MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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| **Module Information**معلومات المادة الدراسية |
| **Module Title** | Electrical Machines | **Module Delivery** |
| **Module Type** | Core | **☒ Theory****☒ Lecture****☒ Lab*** **Tutorial**
* **Practical**
* **Seminar**
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| **Module Code** | MIET2103 |
| **ECTS Credits** | 6 |
| **SWL (hr/sem)** | 150 |
| **Module Level** | UGII | **Semester of Delivery** | 3 |
| **Administering Department** | MIE | **College** | MUC |
| **Module Leader** | Hashem Abdul-Rahem Abdul Ammer | **e-mail** | hashem.attrah@muc.edu.iq |
| **Module Leader’s Acad. Title** |  | **Module Leader’s Qualification** |  |
| **Module Tutor** | Name (if available) | **e-mail** | E-mail |
| **Peer Reviewer Name** | Dr.Noor Kadhim Meftin | **e-mail** | noor.kadhim@muc.edu.iq |
| **Scientific Committee Approval Date** | 17/6/2023 | **Version Number** | 1.0 |

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| **Relation with other Modules**العلاقة مع المواد الدراسية الاخرى |
| **Prerequisite module** | Fundamental of Electrical Engineering | **Semester** | UGI-S1 |
| **Co-requisites module** | None | **Semester** |  |

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| **Module Aims, Learning Outcomes and Indicative Contents**أهداف المادة الدراسية ونتائج التعلم والمحتويات الارشادية |
| **Module Aims**أهداف المادة الدراسية | 1. Study engineering concepts and their applications for electrical machines and transformers.
2. How electrical transformers work, how to connect them, and solve mathematical problems related to them and their types.
3. What are electrical machines and what are their classifications.
4. Knowledge and understanding of the basics of laws related to electrical technology materials.
5. Solve issues and issues and apply the rules of application related to electrical engineering.
6. Giving students confidence and ability to use mathematical foundations in applications on generators, electric motors.
7. Building interactive skills that help classify information and make engineering decisions.
8. Develop proposals and alternatives for electrical parts for medical devices
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| **Module Learning Outcomes**مخرجات التعلم للمادة الدراسية | 1. Learn how transformers work in electrical circuits.
2. List the various terms associated with electrical circuits and machines.
3. Summarize what is meant by electrical transformers and basic electrical machines of all kinds.
4. Discuss the interaction and participation of the number of windings, wire diameter and size of electrical transformers.
5. Description of electrical transformers, motors and generators with direct current and alternating current.
6. Determine the laws related to electrical transformers and their derivations.
7. Identify the equivalent circuits of electrical transformers and methods of calculating their efficiency.
8. Discuss the processes that lead to losses in transformers and electrical machines, and ways to reduce them and increase their efficiency.
9. Discuss the different characteristics of engines and generators, their main components, and the functioning of each.
10. Explain the two laws of machines and determine their efficiency, capacity and torque, and the laws of their formation.
11. Identify the relationship of transformers and electrical machines to medical
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|  | devices.1. Discuss the systems of connecting machines, ways of wrapping coils inside them, and the benefits of each.
2. Determining how to increase the efficiency of motors used in medical devices and methods of maintaining and repairing them.
3. Describe the types of motors included in the formation of medical devices and their classification
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| **Indicative Contents**المحتويات الارشادية | Indicative content includes the following. Part A - Single-phase electrical transformersTypes of electrical transformers, their parts and components, their equivalent circuit, types of losses, how to calculate them, and how to calculate transformer efficiency through mathematical operations and efficiency laws. [10 hours]Part B - Three-phase electrical transformersTypes of three-phase electrical transformers, calculating their cost, types of connections in their files, calculating their equivalent circuits, and deriving special laws for each connection [13 hours]Part C-Electromagnetic and electromechanical induction and the relationship between them and linear motion using those concepts and applications on linear motion and how to generate it. [10 hours]Part D-The electromotive force of single-phase machines, methods of generating them, their laws, and their calculation through mathematical issues and calculating currents, voltages, losses, and capacity. [10 hours]Part E-The electromotive force of the three-phase machines, methods of generating them, their laws, and their calculation through mathematical problems, types of coil connections, testing those machines, and calculating currents, voltages, losses, and real and apparent power. [15 hours]Instantaneous power and average power of alternating current, relative and apparent power.Types of electric motors and how they work [5 hours] Review problem categories [6 hours] |

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| **Learning and Teaching Strategies**استراتيجيات التعلم والتعليم |
| **Strategies** | The main strategy that will be adopted in the delivery of this unit is to encourage students to participate in the exercises, while improving and expanding their critical thinking skills at the same time. This will be achieved through classes and interactive tutorials and by looking at the types of simple experiments that include some of theelectrical wiring activities in the laboratory curriculum that develop students' skills. |

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| **Student Workload (SWL)**الحمل الدراسي للطالب |
| **Structured SWL (h/sem)**الحمل الدراسي المنتظم للطالب خلال الفصل | 79 | **Structured SWL (h/w)**الحمل الدراسي المنتظم للطالب أسبوعيا | 5 |
| **Unstructured SWL (h/sem)**الحمل الدراسي غير المنتظم للطالب خلال الفصل | 71 | **Unstructured SWL (h/w)**الحمل الدراسي غير المنتظم للطالب خلال الفصل | 5 |
| **Total SWL (h/sem)**الحمل الدراسي الكلي للطالب خلال الفصل | 150 |

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

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| **Delivery Plan (Weekly Syllabus)**المنهاج الاسبوعي النظري |
|  | **Material Covered** |
| **Week 1** | Transformers : single phase transformer and construction |
| **Week 2** | Transformers : single phase transformer and construction |
| **Week 3** | Theory of operation, no load and short circuit test. |
| **Week 4** | Equivalent circuit, auto–transformers, instrument transformers |
| **Week 5** | Equivalent circuit, auto–transformers, instrument transformers |
| **Week 6** | Three phase transformers, constructions methods of connection. |
| **Week 7** | Mid exam + Three phase transformers, constructions methods of connection. |
| **Week 8** | Electromechanical energy conversion principles relay operation. |
| **Week 9** | Electromechanical energy conversion principles relay operation. |
| **Week 10** | Motor characteristics, testing, calculation of losses and efficiency. |
| **Week 11** | Induction machines: equivalent circuit, basic equation, simple analysis testing. |
| **Week 12** | Single phase induction motor, methods of starting, siplitphase, capacitor short, capacitor run andshaded pole motors. |
| **Week 13** | Single phase induction motor, methods of starting, siplitphase, capacitor short, capacitor run andshaded pole motors. |
| **Week 14** | Synchronous machines, generators and motors, equivalent circuit, basic equation. |
| **Week 15** | Special machines: Reluctance motor , hysteresis motor , linear motor , stepper motor , dray cup typemotor , servo motor , etc …….. |
| **Week 16** | Preparatory week before final exam |

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| **Delivery Plan (Weekly Lab. Syllabus)**المنهاج الاسبوعي للمختبر |
|  | **Material Covered** |
| **Week 1** | Introduction to measuring devices and identifying wattmeter |
| **Week 2** | Characteristics of single phase electric transformers |
| **Week 3** | Open circuit test of transformers |
| **Week 4** | Load circuit for single phase transformers |
| **Week 5** | Three phase transfer theorem delta- delta |
| **Week 6** | Three phase transfer theorem delta- star |
| **Week 7** | Three phase transfer theorem star- delta |
| **Week 8** | Three phase transfer theorem star- star |
| **Week 9** | Characteristics of DC machine |
| **Week 10** | load test of three phases (I.M) |
| **Week 11** | open circuit test of three phases (I.M) |
| **Week 12** | short circuit test of three phases (I.M) |
| **Week 13** | Speed control of DC motor |
| **Week 14** | load test of DC generator |
| **Week 15** | Series & Shunt DC machine connection |
| **Week 16** | Compound connection of DC machine |

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| **Learning and Teaching Resources**مصادر التعلم والتدريس |
|  | **Text** | **Available in the****Library?** |
| **Required Texts** | Electrical Machines and Drives Fundamentals and AdvancedModelling by Jan A. Melkebeek | Yes |
| **Recommended Texts** | Electrical Machines Drives and Power Systems 5th Edition ByTheodore Wildi | No |
| **Websites** |  |

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| **Grading Scheme**مخطط الدرجات |
| **Group** | **Grade** | التقدير | **Marks (%)** | **Definition** |
| **Success Group (50 - 100)** | **A -** Excellent | امتياز | 90 - 100 | Outstanding Performance |
| **B -** Very Good | جيد جدا | 80 - 89 | Above average with some errors |
| **C -** Good | جيد | 70 - 79 | Sound work with notable errors |
| **D -** Satisfactory | متوسط | 60 - 69 | Fair but with major shortcomings |
| **E -** Sufficient | مقبول | 50 - 59 | Work meets minimum criteria |
| **Fail Group (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 |
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| **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. |