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Ministry of Higher Education and Scientific Research Scientific Supervision and Scientific Evaluation Apparatus Directorate of Quality Assurance and Academic Accreditation Accreditation Department

University of Diyala

College of engineering

Department of Electronic Engineering



**Academic Program and Course Description Guide**

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**Introduction:**



**Concepts and terminology:**



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# TEMPLATE FOR PROGRAMME SPECIFICATION

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| 1. vision |
| The basic vision of the Department of Electronic Engineering is to make the department one of the leading engineering departments in the field of contemporary scientific and technological development. Therefore, the department strives to develop modern scientific curricula in the field of electronic engineering, in addition to completing all requirements for the department’s laboratories. And improving the teaching staff, to provide society with engineering cadres capable of contributing to technological growth. |

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| 1. mission |
| The department offers a high level of knowledge in the field of electronic engineering and its various applications by integrating theoretical knowledge with practical experience. The department strives to advance the process of scientific, engineering and technological research, and to encourage research creativity. The department also provides valuable information to students in their field of specialization, which makes their thinking and ability to solve various technological and scientific problems and meet the needs of society, whether at the public or private sector level, serve our dear country. |

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| 1. Aims of the Program |
| * Train specialized engineers in the field of electronic engineering, with a focus on professional ethics, and prepare them to be distinguished scientifically and practically. |
| * The department supports scientific research to advance knowledge and technology in the field of electronic engineering and its applications. |
| * The department provides a comprehensive training program to equip graduate students with the basic skills needed to be fully prepared to work in community institutions. |
| * Collaborating with all scientific and industrial entities to enhance the engineering education process at the college and elevate its global ranking. |

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| 1. Programmatic accreditation |
| N/A |

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| 1. Other external Supports |
| N/A |

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| 1. Program Structure | | | | |
| Notes | Percentage Notes | of Courses Study | Number of Courses Study | Program Structure |
| متطلبات المؤسسة | 3.9 | 6 | 5 | Institution requirements |
| متطلبات الكلية | 18.7 | 29 | 9 | College requirements |
| متطلبات القسم | 77.4 | 120 | 49 | Requirements of Section |
| There is a summer course | يوجد |  |  | Summer Training |

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| 1. Program Structure | | | | 12. Awards and Credits |
| Level/Year | Course or Module  Code | Course or Module Title | Credit rating |
| 1st Year-1st Semester | E 101 | Mathematics 1 | 6 | Bachelor Degree Requires ( 155) credits |
| 1st Year-1st Semester | EE 101 | Electrical Engineering Fundamentals 1 | 8 |
| 1st Year-1st Semester | EE 107 | Electronic Physics | 6 |  |
| 1st Year-1st Semester | EE 106 | Engineering Drawing | 4 |
| 1st Year-1st Semester | U 103 | Computer Skills | 4 |
| 1st Year-1st Semester | U 104 | English Language | 2 |
| 1st Year-2nd Semester | E 102 | Mathematics 2 | 6 |  |
| 1st Year-2nd Semester | EE 102 | Electrical Engineering Fundamentals 2 | 8 |  |
| 1st Year-2nd Semester | EE 103 | Digital techniques | 7 |  |
| 1st Year-2nd Semester | EE 105 | C++ Programming | 4 |  |
| 1st Year-2nd Semester | EE 104 | Workshops skills | 3 |  |
| 1st Year-2nd Semester | U 101 | Human Rights and Democracy | 2 |  |
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| 2nd Year-1st Semester | E201 | Advance Mathematics –I | 3 |  |
| 2nd Year-1st Semester | EE 201 | Electronics I | 2 |  |
| 2nd Year-1st Semester | EE 203 | Electric Circuits Analysis I | 2 |  |
| 2nd Year-1st Semester | EE 205 | Advanced Programming | 1 |  |
| 2nd Year-1st Semester | EE 208 | Electro-Magnetics I | 2 |  |
| 2nd Year-1st Semester | EE 210 | Digital Electronic I | 2 |  |
| 2nd Year-1st Semester | EE 206 | Machines (DC) | 2 |  |
| 2nd Year-2nd Semester | E202 | Advance Mathematics- II | 3 |  |
| 2nd Year-2nd Semester | EE 202 | Electronics II | 3 |  |
| 2nd Year-2nd Semester | EE 204 | Electric Circuits Analysis II | 2 |  |
| 2nd Year-2nd Semester | EE 212 | Measurement &Instruments | 2 |  |
| 2nd Year-2nd Semester | EE 209 | Electro-Magnetics II | 2 |  |
| 2nd Year-2nd Semester | EE 211 | Digital Electronic II | 3 |  |
| 2nd Year-2nd Semester | EE 207 | Power and AC Machines | 4 |  |
| 2nd Year-2nd Semester | EE 213 | University Culture Activity | - |  |
|  |  |  |  |  |
| 3rd Year-1st Semester | EE 301 | Digital Signal Processing I | 2 |  |
| 3rd Year-1st Semester | EE 309 | Advanced Electronics I | 3 |  |
| 3rd Year-1st Semester | EE 303 | Communication Systems I | 3 |  |
| 3rd Year-1st Semester | EE 305 | Microprocessor and Microcontroller: Hardware | 3 |  |
| 3rd Year-1st Semester | EE 307 | Engineering Analysis I | 2 |  |
| 3rd Year-1st Semester | EE 311 | Antenna | 3 |  |
| 3rd Year-2nd Semester | EE 312 | Engineering Administration | 2 |  |
| 3rd Year-2nd Semester | EE 302 | Digital Signal Processing II | 3 |  |
| 3rd Year-2nd Semester | EE 310 | Advanced Electronics II | 3 |  |
| 3rd Year-2nd Semester | EE 304 | Communication Systems II | 3 |  |
| 3rd Year-2nd Semester | EE 306 | Microprocessor-Based System: Programming | 2 |  |
| 3rd Year-2nd Semester | EE 308 | Engineering Analysis II | 2 |  |
| 3rd Year-2nd Semester | EE 313 | Optoelectronics | 2 |  |
| 3rd Year-2nd Semester | EE 314 | Introduction to Computer Networks | 2 |  |
| Fourth Year-1st Semester | EE 401 | Microelectronic I | 2 |  |
| Fourth Year-1st Semester | EE 403 | Power Electronics I | 3 |  |
| Fourth Year-1st Semester | EE405 | Control System I | 3 |  |
| Fourth Year-1st Semester | EE407 | Digital System Design | 3 |  |
| Fourth Year-1st Semester | EE 409 | Information Theory | 3 |  |
| Fourth Year-1st Semester | EE411 | Hardware Description Language (HDL ) Programming | 3 |  |
| Fourth Year-2nd Semester | EE 413 | Introduction to AI | 2 |  |
| Fourth Year-2nd Semester | E402 | Eng. Graduation Project I | 2 |  |
| Fourth Year-2nd Semester | EE402 | Microelectronic II | 2 |  |
| Fourth Year-2nd Semester | EE404 | Power Electronics II | 3 |  |
| Fourth Year-2nd Semester | EE406 | Control System II | 3 |  |
| Fourth Year-2nd Semester | EE408 | Advanced Digital System Design | 3 |  |
| Fourth Year-2nd Semester | EE410 | Microwave | 2 |  |
| Fourth Year-2nd Semester | E401 | Engineering Profession Ethics | 2 |  |
| Fourth Year-2nd Semester | EE412 | Digital Image Processing | 2 |  |
| Fourth Year-2nd Semester | E403 | Eng. Graduation Project II | 2 |  |

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| 1. Learning Outcomes, Teaching, Learning and Assessment Methods |
| 1. Cognitive goals   A1- The ability to have knowledge in the fields of mathematics and specialized sciences Engineering expertise in the application of electronic engineering.  A2 Preparing the student to continue self-learning and acquire technology And new skills in the field of electronic engineering.  A3- Enabling students to obtain knowledge and understanding of designing and implementing various electronic systems.  A4- The student will understand the foundations of creating, programming, and simulating electronic circuits in hardware languages and various engineering programs.  A5- Enabling the student to visualize project management and solve the problems he encounters in the factory. |
| B. The skills goals special to the program.  B1 - The ability to select and perform the required examinations and collect their locations. Review and analyze the results of the relevant tests.  B2 The ability to design and supervise the implementation of relevant systems In electronic engineering.  B3 The ability to derive and approach engineering problems in a Recognize and determine the appropriate method to address the emerging engineering problems. This.  B4 - Provides them with skills to solve practical problems related to various electronic systems and computer programs for those systems. |
| C. Affective and value goals  C1- Questioning: Searching for a new information and raising questions.  C 2 Inference and deduction: thinking about what is beyond the known available to fill the gaps in it  C 3 Comparison: Noticing the proportions and differences between things  C 4- Classification: Placing things into groups according to common characteristics. |
| 1. Teaching and Learning Methods |
| * Providing students with the basics, additional topics, and field experiences related to the outcomes of thinking and analysis. * Forming discussion circles during or outside lectures to discuss scientific engineering topics that require thinking and analysis. * Asking students, a set of thinking questions during lectures, such as (what, how, when, why) for specific topics. * Giving students homework and periodic reports. |
| 1. Assessment methods |
| * Daily exams with practical and scientific questions. * Participation marks for difficult competition questions among students. * Assigning grades to homework assignments and reports assigned to them. * Semester exams for the curriculum in addition to the final exam. |

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| 1. Academic staff | | | |
| Number of teaching staff | | **Specialization** | **Scientific degree** |
| 1 | Electronic and communication | | Prof |
| 5 | Electronic | | Asst. Prof |
| 1 | Control | | Asst. Prof |
| 5 | Electronic and communication | | Lect. |
| 3 | Electronic | | Lect. |
| 1 | communication | | Lect. |
| 1 | Power | | Lect. |
| 5 | Electronic and communication | | Asst. LECT |

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| 1. Personal Development Planning |
| It is planned to develop the students’ personalities by holding discussion circles with them and asking them for periodic reports and seminars throughout the four stages and on various topics to develop their personal development. |
| 1. Admission criteria . |
| According to the rules and regulations of Ministry of Higher Education and Scientific Research. |
| 1. Key sources of information about the program |
| * College website. * The department’s website and contact the department by email. |

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| **Curriculum Skills Map** | | | | | | | | | | | | | | | | |
| **please tick in the relevant boxes where individual Programme Learning Outcomes are being assessed** | | | | | | | | | | | | | | | | |
|  | | | | **Programme Learning Outcomes** | | | | | | | | | | | | |
| Year / Level | Course Code | Course Title | Core (C)  Title or Option (O**)** | Knowledge and understanding | | | | | Subject-specific skills | | | | Thinking Skills | | | |
| **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **C1** | **C2** | **C3** | **C4** |
| Fourth Year-2nd Semester | **EE404** | Power Electronics II | C | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
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# TEMPLATE FOR COURSE SPECIFICATION

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| HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW |

**COURSE SPECIFICATION**

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| This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification. |

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|  | 1. Course title | Power Electronics II | |
|  | 2. Course code | EE 404 | |
|  | 3. Semester/Year | 2nd Semester – 4th Year | |
|  | 4. Date of production/revision of this specification | March 2024 | |
|  | 5. Modes of Attendance offered | Class Lectures | |
|  | 6. Number of Credit Hours (Total) / Number of Units (Total) | 30 hours /3 units | |
|  | 7. Course administrator's name (mention all, if more than one name) | Rokan Ali Ahmed  rokan.Ahmed@uodiyala.edu.iq | |
|  | 8. Aims of the Course | | |
|  | The power electronics II course teaches students how to design power electronics converters and implement them using appropriate engineering applications. In addition to qualifying the student to be an advanced power electronics designer by improving his engineering sense, which begins with the process of building the idea and progresses through learning the necessary design stages to the final inspection of the developed system. | | |
| A- Cognitive goals.  A1- The student will understand the definition of power electronics, as well as the mathematical analysis of power electronics systems, their relationship to other engineering sciences, and their electronic applications..  A2- During the semester, the student learns how self-education continues to build new skills in power electronics system design..  A3- Enabling the learner to understand, create, and implement different power electronics circuits.  A4- Consolidating the knowledge needed to design and simulate power electronics circuits using engineering programs and transferring it to hardware languages.  A5- Learn and comprehend how to use this knowledge in fixing problems that may arise in the production. | | |
| B. The skills goals special to the course.  B1 - Proficiency in the mathematical relationships necessary for power electronics system design.  B2- Capability to design and implement power electronics circuits pertinent to electronic engineering.  B3- Capability to scientifically deduce mathematical relationships and apply them to engineering problems in order to address emerging challenges.  B4- Providing suitable engineering programs and enhancing the skills necessary to resolve practical problems associated with power electronics circuits in power electronics converters. | | |
| C. Affective and value goals  C1- By asking questions, the student is encouraged to consider the relevance of power electronics in aiding modern living and to search for new technologies.  C2- Urging the student to consider the significance of the impact of power electronics on the ability to build scientific research approaches that fill gaps.  C3- - Inviting students to compare different types of power electronic converters and consider and track their rapid development.  C4 Classification of power electronic converters using common criteria to consolidate information. | | |
| 9- Teaching and Learning Methods | | |
| * Students learn the basics, extra subjects, and hands-on activities that are connected to the results of their thinking and analysis. * Setting up discussion groups during or after classes to talk about difficult scientific and engineering topics that need careful thought and analysis. * Asking students a set of questions to help them think during lessons, like "what," "how," "when," and "why" about certain topics. | | |

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| 10. Course Structure | | | | | |
| Week | Hours | ILOs | Unit/Module or Topic Title | Teaching Method | Assessment Method |
| Week1 | 2 | Inverter and single-phase inverter understanding | Inverter ,Single phase inverter | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week2 | 2 | Understanding three-phase through different angles | Three phase (both 120 mode and 180 mode) inverters | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week3 | 2 | Identify the current source and resonant inverters. | Resonant inverter – Current source inverter | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week4 | 2 | Define multilevel inverter and its operation. | Multi-level inverters operations . | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week5 | 2 | Identify multilevel inverter types | Multi-level inverters types. | Lectures Notes  PDF  power point  Video t | Daily exams + monthly exams |
| Week6 | 2 | Discover the Multilevel inverter's features and applications | Multi-level inverters feature and application . | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week7 | 2 | التعرف على تقنيات عرض النبضة | PWM techniques | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week8 | 2 | Understand PWM techniques | Sinusoidal PWM modified PWM | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week9 | 2 | Introduction to the subject of space vector modulations | Introduction to space vector modulations | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week10 | 2 | Study the concept of harmonic reduction. | Harmonic reduction | Lectures Notes  PDF  power point  Video t | Daily exams + monthly exams |
| Week11 | 2 | AC voltage controllers and their various forms | AC voltage controller, types, | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week12 | 2 | Discovering the voltage controls for the single phase and three phase | single phase and three phase AC Controllers | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week13 | 2 | Learn about the renewable energy features and types.ة | Renewable energy features and types. | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |
| Week14 | 2 | How to make electricity from renewable energy sources | Renewable Energy to Electricity | Lectures Notes  PDF  power point  Video t | Daily exams + monthly exams |
| Week15 | 2 | Learn about the economics and policies of renewable energy | Renewable Energy Economics and Policy | Lectures Notes  PDF  power point  Video | Daily exams + monthly exams |

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| 11. Infrastructure | |
| 1. Books Required reading: | [Power Electronics: Circuits, Devices, and Applications](https://books.google.co.in/books?id=-WqvjxMXClAC&printsec=frontcover&dq=Power%20electronics%20by%20daniel%20hart&hl=en&sa=X&ved=0ahUKEwjJidS-7ezUAhUMNpQKHRTNAocQ6AEINDAD) by M.H. Rashid |
| 2. Main references (sources) | * Lectures presented by the Lecturer * Books available in the college library |
| A- Recommended books and references (scientific journals, reports…). | * [Power electronics: converters, applications, and design](https://books.google.co.in/books?id=oxR8vB2XjgIC&printsec=frontcover&dq=Power%20electronics%20by%20Ned%20mohan&hl=en&sa=X&ved=0ahUKEwiQsdSQ7ezUAhXDlJQKHU82BhsQ6AEIIzAA) by Ned Mohan. * Power Electronics by C. W. Lander. |
| B-Electronic references, Internet sites… | Any other materials available on the web. |
| 12. The development of the curriculum plan | |
| Introducing the MATLAB program to explain the material as well as to carry out laboratory experiments | |