*Republic of Iraq*

*Ministry of Higher Education & Scientific Research Supervision and Scientific Evaluation Directorate Quality Assurance and Academic Accreditation International Accreditation Dept.*

Academic Program Specification Form for The Academic

University name... Diyala University...

 College/Institute: College of...Engineering...

 Scientific Department: Department of ......Electronic Engineering.......

 Name of the academic or professional program: Bachelor of Electronic Engineering

 Name of final degree: Bachelor of Electronic Engineering

 Academic system: semester

 Description preparation date: 3/7/2024

 Date of filling the file: 3/7/2024

Prof. Dr. Anees A. Khadom

**The Dean**

Date :17/9/2023

Signature

Assist. prof. Dr. Jabbar Q. Jabbar

Dean ’s Assistant for Scientific Affairs

Date :17/9/2023 Signature

 Assist. prof. Dr. Salah N Farhan

The College Quality Assurance and University Performance Manager

Date :17/9/2023 Signature

Quality Assurance And University Performance Manager Date : / /

Signature

# TEMPLATE FOR PROGRAMME SPECIFICATION

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| 1. vision
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| 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
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| 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
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| * Train specialized engineers in the field of electronic engineering, with a focus on professional ethics, and prepare them to be distinguished scientifically and practically.
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| * 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
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| N/A |

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| 1. Other external Supports
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| N/A |

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| 1. Program Structure
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| 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 ModuleCode | 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 |  |
|  |  |  |  |  |
| 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 |  |
|  |  |  |  |  |
| 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
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| 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 itC 3 Comparison: Noticing the proportions and differences between thingsC 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.
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| 1. Assessment methods
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| * 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
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|  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
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| 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 .
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| 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** |
| 4th Year-2nd Semester | **EE 410** | Microwave | 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 |  Microwave |
| 2. Course code |  EE 410 |
| 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) | 45 hours /3 units |
| 7. Course administrator's name (mention all, if more than one name) | Tahreer Mahmoodtahreer\_mahmood\_eng@uodiyala.edu.iq |
| 8. Aims of the Course |
| The subject of Information Theory aims for the student to learn during the academic year how to convert analogue signals into digital signals, and how to transmit these digital signals through several types of transmission channels used in digital communications systems. The student also learns information compression techniques to obtain high transmission efficiency and error detection and correction techniques. During this subject, the student deals with digital signals and applies all techniques practically using the MATLAB program. |

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| 9· Learning Outcomes, Teaching ,Learning and Assessment Methode |

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| A- Cognitive goals. A1-During the first semester of the academic year, the student learns the concept of microwave engineering and the frequencies that operate in this range. Then he learns the wave equation, its reflection and refraction, and how to analyze this wave. He also learns transmission lines, in addition to learning the solution using... Smith Chart.During the second semester, the student learns the following:A2- Understanding and studying the Scattering Matrix and finding its elements to benefit from in analyzing microwave networks, in addition to the concept of Impedance Matching.A3- Understanding and studying Active Elements, including Waveguides.A4- The student learns the topic of Microwave Cavity Resonators.A5 - Understanding and studying passive elements, including Microwave Couplers and Circulators.A6- The student learns everything related to microwave transistors and diodes, such as Gunn diode, Tunnel diode, and others.A7- The student learns the concept of klystron and magnetron and the purpose of their use. |
| B. The skills goals special to the course. B1-Familiarity with mathematical derivations related to the subject of the plane wave equation, its reflection and refraction.B2- Familiarity with the laws and calculations of transmission lines and learning to extract them from the Smith diagram.B3- Familiarity with mathematical derivations and relationships related to the subject of load suitability and the S matrix.B4- Familiarity with the mathematical derivations related to the topic of (Waveguides) and understanding how the wave is transmitted through them.B5- Familiarity with derivations and mathematical relationships related to the topic (Cavity Resonators).B6- Familiarity with the mathematical laws related to the subject of inert elements, the most important of which are duals.B7- Familiarity with the method of using and the importance of diodes and microtransistors, in addition to their theoretical concept. |
| Teaching and Learning Methods |
| * The lecturer prepares lectures on the subject in paper and electronic form and presents them to the students.
* The lecturer delivers lectures in detail.
* The lecturer requests periodic reports and homework assignments on the basic topics of the subject.
 |
| Assessment methods |
| * Daily discussion to determine the extent of students’ understanding of the material and to evaluate the daily contributions.
* Daily exams with various short scientific questions to understand the extent of their understanding of the material.
* Giving part of the semester’s grade to homework assignments.
* Daily exams (Quiz) and monthly exams for the curriculum and the final exam
 |
| C. Affective and value goals C1-Urging the student to expand his understanding of cosmic phenomena and waves and linking them to the concept of the vector equation.C2- Urging the student to think about the most important applications of TL in the field of communications and microwave transmission.C3- Urging the student to think about the most important applications of Impedance Matching in the field of control, machinery and communications.C4- Urging the student to think about the most important uses of vectors and oscillators in the field of electronic engineering and micro and digital communications.C5- Urging the student to think about the importance of studying microwave engineering devices and components such as diodes and transistors.C6- Urging the student to expand his thinking about the importance of using the Klystron and the Magnetron |
| 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.
 |
| 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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| D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)D1- Enabling students to write reports on topics related to physics.D2- Enabling students to know how to use the Internet to obtain important information.D3- Raising the student’s self-confidence by linking theoretical material to practical reality.D4- Developing students’ skills in how to deal with computer hardware and software problems and how to deal with them. |

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| 10. Course Structure |
| Week | Hours | ILOs | Unit/Module or Topic Title | Teaching Method | Assessment Method |
| Week 1  | 3 | The teacher reviews everything related to electromagnetic theory | Electromagnetic Theory | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 2 | 3 | The teacher explains an introduction to microwave engineering | Microwave Engineering | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 3 | 3 | An introduction to transmission lines | Transmission Line Theory | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 4 | 3 | A detailed explanation of how to find transmission line constants and loads and solve problems | Transmission Line Theory | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 5 | 3 | An expanded explanation of the Scattering Matrixand uses of its elements | S-Parameters  | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 6 | 3 | Understand and study the method of router transmission across routers with examples | Waveguides | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 7 | 3 | Explain the different types of vectors, which are rectangular, circular, and semicircular, with examples | Waveguides | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 8 | 3 | Understanding and studying the method of wave transmission through oscillators and explaining their types | Cavity Resonators | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 9 | 3 | Understanding and studying how duals work and their importance in transmitting microwaves | Microwave Directional Couplers | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 10 | 3 | Understanding and studying the way insulators work and their importance in the flow and transmission of microwaves | Design & Analysis of Ferromagnetic Components in Microwave | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 11 | 3 | The lecturer presents the types of diodes and micro transistors, their theoretical concept and applications | Microwave Diodes & Transistors | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 12 | 3 | Understand how microwave tubes and filters work and how to use them within the microwave network | Microwave Tubes & Filters | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 13 | 3 | Understanding and studying the mechanism of operation of amplifiers and microwave oscillators | Microwave Amplifiers & Oscillators  | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 14 | 3 | Understanding and studying the mechanism of operation of the Klystron and Magnetron and the method of amplifying | Microwave Amplifiers & Oscillators | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |
| Week 15 | 3 | Showcasing the latest scientific findings in microwave engineering applications,  | Applications of Microwave Engineering | Lectures NotesPDFpower pointVideo | Daily exams + monthly exams |

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| 11. Infrastructure |
| 1. Books Required reading: | 1. Samuel Liao “Microwave Devices and Circuits”.2. David M. Pozar. “Microwave Engineering” Fourth Edition. |
| 2. Main references (sources) | • Lectures presented by the Lecturer• Books available in the college library |
| A- Recommended books and references (scientific journals, reports…). | All solid scientific journals related to the broad and advanced concept of microwave engineering. |
| B-Electronic references, Internet sites… | All websites and electronics that have the course vocabulary |
| 12. The development of the curriculum plan |
| It was suggested that there be a laboratory for the substance to conduct experiments on the substance |