SEEE1022 INTRODUCTION TO SCIENTIFIC PROGRAMMING

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

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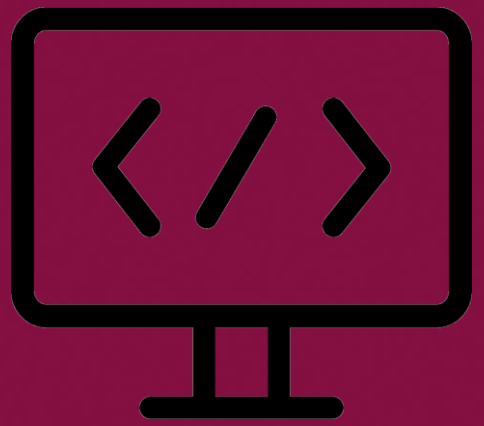
Introduction



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P19a-04-03-30, School of Electrical Engineering, UTM

COURSE POLICY

1. Attendance is compulsory. You must attend 80% of lecture hours to be eligible to attend final exam.
2. You are responsible for whatever is taught in lecture. If you miss a class, it is your responsibility to find out about assignments, quizzes and exams.
3. Punctuality is expected.
4. Makeup tests will not be given except in the case of actual emergencies with written evidence.
5. You are encouraged to collaborate (not copy) on assignment problems with your “study buddies.”

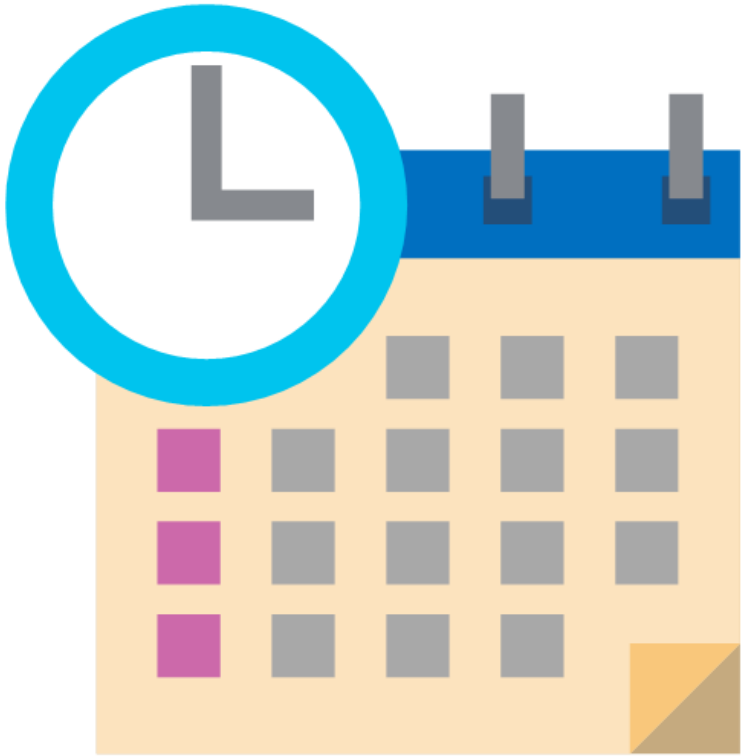
COURSE SCHEDULE

SECTION 9

- Sunday (8.00 am to 10.00 am)
- Monday (10.00 am to 11.00 am)

SECTION 10

- Sunday (8.00 am to 10.00 am)
- Tuesday (10.00 am to 11.00 am)



ASSESSEMENT

Assessment	Mark (%)
Test 1 (Expected on 25 November 2020, 8.00 pm)	20
Quiz 1	5
Quiz 2	5
Group Assignment	20
Final Exam	50
Total	**100**

INTRODUCTION TO SCIENTIFIC PROGRAMMING

THIS COURSE WILL INTRODUCE

- Fundamentals of scientific programming languages and techniques used by engineers to solve engineering problems.
- Common scientific programming languages and their advantages and disadvantages.
- Programming, program design, verification and visualization.
- Scientific computing, tools, techniques to solve engineering problems.
- Implement algorithms using high level programming language (e.g. MATLAB, Mathematica, FORTRAN).

PRE-REQUISITES

- Students must have fundamentals in:
  - Basic operation of computer
  - Basic math

COURSE LEARNING OUTCOMES

No.	Course Learning Outcome
CLO1	Apply the knowledge of scientific programming to describe complex engineering problems in flowcharts, pseudocode and programs.
CLO2	Apply concepts of scientific programming to solve complex engineering problems using software programs and perform program debugging.
CLO3	Analyze and apply an advanced program using scientific programming language with data processing, analysis and visualization to solve an engineering problem.

COURSE OUTLINE

Week 1	:	**Overview of languages** Program development, aspects of computers and their operation, comparisons of different languages for scientific programming and their advantages/disadvantages, flowchart, pseudocode.
Week 2	:	**Introduction to MATLAB** MATLAB Workspace, variables, operators, basic data types, M-file script, comments, punctuation, complex numbers, floating point, arithmetic, mathematical functions
Week 3	:	**Complex Data type** Arrays, matrices, multidimensional arrays, character strings
Week 4	:	**Control Flow** Loops, conditionals, switch, pause, break, continue, return
Week 5	:	**Functions** M file function rules, input output arguments, encapsulation, variable scope, anonymous functions, creating your own toolbox
Week 6	:	**Input & Output** Plain text files, Binary files, Set Functions, Bit Functions, base conversion **Debugging & Profiling**

COURSE OUTLINE (CONT.)

Week 7	:	**Graphics** Plot function, linestyles, multiple plots, figures, sub plots, specialized 2D plots, introduction to 3D plots
Week 8	:	**Mid Semester Break**
Week 9	:	**Matrix Algebra** Sets of linear equations, matrix functions, special matrices, sparse matrices
Week 10	:	**Data Analysis** Basic statistical analysis, basic data analysis
Week 11	:	**Data interpolation** One dimensional interpolation, two dimensional interpolation
Week 12	:	**Polynomials** Roots, multiplication, addition, division, derivatives and integrals, rational polynomials, curve fitting
Week 13	:	**Integration and Differentiation** Integration, differentiation

COURSE OUTLINE (CONT.)

Week 14	:	**Differential Equations** ODE Solver
Week 15	:	**Object Oriented Programming** Introduction to Object Oriented Programming, cell arrays, structures, properties, methods, events, class with reference behaviour
Week 16	:	**Revision Week**
Week 17	:	**Final Exam Week**

REFERENCES

1. Duane Hanselman and Bruce Littlefield, Mastering MATLAB 7, Pearson Education, 1st Edition, 2005.
2. Holly Moore, MATLAB for Engineers, Pearson Education, 1st Edition, 2015.
3. Quarteroni Alfio, Saleri Fausto and Gervasio Paola, Scientific Computing with MATLAB and Octave¸Springer, 2014.

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