# Fundamentals of Electrical Engineering

| Module Information | | | | | |
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| **Module Title** | **Fundamentals of Electrical Engineering** | | | **Module Delivery** | |
| **Module Type** | **Core** | | | ✓ **Theory**<br>✓ **Lecture**<br>✓ **Lab**<br>✓ **Tutorial**<br>✓ **Practical**<br>✓ **Seminar** | |
| **Module Code** | **CYBT101** | | | | |
| **ECTS Credits** | **5** | | | | |
| **SWL (hr/sem)** | **125** | | | | |
| **Module Level** | | UGx11 1 | **Semester of Delivery** | | 1 |
| **Administering Department** | | Cyber Security Techniques Engineering | **College** | Technical Engineering College for computer and AI / KIRKUK | |
| **Module Leader** | | | **e-mail** | | |
| **Module Leader's Acad. Title** | | | **Module Leader's Qualification** | | |
| **Module Tutor** | Name (if available) | | **e-mail** | E-mail | |
| **Peer Reviewer Name** | | Name | **e-mail** | E-mail | |
| **Scientific Committee Approval Date** | | 31/12/2025 | **Version Number** | 1.0 | |

| Relation with other Modules | | | |
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| **Prerequisite module** | None | **Semester** | |
| **Co-requisites module** | None | **Semester** | |

| Module Aims, Learning Outcomes and Indicative Contents | |
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| **Module Objectives** | 1. To learn the basics of electrical elements (Symbols and Abbreviations, Units, Electric Circuit and Direct Current).<br>2. Study Ohm's law<br>3. To learn Kirchhoff's Laws<br>4. Network Analysis Methods<br>5. Study The Alternating Current Network<br>6. Phase Diagram |
| **Module Learning Outcomes** | Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.<br>1. Recognize how electricity works in electrical circuits.<br>2. List the various terms associated with electrical circuits.<br>3. Summarize what is meant by a basic electric circuit.<br>4. Define Ohm's law.<br>5. Explain the two Kirchoff's laws used in circuit analysis.<br>6. Use different Network Analysis Methods to analyze and solve the electrical circuits |

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| | 7. Discuss the various properties of resistors, capacitors, and inductors.<br>8. Discuss the operations of sinusoid and phasors in an electric circuit.<br>9. Identify the capacitor and inductor phasor relationship with respect to voltage and current. |
| **Indicative Contents** | Indicative content includes the following.<br><br><u>Part A - Introduction to electrical circuits</u><br>Symbols And Abbreviations, Units, Electric Circuit & It's Element. The Direct Current Network.<br>Ohm's law, Series Circuits, Parallel Circuits, Series-Parallel Circuits, Open and Short Circuits, Source Transformation<br>Conversion Of Delta to Star Connection And Vice Versa [15 hrs]<br><br><u>Part B - Kirchhoff's Laws</u><br>How to use in Network Analysis. [5 hrs]<br><br><u>Part C - Network Analysis Methods</u><br>Loop (mesh) Current Method.<br>Superposition Method.<br>Thevenin's Theorem<br>Norton's Theorem<br>Maximum Power Transfer Theorem<br>Nodal Voltage Method. [30 hrs]<br><br><u>Part D - The Alternating Current Network</u><br>Types of Alternating Waveforms, Generation of Alternating Current, and Definitions related to Alternating Waveforms.<br>The Mean Values of Current and Voltage the Effective Vales of Current and Voltage<br>Circuit Elements in the Phase Domain<br>The Vector Diagram<br>Series Ac Circuits and Parallel Ac Circuits<br>Using Kirchhoff's laws to solve AC circuits [20 hrs]<br><br><u>Revision problem classes</u> [5 hrs] |

| **Learning and Teaching Strategies** | |
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| **Strategies** | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students. |

| **Student Workload (SWL)** | | | |
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| **Structured SWL (h/sem)** | 63 | **Structured SWL (h/w)** | 5 |

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| **Unstructured SWL (h/sem)** | 62 | **Unstructured SWL (h/w)** | 2 |
| **Total SWL (h/sem)** | **125** | | |

**Module Evaluation**

| As | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
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| **Formative assessment** | **Quizzes** | 6 | 10% (10) | 4, 5, 6, 8, 11 and 12 | LO #4, #5, #6, #7, #8 and #9 |
| | **Assignments** | 7 | 10% (10) | 3, 4, 5, 6, 8, 11 and 12 | LO #4, #5, #6, #7, #8 and #9 |
| | **Projects / Lab.** | 1 | 10% (10) | Continuous | All |
| | **Report** | 6 | 10% (10) | 13 | LO #4, #5, #6, #7, #8 and #9 |
| **Summative assessment** | **Midterm Exam** | 2hr | 10% (10) | 7 | LO #1 - #7 |
| | **Final Exam** | 3hr | 50% (50) | 16 | All |
| **Total assessment** | | | 100% (100 Marks) | | |

**Delivery Plan (Weekly Syllabus)**

| Week | Material Covered |
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| **Week 1** | **Symbols And Abbreviations, Units, Electric Circuit & It's Element. The Direct Current Network.** |
| **Week 2** | **Ohm's law, Series Circuits, Parallel Circuits, Series-Parallel Circuits, Open and Short Circuits, Source Transformation** |
| **Week 3** | **Conversion Of Delta to Star Connection And Vice Versa** |
| **Week 4** | **Kirchhoff's Laws How to use in Network Analysis..** |
| **Week 5** | **Loop (mesh) Current Method.** |
| **Week 6** | **Superposition Method.** |
| **Week 7** | **Thevenin's Theorem** |
| **Week 8** | **Norton's Theorem** |
| **Week 9** | **Maximum Power Transfer Theorem** |
| **Week 10** | **Nodal Voltage Method** |
| **Week 11** | **Types of Alternating Waveforms, Generation of Alternating Current, and Definitions related to Alternating Waveforms.**<br>**The Mean Values of Current and Voltage the Effective Vales of Current and Voltage** |
| **Week 12** | **Circuit Elements in the Phase Domain**<br>**The Vector Diagram** |
| **Week 13** | **Series Ac Circuits and Parallel Ac Circuits** |

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| **Week 14** | **Using Kirchhoff's laws to solve AC circuits** |
| **Week 15** | **Preparatory week before the final Exam** |
| **Week 16** | **Final Exam** |

| **Delivery Plan (Weekly Lab. Syllabus)** | |
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| **Week** | **Material Covered** |
| **Week 1** | **Basic information** |
| **Week 2** | **Color of resistance** |
| **Week 3** | **Ohm's law and resister in series and parallel** |
| **Week 4** | **Star and delta connection** |
| **Week 5** | **Kirchhoff's law** |
| **Week 6** | **Superposition theorem** |
| **Week 7** | **Thevenin's Theorem** |
| **Week 8** | **Maximum Power Transfer** |
| **Week 9** | **Norton's Theorem** |
| **Week 10** | **Operating of Oscilloscope (CRO)** |
| **Week 11** | **Utilization of Oscilloscope** |
| **Week 12** | **The Sine wave** |
| **Week 13** | **Application of AC signal** |
| **Week 14** | **Time constant** |

| **Learning and Teaching Resources** | | |
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| | **Text** | **Available in the Library?** |
| **Required Texts** | Electric Circuits, by: James W. Nilsson and Susan A. Riedel Pearson Education Limited 10th edition 2015 | Yes |
| **Recommended Texts** | FUNDAMENTALS OF ELECTRICAL ENGINEERING, by: Giorgio Rizzoni, McGraw-Hill, 1st edition, 2009. | No |
| **Websites** | https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering | |

| **Grading Scheme** | | | |
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| **Group** | **Grade** | **Marks %** | **Definition** |
| **Success Group (50 - 100)** | **A -** Excellent | 90 – 100 | Outstanding Performance |
| | **B -** Very Good | 80 – 89 | Above average with some errors |
| | **C -** Good | 70 – 79 | Sound work with notable errors |
| | **D -** Satisfactory | 60 – 69 | Fair but with major shortcomings |
| | **E -** Sufficient | 50 – 59 | Work meets minimum criteria |
| **Fail Group (0 – 49)** | **FX –** Fail | (45-49) | More work required but credit awarded |
| | **F –** Fail | (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.