements are logical and seem self-evident.
- **Bibliography:** Refer to any reference that you used in your assignment. Citations in the body of the paper should refer to a bibliography at the end of the paper.

• Protection by Copyright

1. Coursework, laboratory exercises, reports, and essays submitted for assessment must be your own work, unless in the case of group projects a joint effort is expected and is indicated as such.
2. Use of quotations or data from the work of others is entirely acceptable, and is often very valuable provided that the source of the quotation or data is given. Failure to provide a source or put quotation marks around material that is taken from elsewhere gives the appearance that the comments are ostensibly your own. When quoting word-for-word from the work of another person quotation marks or indenting (setting the quotation in from the margin) must be used and the source of the quoted material must be acknowledged.
3. Sources of quotations used should be listed in full in a bibliography at the end of your piece of work.

• Avoiding Plagiarism

1. Unacknowledged direct copying from the work of another person, or the close paraphrasing of somebody else's work, is called plagiarism and is a serious offence, equated with cheating in examinations. This applies to copying both from other students' work and from published sources such as books, reports or journal articles.
2. Paraphrasing, when the original statement is still identifiable and has no acknowledgement, is plagiarism. A close paraphrase of another person's work must have an acknowledgement to the source. It is not acceptable for you to put together unacknowledged passages from the same or from different sources linking these together with a few words or sentences of your own and changing a few words from the original text: this is regarded as over-dependence on other sources, which is a form of plagiarism.
3. Direct quotations from an earlier piece of your own work, if not attributed, suggest that your work is original, when in fact it is not. The direct copying of one's own writings qualifies as plagiarism if the fact that the work has been or is to be presented elsewhere is not acknowledged.
4. Plagiarism is a serious offence and will always result in imposition of a penalty. In deciding upon the penalty the Department will take into account factors such as the year of study, the extent and proportion of the work that has been plagiarized, and the apparent intent of the student. The penalties that can be imposed range from a minimum of a zero mark for the work (without allowing resubmission) through caution to disciplinary measures (such as suspension or expulsion).

Course/Module Academic Calendar

Week	Basic and support material to be covered	HW
(1)	Mathematical Preliminaries: Computer arithmetic, round-off error, source of errors	
(2)	Solution of equations in one variable Bisection method	
(3)	Fixed point method, False position method	
(4)	Secant method, Newton-Raphson method	
(5)	Interpolation and polynomial approximation, Introduction to interpolation	Homework
(6)	Linear and Lagrange interpolation, Newton's polynomial	

(7)	Direct methods for solving linear systems of equations, Gaussian elimination	
(8)	Pivoting strategy, LU factorization	
(9)	Iterative methods for solving linear systems	
(10)	Jacobi iteration,	Homework
(11)	Gauss-Seidel iteration	
(12)	Iterative methods for solving nonlinear systems: Fixed point iteration	
(13)	Iterative methods for solving nonlinear systems: Seidel iteration, Newton's method	
(14)	Curve fitting techniques: Least-square line	Homework
(15)	Polynomial fitting, Least-square power fit Tutorial, Homework Exam	
(16)	Final Exam	

Expected workload

On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.

Attendance policy

Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Module References

Students will be expected to give the same attention to these references as given to the Module textbook(s)

Programming with mathematica: an Introduction , Wellin,Paul R., Cambridge:
Cambridge University Press, 2013

Website(s):

<http://ecourse.philadelphia.edu.jo/login/index.php> // our e-course