# MODULE DESCRIPTION FORM

# نموذج وصف المادة الدراسية

| Module Information<br>معلومات المادة الدراسية | | | | | |
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| **Module Title** | **Fundamentals of Electronic Engineering / أسس الهندسة الإلكترونية** | | | **Module Delivery** | |
| **Module Type** | **S** | | | ☒ **Theory**<br>☒ **Lecture**<br>☒ **Lab**<br>☐ **Tutorial**<br>☐ **Practical**<br>☐ **Seminar** | |
| **Module Code** | **CYBT200** | | | | |
| **ECTS Credits** | 4 | | | | |
| **SWL (hr/sem)** | 100 | | | | |
| **Module Level** | | | **Semester of Delivery** | 3 | |
| **Administering Department** | Department of Cybersecurity Technical Engineering | | **College** | Technical Engineering College of Computer and Artificial Intelligence - Kirkuk | |
| **Module Leader** | | | **e-mail** | | |
| **Module Leader's Acad. Title** | | | **Module Leader's Qualification** | Ph.D. in Electronic Engineering | |
| **Module Tutor** | | | **e-mail** | | |
| **Peer Reviewer Name** | | | **e-mail** | | |
| **Scientific Committee Approval Date** | 2/11/2026 | | **Version Number** | 1.0 | |

| Relation with other Modules<br>العلاقة مع المواد الدراسية الأخرى | | | |
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| **Prerequisite module** | Electrical Fundamentals | **Semester** | 1 |

| Module Aims, Learning Outcomes and Indicative Contents<br>أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية | |
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| **Module Aims**<br>أهداف المادة الدراسية | This module aims to introduce students to the fundamental principles of electronic engineering, semiconductor physics, and basic electronic devices. It focuses on the physics of semiconductor materials, PN junction diodes, diode equivalent models, DC and AC analysis of diode application circuits (rectifiers, filters, clippers, clampers, and Zener voltage regulators), Bipolar Junction Transistors (BJT) construction, operating principles, DC biasing, load line analysis, and an introduction to Field Effect Transistors (JFET/MOSFET). The course also aims to provide hands-on experience in laboratory breadboarding, circuit testing, and electronic instrumentation. |
| **Module Learning Outcomes**<br><br>مخرجات التعلم للمادة الدراسية | Understand the physics of semiconductors, energy bands, intrinsic/extrinsic materials, and charge carrier transport mechanisms.<br>Understand the structure, PN junction operation, VI characteristics, and equivalent circuit models of diodes and Zener diodes.<br>Analyze and design diode application circuits, including half-wave/full-wave rectifiers, power supply filters, clippers, clampers, and voltage regulators.<br>Comprehend Bipolar Junction Transistor (BJT) principles, NPN/PNP structures, current components, and operating modes (Cutoff, Active, Saturation).<br>Perform DC analysis, DC load line evaluation, and Q-point determination for BJT bias configurations (Fixed, Emitter, Voltage Divider).<br>Understand the basic construction, operation, and characteristics of Field Effect Transistors (JFET and MOSFET).<br>Construct, test, and measure electronic circuits practically using oscilloscopes, function generators, DC power supplies, and DMMs. |
| **Indicative Contents**<br>المحتويات الإرشادية | The module will cover the following key areas:<br>Physics of Semiconductors: Atomic Structure, Energy Bands, Intrinsic & Extrinsic Semiconductors, Doping Process, Drift & Diffusion<br>PN Junction Diode: Depletion Region, Barrier Potential, Forward & Reverse Biasing, VI Characteristics, Static & Dynamic Resistance<br>Diode Equivalent Models (Ideal, Piecewise Linear) and DC Load Line Analysis<br>AC to DC Rectifiers: Half-Wave Rectifier (HWR), Full-Wave Rectifiers (Center-Tapped & Bridge), PIV, Efficiency, and Capacitor Filters<br>Diode Clipper Circuits (Series & Parallel) and Clamper Circuits (Positive & Negative)<br>Zener Diode Principles, Avalanche & Zener Breakdown, and Zener Voltage Regulation<br>Bipolar Junction Transistor (BJT): Construction, NPN/PNP Operation, Current Components (Alpha & Beta)<br>BJT Configurations: Common Emitter (CE), Common Base (CB), Common Collector (CC) Input/Output Characteristics<br>BJT DC Biasing: Fixed-Bias, Emitter-Stabilized Bias, Voltage Divider Bias, Stability Factor, and Q-Point Analysis<br>Field Effect Transistors (FET): JFET Structure, MOSFET Types (Depletion & Enhancement), and VI Characteristics<br>Special Semiconductor Devices: Light Emitting Diodes (LEDs), Photodiodes, Varactor Diodes<br>Introduction to Electronic Circuit Simulation using Multisim / SPICE |

| Learning and Teaching Strategies<br>استراتيجيات التعلم والتعليم | |
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| **Strategies** | The module will employ a combination of strategies including:<br>Lectures: To provide theoretical foundations on electronic principles, device physics, and circuit design principles.<br>Group Discussions: To facilitate problem-solving and critical thinking through analyzing electronic circuit behavior.<br>Problem-Solving Sessions: To work through numerical problems on diode DC/AC analysis, rectifier design, Zener regulation, and transistor biasing.<br>Practical Lab Sessions: Hands-on experience constructing electronic circuits on breadboards and making measurements using lab instruments.<br>Tutorials: To delve into complex topics like load line analysis, transistor bias stability, and waveform shaping circuits.<br>Mid-term and final exams: To assess comprehensive theoretical knowledge and analytical engineering skills.<br>Preparatory Week: To give students time to revise and clarify any difficulties before the final exam. |

| Student Workload (SWL)<br>الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا | | | |
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| **Structured SWL (h/sem)**<br>الحمل الدراسي المنتظم للطالب خلال الفصل | 124 | **Structured SWL (h/w)**<br>الحمل الدراسي المنتظم للطالب أسبوعيا | 8 |
| **Unstructured SWL (h/sem)**<br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 76 | **Unstructured SWL (h/w)**<br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5 |
| **Total SWL (h/sem)**<br>الحمل الدراسي الكلي للطالب خلال الفصل | 200 | | |

| Module Evaluation<br>تقييم المادة الدراسية | | | | | |
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| | | **Time/Number** | **Weight (Marks)** | **Week Due** | **Relevant Learning Outcome** |
| **Formative assessment** | **Quizzes** | 2 | 5% (5) | 5, 10 | LO #1, 3 and 5 |
| | **Assignments** | 2 | 5% (5) | 2, 12 | LO #2, 4 and 6 |
| | **Projects / Lab.** | 1 | 10% (10) | Continuous | LO #7 |

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| | **Report** | 1 | 10% (10) | 13 | LO #3, 5 and 7 |
| **Summative assessment** | **Midterm Exam** | 2 hr | 20% (20) | 8 | LO #1 - 4 |
| | **Final Exam** | 2hr | 50% (50) | 16 | All |
| **Total assessment** | | | 100% (100 Marks) | | |

| **Delivery Plan (Weekly Syllabus)**<br>المنهاج الاسبوعي النظري | |
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| | **Material Covered** |
| **Week 1** | Introduction to Electronic Engineering: Energy bands, Conductors, Insulators, and Semiconductor Physics. |
| **Week 2** | Extrinsic Semiconductors: N-type & P-type Doping, Charge Carriers, Drift Current, and Diffusion Current. |
| **Week 3** | PN Junction Diode: Depletion Layer Formation, Built-in Potential, Forward & Reverse Biasing Mechanisms. |
| **Week 4** | Diode VI Characteristics: Static & Dynamic Resistance, Ideal vs. Practical Diode Models. |
| **Week 5** | Diode DC Circuit Analysis: Graphical Analysis, Load Line, and Q-Point Determination. |
| **Week 6** | AC to DC Rectification: Half-Wave Rectifier (HWR) Circuit Analysis, PIV, and Average/RMS Voltages. |
| **Week 7** | Full-Wave Rectifiers: Center-Tapped and Bridge Rectifier Circuits, Efficiency, and Ripple Factor. |
| **Week 8** | Mid-term Exam (الفصل منتصف اختبار) & Power Supply Filters: Capacitor Input Filter and Voltage Regulation. |
| **Week 9** | Diode Clipper Circuits: Series & Parallel Clippers with Independent DC Voltage Sources. |
| **Week 10** | Diode Clamper Circuits: Positive & Negative Waveform Clampers, Voltage Multipliers. |
| **Week 11** | Zener Diode Principles: Zener & Avalanche Breakdown Mechanisms, Characteristics, and Zener Voltage Regulator. |
| **Week 12** | Bipolar Junction Transistor (BJT): Construction, NPN/PNP Types, Basic Operation, and Current Relations. |
| **Week 13** | BJT Configurations: Common Emitter (CE), Common Base (CB), Common Collector (CC) Characteristics. |
| **Week 14** | BJT DC Biasing: Fixed-Bias, Emitter-Stabilized Bias, and Voltage Divider Bias Circuits. |
| **Week 15** | BJT DC Load Line Analysis: Stability Factor, Q-Point Selection, and Saturation/Cutoff Conditions. |

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| **Week 16** | **Introduction to Field Effect Transistors (JFET & MOSFET) / Special Semiconductor Devices / Final Examination.** |

| **Delivery Plan (Weekly Lab. Syllabus)**<br>المنهاج الاسبوعي للمختبر | |
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| | **Material Covered** |
| **Week 1** | Lab 1: Introduction to Electronics Laboratory Equipment (Oscilloscope, Function Generator, Power Supply, DMM). |
| **Week 2** | Lab 2: Measurement of PN Junction Diode Forward & Reverse VI Characteristics and Dynamic Resistance. |
| **Week 3** | Lab 3: Design, Construction, and Testing of Half-Wave and Full-Wave Bridge Rectifiers with Capacitor Filter. |
| **Week 4** | Lab 4: Constructing and Waveform Analysis of Diode Clipper and Clamper Circuits on Oscilloscope. |
| **Week 5** | Lab 5: Testing Zener Diode Voltage Regulation Characteristics under Varying Input Voltage and Load Current. |
| **Week 6** | Lab 6: BJT Transistor Input and Output VI Characteristics Measurement and DC Biasing Setup. |
| **Week 7** | Lab 7: Revision, Electronic Circuit Simulation (Multisim), Practical Exam, and Lab Project Assessment. |

| **Learning and Teaching Resources**<br>مصادر التعلم والتدريس | | |
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| | **Text** | **Available in the Library?** |
| **Required Texts** | Boylestad, R. L., & Nashelsky, L. (2013). "Electronic Devices and Circuit Theory" (11th ed.). Pearson. | Yes |
| **Recommended Texts** | Floyd, T. L. (2017). "Electronic Devices: Conventional Current Version" (10th ed.). Pearson. | Yes |
| **Websites** | Yes | |

| **Grading Scheme**<br>مخطط الدرجات |
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| Group | Grade | التقدير | Marks (%) | Definition |
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| **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.