# COURSE OUTLINE: ELN109 - ELECTRONIC CIRCUITS

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Approved: Corey Meunier, Chair, Technology and Skilled Trades

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| **Course Code: Title** | ELN109: ELECTRONIC DEVICES AND CIRCUITS |
| **Program Number: Name** | 4026: ELECTRICAL TN-PROC<br>4029: ELECTRICAL TY-PROCES<br>4127: ELECTRICAL TN-TRADES |
| **Department:** | ELECT./INSTRUMENTATION PS |
| **Semesters/Terms:** | 19W |
| **Course Description:** | This course is a detailed study of BJTs, JFETs, MOSFETs and OPAMPs as well as applications of these devices including transistor amplification, switching, timing circuits and OpAmp applications. This course will focus on operational analysis and troubleshooting of circuits employing these devices. Hands on skills will be reinforced in the laboratory component of this course, which includes device testing, circuit assembly, testing and troubleshooting. |
| **Total Credits:** | 5 |
| **Hours/Week:** | 5 |
| **Total Hours:** | 75 |
| **Prerequisites:** | ELN100, ELR100 |
| **Corequisites:** | There are no co-requisites for this course. |
| **This course is a pre-requisite for:** | ELN115, ELN213 |
| **Vocational Learning Outcomes (VLO's) addressed in this course:**<br>**Please refer to program web page for a complete listing of program outcomes where applicable.** | **4026 - ELECTRICAL TN-PROC**<br>VLO 1 Interpret and produce electrical and electronics drawings including other related documents and graphics.<br>VLO 2 Analyze and solve routine technical problems related to electrical systems by applying mathematics and science principles.<br>VLO 6 Verify acceptable functionality and apply troubleshooting techniques for electrical and electronic circuits, components, equipment, and systems under the supervision of a qualified person.<br>VLO 12 Apply health and safety standards and best practices to workplaces. |
| **Essential Employability Skills (EES) addressed in this course:** | EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.<br>EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.<br>EES 3 Execute mathematical operations accurately.<br>EES 4 Apply a systematic approach to solve problems.<br>EES 5 Use a variety of thinking skills to anticipate and solve problems.<br>EES 6 Locate, select, organize, and document information using appropriate technology and information systems.<br>EES 7 Analyze, evaluate, and apply relevant information from a variety of sources. |

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| | EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.<br>EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.<br>EES 10 Manage the use of time and other resources to complete projects.<br>EES 11 Take responsibility for ones own actions, decisions, and consequences. |
| **Course Evaluation:** | Passing Grade: 50%, D |
| **Other Course Evaluation & Assessment Requirements:** | To successfully pass this course, the student must receive passing grades for both the Test and Evaluation portion of the class AND the Laboratory portion.<br><br>Grade<br>Definition Grade Point Equivalent<br>A+ 90 - 100% 4.00<br>A 80 - 89%<br>B 70 - 79% 3.00<br>C 60 - 69% 2.00<br>D 50 - 59% 1.00<br>F (Fail)49% and below 0.00<br><br>CR (Credit) Credit for diploma requirements has been awarded.<br>S Satisfactory achievement in field /clinical placement or non-graded subject area.<br>U Unsatisfactory achievement in field/clinical placement or non-graded subject area.<br>X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.<br>NR Grade not reported to Registrar`s office.<br>W Student has withdrawn from the course without academic penalty. |
| **Books and Required Resources:** | Introductory Electronic Devices and Circuits by Robert T. Paynter<br>Publisher: Pearson Custom ElectronicsTechnology Publishing Edition: Custom Edition<br>ISBN: 978-1-269-26047-3<br>Available in Campus Book Store |

**Course Outcomes and Learning Objectives:**

| **Course Outcome 1** | **Learning Objectives for Course Outcome 1** |
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| 1. Describe the construction and operation of a Bipolar Junction Transistor (BJT) | 1.1 Describe the construction of a bipolar junction transistor (BJT) and the difference between the npn and pnp transistors.<br>1.2 Describe the operation of a transistor in the active, cutoff and saturation regions and how to bias the transistor accordingly.<br>1.3 Describe the transistor as a current-controlled device and state the relationship among the three terminal currents.<br>1.4 Define beta and use it in transistor current calculations.<br>1.5 Using a specification sheet, list the parameters and operating characteristics of different transistors.<br>1.6 Describe how to test transistors in and out of circuit with an analog or digital meter. |
| **Course Outcome 2** | **Learning Objectives for Course Outcome 2** |
| 2. Analyze, assemble, test and troubleshoot various BJT biasing configurations. | 2.1 State the purpose of dc biasing for transistor circuits.<br>2.2 Identify and analyze common transistor biasing circuits.<br>2.3 Plot the dc load line for an amplifier and explain what the Q-point represents. |

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| | 2.4 Define and Calculate the Q-Point, Saturation and Cutoff.<br>2.5 Describe, analyze and calculate the operation of a base-bias circuit, and explain why this bias is used when you require the transistor to act as a switch.<br>2.6 Assemble and test biasing circuits using proper test equipment.<br>2.7 Correctly use common test equipment in the analysis and troubleshooting of transistor circuits.<br>2.8 Analyze, test and troubleshoot, transistor switching circuits and amplifiers.<br>2.9 Identify and understand the operation of other transistor configurations including Darlington |
| **Course Outcome 3** | **Learning Objectives for Course Outcome 3** |
| 3. Describe and analyze the operation of basic transistor amplifiers. | 3.1 Identify and compare various Amplifier classes.<br>3.2 List the fundamental ac properties of amplifiers.<br>3.3 Derive the ac equivalent for a class A amplifier.<br>3.4 Explain and Calculate the effects of input and output impedance on voltage gain.<br>3.5 Perform a complete mathematical dc and ac analysis of a voltage divider bias class A amplifier.<br>3.6 Assemble and test a single stage amplifier for proper dc and ac voltages.<br>3.7 Troubleshoot a multi-stage amplifier in a safe and proper manner. |
| **Course Outcome 4** | **Learning Objectives for Course Outcome 4** |
| 4. Describe and analyze the characteristics, operation, biasing, and testing of JFETs and MOSFETs. | 4.1 Identify the two types of JFETs and describe the construction and operation of each.<br>4.2 Describe and analyse the different types of JFET biasing circuits.<br>4.3 Compare FET characteristics, advantages and disadvantages with BJTs.<br>4.4 Identify the two types of MOSFETs and describe the construction and operation of each.<br>4.5 Describe and analyse the different types of MOSFET biasing circuits.<br>4.6 Assemble, test and troubleshoot different JFET and MOSFET circuits. |
| **Course Outcome 5** | **Learning Objectives for Course Outcome 5** |
| 5. Describe and analyze the operation, characteristics and applications of Operational Amplifiers (OpAmps) | 5.1 Describe the operational amplifier.<br>5.2 Explain IC identification of an OPAMP.<br>5.3 Explain the term differential amplifier.<br>5.4 Describe the operation of a discrete differential amplifier.<br>5.5 Using a specification sheet, list and understand the operating and electrical characteristics of OPAMPS.<br>5.6 Describe, analyse and calculate the operation of common OPAMP circuits including Inverting, Non-Inverting, Follower, and Comparator.<br>5.7 Assemble, test and troubleshoot common OPAMP circuits. |

**Evaluation Process and Grading System:**

| Evaluation Type | Evaluation Weight | Course Outcome Assessed |
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| Labs, Practical tests and Reports | 40% | |

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| | Theory tests (3) and Quizzes | 60% | |
| **Date:** | August 22, 2018 | | |
| | Please refer to the course outline addendum on the Learning Management System for further information. | | |