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|  | <p>Ministry of Higher Education and Scientific Research - Iraq</p> <p>University of Warith Al_Anbiyaa....<br/>College of Engineering<br/>Oil and Gas Department</p> |  |
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## MODULE DESCRIPTOR FORM

### نموذج وصف المادة الدراسية

| Module Information                 |                                      |                               |  |
|------------------------------------|--------------------------------------|-------------------------------|--|
| معلومات المادة الدراسية            |                                      |                               |  |
| Module Title                       | <b>Computer Programming II</b>       |                               | Module Delivery                            |
| Module Type                        | Support or related learning activity |                               | <input checked="" type="checkbox"/> Theory |
| Module Code                        | ENG214                               |                               | <input type="checkbox"/> Lecture           |
| ECTS Credits                       | 5                                    |                               | <input checked="" type="checkbox"/> Lab    |
| SWL (hr/sem)                       | 125                                  |                               | <input type="checkbox"/> Tutorial          |
|                                    |                                      |                               | <input type="checkbox"/> Practical         |
|                                    |                                      |                               | <input type="checkbox"/> Seminar           |
| Module Level                       | UGII                                 | Semester of Delivery          | 1  |
| Administering Department           | OGE                                  | College                       | Engineering                                |
| Module Leader                      | Baqir Kadhim                         | e-mail                        | baqer.kadhim@uowa.edu.iq                   |
| Module Leader's Acad. Title        | Asst. Lecturer                       | Module Leader's Qualification | MS.c                                       |
| Module Tutor                       | NA                                   | e-mail                        |  |
| Peer Reviewer Name                 |                                      | e-mail                        |  |
| Scientific Committee Approval Date | 01/06/2023                           | Version Number                | 1.0  |

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

|                             |         |                 |   |
|-----------------------------|---------|-----------------|---|
| <b>Prerequisite module</b>  | COPR115 | <b>Semester</b> | 1 |
| <b>Co-requisites module</b> | None    | <b>Semester</b> |   |

**Module Aims, Learning Outcomes and Indicative Contents**

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|  |  |
|--|--|
| <b>Module Aims</b><br>أهداف المادة الدراسية                      | <p>The main objective of this course is to provide a foundation in programming for engineering problem solving using the MATLAB software package. Students will develop the skills analyze and break down an engineering program and solve it algorithmically using MATLAB. After this course, students will have an understanding of various programming constructs and how they can be used to solve a computational problem.</p>  |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ul style="list-style-type: none"> <li>• An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.</li> <li>• An ability to develop the confidence necessary to successfully solve Mathematical problems with a computer.</li> <li>• An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.</li> </ul>  |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p>we will provide students with the skills to create &amp; develop applications using MATLAB , where that allow Engineers to develop engineering applications that run in the Windows environment. MATLAB provides the engineer a programming tool to write simple programs quickly that meet their needs. Example programs written using MATLAB include gas and oil fluid correlations, interpolation software, gas well bottom hole pressure from surface conditions, volumetric reserve calculations, simple log analysis, water pattern analysis and bottom hole pressure analysis, also MATLAB can help you develop predictive maintenance algorithms customized to the specific operational and architectural profile of your equipment. Use Predictive Maintenance Toolbox to design condition indicators and estimate the remaining useful life of your critical equipment like pumps and compressors</p> |

**Learning and Teaching Strategies**

استراتيجيات التعلم والتعليم

|                   |  |
|-------------------|--|
| <b>Strategies</b> | The main strategy that will be adopted in delivering this module is to Encourage students to ask and answer questions, as well as training students to implement many practical exercises in the laboratory (which covers most of what is studied in theoretical lectures), which in turn gives students the ability to carry out the work required of them in the future in their practical life. |
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### Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

|  |     |   |   |
|--|-----|---|---|
| <b>Structured SWL (h/sem)</b><br>الحمل الدراسي المنتظم للطالب خلال الفصل       | 75  | <b>Structured SWL (h/w)</b><br>الحمل الدراسي المنتظم للطالب أسبوعيا       | 5 |
| <b>Unstructured SWL (h/sem)</b><br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 47  | <b>Unstructured SWL (h/w)</b><br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 3 |
| <b>Total SWL (h/sem)</b><br>الحمل الدراسي الكلي للطالب خلال الفصل              | 125 |   |   |

### Module Evaluation

تقييم المادة الدراسية

|                             |                        | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| <b>Formative assessment</b> | <b>Quizzes</b>         | 2           | 10% (10)         | 5, 10      | LO #1, 2, 10 and 11       |
|                             | <b>Assignments</b>     | 2           | 10% (10)         | 2, 12      | LO # 3, 4, 6 and 7        |
|                             | <b>Projects / Lab.</b> | 1           | 10% (10)         | Continuous | All                       |
|                             | <b>Report</b>          | 1           | 10% (10)         | 13         | LO # 5, 8 and 10          |
| <b>Summative assessment</b> | <b>Midterm Exam</b>    | 2 hr        | 10% (10)         | 7          | LO # 1-7                  |
|                             | <b>Final Exam</b>      | 2hr         | 50% (50)         | 16         | All                       |
| <b>Total assessment</b>     |                        |             | 100% (100 Marks) |            |                           |

### Delivery Plan (Weekly Syllabus)

## المنهاج الأسبوعي النظري

|               | Material Covered   |
|---------------|--|
| <b>Week 1</b> | Starting With Matlab: MATLAB windows , Menus and the toolbar , Working in the command window , Arithmetic operations with scalars , Display formats , Elementary math built-in functions, Useful commands for managing variables, Script files and the Editor Debugger, Matlab Help System   |
| <b>Week 2</b> | Vector :Row Vectors, Extracting Bits of a vector, Column Vectors, Transposing, Matrices.vector addressing , Using a colon:in addressing vector , Adding elements to existing variables, Deleting elements, Built-in functions for handling vector , Mathematics With vector: Addition and subtraction , vector multiplication, vector division , |
| <b>Week 3</b> | Creating Arrays:<br><br>Creating a two-dimensional array (matrix) , The transpose operator , Array addressing , Using a colon: in addressing arrays, Adding elements to existing variables, Deleting elements, Built-in functions for handling arrays  |
| <b>Week 4</b> | Mathematics With Array:Addition and subtraction , Array multiplication, Array division , Elementby-element operations , Using arrays in MATLAB built-in math functions,Built-in functions for analyzing arrays, Generation of random numbers   |
| <b>Week 5</b> | Functions:Elementary Functions( log10, log, exp, sqrt), Max, min, mean, all, sort, unique, length, size, sum, abs functions, Polyarea, std (Standard Deviation), roots (Polynomial Roots), polyval, diff functions, Build functions  |
| <b>Week 6</b> | Programming In Matlab: Relational and logical operators, Conditional statements, if constructs(if ... end, if ... else ... end, if ... elseif ... else ... end), Switch statements. The switch case statement,   |
| <b>Week 7</b> | Loops:For Loops, while loop, Break & continue statement.   |

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| <b>Week 8</b>                               | Symbolic toolbox<br>Factor, simplify and Expand the terms, Solving Equations, User-definedfunction ( Inline, vectorize), Differentiation(The first derivative, The nth derivative), Integration (Definitive and in-definitive integrals, Multiple integral), Solutions of Differential Equations (First Order Differential Equations, Higher Order Differential Equations), Limits |
| <b>Week 9</b>                               | Graphic<br>Plotting functions, Plotting a given data set, Adding (titles, axis labels, and annotations), Multiple data sets in one plot, Multiple Plots in One Figure, Three Dimensional Plot-Surface Generation   |
| <b>Week 10</b>                              | Polynomials, Curve Fitting, And Interpolation :<br>Polynomials, Curve fitting , Interpolation , Extrapolation  |
| <b>Week 11</b>                              | Applications and Engineering Problems:Numerical analysis,The Root of The Equation<br>Iteration method, Linear interpolation method, Bisection method, Tangent method (Newton-Raphson method).  |
| <b>Week 12</b>                              | Solution of System of Equations: The Elimination method, Gauss-Jordan method, Gauss- Seidel Method, Newton-Raphson method.   |
| <b>Week 13</b>                              | The solution of Ordinary Differential Equations:<br>The Taylor Series method, The Euler method, The Runge-Kutta method, Method of Solving Higher Order Equations   |
| <b>Week 14</b>                              | Petroleum Data Science and Machine Learning  |
| <b>Week 15</b>                              | Apply the fundamental knowledge of mathematics, science & engineering, to solve the real engineering problems  |
| <b>Week 16</b>                              | <b>Preparatory week before the final Exam</b>  |
| <b>Delivery Plan (Weekly Lab. Syllabus)</b> |  |
| المنهاج الاسبوعي للمختبر                    |  |
|   | <b>Material Covered</b>  |

|               |   |
|---------------|---|
| <b>Week 1</b> | Starting With MATLAB: MATLAB windows , Menus and the toolbar , Working in the command window , Arithmetic operations ( exercises using MATLAB as calculator).   |
| <b>Week 2</b> | Vectors (practical exercises + homework): Row Vectors, Column Vectors, Transposing, Vector addressing , Adding elements to existing variables, Deleting elements, Built-in functions for handling vector , Mathematics With vector: Addition and subtraction , vector multiplication, vector division . |
| <b>Week 3</b> | Matrices (practical exercises + homework):<br>Creating a two-dimensional array (matrix) , The transpose operator , addressing , Using a colon: in addressing arrays, Adding elements to existing variables, Deleting elements.  |
| <b>Week 4</b> | Mathematics with Matrix (practical exercises + homework):<br>Addition and subtraction, Array multiplication, Array division, element by-element operations.   |
| <b>Week 5</b> | Built in functions (practical exercises + homework): log10, log, exp, sqrt, max, min, mean, all, sort, length, size, sum, abs, polyarea, std (Standard Deviation).  |
| <b>Week 6</b> | Test.   |
| <b>Week 7</b> | Programming In Matlab (practical exercises + homework):<br>Relational and logical operators. Solving simple exercises using script files ( Editor).   |
| <b>Week8</b>  | Conditional statements (practical exercises + homework):<br>if constructs (if ... end, if ... else ... end, if ... elseif ... else ... end), Switch statement (The switch case statement).  |
| <b>Week9</b>  | Loop statements (practical exercises + homework):<br>For Loops, while loop, Break & continue statement.   |
| <b>Week10</b> | User defined functions (practical exercises + homework):<br>Creating a function file, structure of a function file, saving a function file , and using a user-defined function  |
| <b>Week11</b> | Graphic (practical exercises + homework):<br>Plotting functions, Plotting a given data set, Adding (titles, axis labels, and annotations), and multiple data sets in one plot, Multiple Plots in One Figure, Three Dimensional Plot-Surface Generation  |
| <b>Week12</b> | Symbolic toolbox (practical exercises + homework):  |

|               |  |
|---------------|--|
|               | Factor, simplify and Expand the terms, Solving Equations, User-defined function ( Inline, vectorize), Differentiation, Integration, Solutions of Differential Equations (First Order Differential Equations, Higher Order Differential Equations), and Limits. |
| <b>Week13</b> | Solution of System of Equations (practical exercises + homework):<br><br>The Elimination method, and Newton-Raphson method.  |
| <b>Week14</b> | Solve some engineering problems using MATLAB   |
| <b>Week15</b> | Preparatory week before the final Exam   |

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

|                          | Text  | Available in the Library? |
|--------------------------|---|---------------------------|
| <b>Required Texts</b>    | 1. RudraPratap: Getting started with MATLAB 7, Oxford Press (Indian edition),2006.<br><br>2. Desmond J. Higham and Nicolas J. Higham: Matlab Guide, SIAM, 2000. | yes                       |
| <b>Recommended Texts</b> | Introduction to MATLAB for Chemical & Petroleum Engineering 2nd Edition by Sam Toan , Hertanto Adidharma , Bahareh Nojabaei                                     | No                        |
| <b>Websites</b>          |   |                           |

### Grading Scheme

#### مخطط الدرجات

| Group                               | Grade                   | التقدير | Marks (%) | Definition                       |
|-------------------------------------|-------------------------|---------|-----------|----------------------------------|
| <b>Success Group<br/>(50 - 100)</b> | <b>A</b> - Excellent    | امتياز  | 90 - 100  | Outstanding Performance          |
|                                     | <b>B</b> - Very Good    | جيد جدا | 80 - 89   | Above average with some errors   |
|                                     | <b>C</b> - Good         | جيد     | 70 - 79   | Sound work with notable errors   |
|                                     | <b>D</b> - Satisfactory | متوسط   | 60 - 69   | Fair but with major shortcomings |

|                        |                |                     |         |                                       |
|------------------------|----------------|---------------------|---------|---------------------------------------|
|                        | E - Sufficient | مقبول               | 50 - 59 | Work meets minimum criteria           |
| Fail Group<br>(0 – 49) | FX – Fail      | راسب (قيد المعالجة) | (45-49) | More work required but credit awarded |
|                        | F – Fail       | راسب                | (0-44)  | Considerable amount of work required  |
|                        |                |                     |         |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

