**Course description form**

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| 1. **Course Name**
 |
| Application Engineering Programs |
| 1. **Course Code**
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| EP206 |
| 1. **Semester/Year**
 |
| 2n’d Semester/Third Year |
| 1. **The date this description was prepared**
 |
| 17 / 9 / 2023  |
| 1. **Available forms of attendance**
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| Face-to-Face theoretical lectures |
| 1. **Number of study hours (total) / number of units (total)**
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| 45/2 |
| 1. **Name of the course administrator**
 |
| Name: Lect. Hayder Salim HameedEmail:haydersalim@uodiyala.edu.iq  |
| 1. **Course objectives**
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| 1. Providing the student with basic information about software simulation systems.2. Familiarity with the famous mathematical and engineering analysis software simulation system (MATLAB Simulink.).3. The student’s knowledge of a simulation system in which an integrated dynamic and programming model is designed. The modeling and simulation process is then carried out through the tool that was originally developed by MathWorks.4. Obtaining sufficient information about the use of the program regarding the possibility of dispensing with real experiments if relying on simulation in MATLAB. | **Objectives of the study subject** |
| 1. Solution of non-linear equations and root findings.
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| * The student is directed in the practical laboratory and is tasked with analyzing and programming a simple engineering system or application using MATLAB Simulink, generating automatic code, testing and verifying the integrated systems, and displaying the results of the analysis and programming.
* Important notes about the importance of programming using the simulation system in our lives and the extent of progress of some countries in the field of software. Important programs in our lives are also reviewed and widely used such as medical or agricultural applications and other applications programmed by engineers, analysts and programmers.
* Through discussion, students participate in solving some practical problems.
* Asking the student to visit the library and the international information network (the Internet) to obtain additional knowledge of the academic subjects.
* Presenting a seminar to the student in front of his fellow students to enhance his self-confidence.
 | **The Strategy**  |
| 1. Numerical integration and differentiation.
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| Interpolation and solving differential equations. | **Learning method** | **Required learning outcomes** | **Name of the unit or topic**  | **Hours** | **Week** |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Teach the student how to get started with Matlab/Simulink. | Introduction, What is Simulink? | 3 | 1 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to dealing with blocks and their settings. | Working with Blocks, Block Settings, Model Annotation | 3 | 2 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to the resource library and settings of the Simlink window. | The Solver, Sources Library | 3 | 3 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to using the library of mathematical operations blocks and showing the results. | Sinks Library, Math Operations Library  | 3 | 4 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to building user-programmed blocks and dealing with logical tables. | User Defined Functions & Lookup Tables  | 3 | 5 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to the explanation of interconnected secondary systems and how to communicate signals. | Ports & SubsystemsSignal Routing & Logicals | 3 | 6 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to explaining how to represent differential and integral equations using simulation. |  Integration and Differentiation | 3 | 7 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to the possibility of running code and simulation at the same time. | MATLAB & Simulink Working Together | 3 | 8 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to solving problems through examples | Examples Models | 3 | 9 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to the use of existing abbreviations. | Simulink Shortcuts | 3 | 10 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to solving a step variable by dynamically adjusting the size of the time step, causing it to increase when the variable changes slowly and decrease when the variable changes quickly. | The Solver: Zero-Crossing Options | 3 | 11 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to logging in and obtaining additional information and assistance in dealing with salmon. | Simulink Online Documentation | 3 | 12 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | More training at a similar level to the exercises | **Further Examples** | 3 | 13 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introducing the student to how to program the Arduino. |  Introduction To The Arduino Microcontroller,Arduino Sketch Structure | 3 | 14 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Explanation of applied examples of Arduino programming | Example: Using a Solderless Breadboard,Servomotors | 3 | 15 |
| 1. **Course Evaluation**
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| Distribution of the grade out of 100 according to the tasks assigned to the student, such as daily preparation, daily, oral, monthly, written exams, reports, etc. |
| 1. **Learning and teaching resources**
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| Modeling and simulation of systems using M**ATLAB and Simulink** | Required textbooks (methodology, if any) |
| 1- Applied Mathematical Modelling of Engineering Problems**2- *Introduction to Simulink®******with Engineering Applications*** | Main references (sources) |
| All solid scientific journals that are related to the broad concept of programming using MATLAB. | Recommended supporting books and references (scientific journals, reports....) |
| **https://www.mathworks.com/** | Electronic references, Internet sites |