**Course description form**

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| 1. **Course Name**
 |
| Electromagnetics II |
| 1. **Course Code**
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| EP209 |
| 1. **Semester/Year**
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| 2n’d Semester/Second Year |
| 1. **The date this description was prepared**
 |
| 1/9/2023  |
| 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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| 30/6 |
| 1. **Name of the course administrator**
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| Name: Ass. Lect. Yasir Ghazi RashidEmail:yasserghazee\_enge@uodiyala.edu.iq |
| 1. **Course objectives**
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| The objective of the subject of electromagnetic theory in the second course is to introduce the student to the concept of voltage and the potential difference on a charge or system of charges and the potential field, as well as the relationship between voltage and the electric field and ways to extract them mathematically, in addition to getting to know the concepts of the electric duo and electric flux and knowing their laws and ways to extract them. In this course, the student also learns about the types of materials such as conductors, insulators, and semiconductors, as well as the types of currents and their densities that pass through the three types of materials. The student also learns about the concept of electrical polarization. The student also learns about the concept of insulators and their direct relationship to the electrical capacity and energy stored in them, the operation of capacitors and methods of connecting them. Finally, the concept of magnetic flux and how it arises is learned, and the laws of Biot-Svart &amp; We then discuss the magnetic field, how to measure it on a strip of electric current, and magnetic flux density and its relationship to the magnetic field. The student also learns how to extract these concepts mathematically. | **Objectives of the study subject** |
| 1. **Teaching and learning strategies**
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| * Weekly lectures included providing students with the basics and topics related to the pre-skills education outcomes to solve practical problems through presentation, lecture, or conducting experiments.
* Solve a group of practical and applied examples by faculty members.
* Through discussion, students participate in solving some practical problems.
* Practical laboratories in the department are monitored by faculty members in the department.
* 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. **Course structure**
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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 | Learn about the properties of materials. Convection and conduction currents; Conductor properties and boundary conditions; The way of the magicians; Semiconductors. Nature of insulating materials. | **Electric Fields in Material Space:***Properties of Materials; Convection and Conduction Currents; Conductor properties and boundary conditions; The method of mages; Semiconductors; The nature of dielectric materials; Boundary conditions for perfect dielectric materials.* | 4 | 1&2 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Definition of capacity; Capacity of some useful configurations; Two-wire line capacity. Poisson and Laplace equations - Poisson and Laplace equations; Singularity theory; Solve Laplace's equation in a given situation. | **Capacitance:***Capacitance; Capacitance of some useful configuration; Capacitance of a two-wire line; Poisson's and Laplace's equations-Poisson's and Laplace equations; Uniqueness theorem; Solution of Laplace’s equation in certain situation; Solution of Poisson's equation in certain situation; Product solution of Laplace’s equation.* | 6 | 3&4&5 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Introduction to static magnetic fields: Magnetic field constant. Peyote-Savart Law; Curl Stoke's Theory | **Magnetostatic Fields:***The steady of magnetic field; Biot- savart law; the curl; Stocke's theorem* | 4 | 6&7 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Understand and apply Ampere's circle law; Application of Ampere's law. Magnetic flux and magnetic flux density. | **Magnetostatic Fields:***Ampere's circuit law; Application of ampere's law; Magnetic flux and magnetic flux density; The scalar and vector magnetic potential; Derivation of steady magnetic field laws.* | 6 | 8&9&10 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Calculating magnetic forces. Materials and the induced force on a moving charge; The force on the differential current element. The force between the differential current elements. | **Magnetostatic Fields:***Magnetic forces; Materials and inductance-force on a moving charge; Force on a differential current element; Force between differential current elements.* | 4 | 11&12 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Understanding force and torque in a closed circuit; The nature of magnetic materials; Magnetism and permeability. Magnetic boundary conditions | **Magnetostatic Fields:***Force and torque on a closed circuit; The nature of magnetic materials; Magnetization and permeability; Magnetic boundary conditions, The magnetic circuit, Potential energy and forces on magnetic materials; Inductance and mutual inductance; Time varying fields.* | 4 | 13&14 |
| Daily, oral, monthly, written examinations and reports | Whiteboard and Data show | Learn about Max Well's equations | **Maxwell’s Equations:***Maxwell's equations-faraday's law; displacement current; Maxwell’s equations in point form; Maxwell’s equations integral form; the retarded potentials.* | 2 | 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.

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| 10% (10) | **Quizzes** |
| 10% (10) | **Assignments** |
| 10% (10) | **Projects**  |
| 10% (10) | **Report** |
| 40% (40) | **Annual quest** |
| 60% (60) | **Final Exam** |
| 100% (100 Marks) | **Total assessment** |

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| 1. **Learning and teaching resources**
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| Matthew, N. O. "Sadiku Elements of Electromagnetics." (2018). | Required textbooks (methodology, if any) |
| Electromagnetics By Joseph Edminister (Schaum’s Outline Series) : Joseph Edminister, Vishnu Priye Mc Graw Hill Education | Main references (sources) |
| All scientific magazines and periodicals related to electromagnetic fields | Recommended supporting books and references (scientific journals, reports....) |
| https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering | Electronic references, Internet sites |