**COURSE OUTLINE**

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| EGR | 221 |  | Introduction to Electric Circuit Analysis |  | 4 |
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| **Dept. Abbr.** | **Course No.** |  | **Course Title** |  | **Credits** |
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| Prepared by | Science | Lin Lin | Lin Lin | Jon Morris | 12/2/2013 |
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|  | **Department** | **Faculty** | **Program Coordinator** | **Division Chairperson** | **Date** |
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| ***Course Description***  **EGR\*221, Introduction to Electric Circuit Analysis, (4 credits)**  This course covers basic concepts, theorems, laws, methods of analysis, and application examples in DC and AC circuits. Topics include Resistance, capacitance, inductance, operational amplifiers, Ohm’s Law, Kirchhoff’s Laws, Thevenin’s and Norton’s Theorems, Nodal and loop analysis, first and second order transient circuits, steady-state analysis, and polyphase circuits. Laboratory experiments involve using simulation software and using instruments for circuit building and testing. Four hours of lecture/laboratory per week. *Prerequisite: MAT\*254.* |
| ***General Objectives of the Course***  Upon successful completion of this course the student will be able to:   * Understand the underlying physical foundations of Electrical Circuits * Apply mathematics to solve a wide variety of circuit problems * Design basic electrical components to meet desired needs * Use computers and modern tools (PSPICE, MATLAB, Multisim) to solve circuit problems   ***TAP Learning Outcomes (Competencies) of the Course***  **Quantitative Reasoning** (designated competency)   1. Represent mathematical and quantitative information symbolically, graphically, numerically, and verbally. 2. Apply quantitative methods to investigate routine and novel problems. This includes calculations/procedures, mathematical and/or statistical modeling, prediction, and evaluation. 3. Interpret mathematical and quantitative information and draw logical inferences from representations such as formulas, equations, graphs, tables, and schematics. 4. Evaluate the results obtained from quantitative methods for accuracy and/or reasonableness.   **Scientific Reasoning** (designated competency)   1. Explain the methods of scientific inquiry that lead to the acquisition of knowledge. Such methods include observations, testable hypotheses, logical inferences, experimental design, data acquisition, interpretation, and reproducible outcomes. 2. Apply scientific methods to investigate real-world phenomena, and routine and novel problems. This includes data acquisition and evaluation, and prediction. 3. Represent scientific data symbolically, graphically, numerically, and verbally. 4. Interpret scientific information and draw logical references from representations such as formulas, equations, graphs, tables, and schematics. 5. Evaluate the results obtained from scientific methods for accuracy and/or reasonableness.   **Scientific Knowledge & Understanding** (designated competency)   1. Communicate using appropriate scientific terminology. 2. Use representations and models to communicate scientific knowledge and solve scientific problems. 3. Plan and implement data collection strategies appropriate to a particular scientific question. 4. Articulate the reasons that scientific explanations and theories are refined or replaced. 5. Evaluate the quality of scientific information on the basis of its source and the methods used to generate it.   **Information Literacy / Continuing Learning** (embedded competency)   1. Demonstrate competency in using current, relevant technologies to solve problems, complete projects, and make informed decisions. 2. Synthesize information to broaden the knowledge base and produce both independent and collaborative work   **Critical Analysis & Logical Thinking** (embedded competency)   1. Analysis: Break subject matter into components and identify their interrelations to ascertain the defining features of the work and their contributions to the whole. 2. Synthesis: Draw together disparate claims into a coherent whole in order to arrive at well-reasoned and well-supported inferences that can be justified as a conclusion. |

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| **Unit #** | **Instructional Unit** | **Specific Objectives of Unit** |
| 1 | Basic Concepts | * know the definitions of voltage, current, power, independent and dependent sources * calculate the power absorbed by a circuit element |
| 2 | Resistive Circuits | * apply Ohm’s law, Kirchhoff’s current law and voltage law * combine resistors in series and parallel * analyze single-loop and single-node-pair circuits * analyze electric circuits containing dependent sources |
| 3 | Nodal and Loop Analysis Techniques | * calculate all currents and voltages in circuits that contain multiple nodes and loops * employ Kirchhoff’s current law (KCL) and voltage law (KVL) |
| 4 | Operational Amplifiers | * model the op-amp device * analyze circuits that employ op-amps |
| 5 | Additional Analysis Techniques | * analyze circuits using the principle of superposition * calculate a Thevenin equivalent circuit for a linear circuit * calculate a Norton equivalent circuit for a linear circuit * use the maximum power transfer theorem |
| 6 | Capacitance and Inductance | * use circuit models for inductors and capacitor * calculate stored energy for capacitors and inductors * calculate voltages and currents for capacitors and inductors in circuits with dc sources * combine capacitors and inductors in series and parallel |
| 7 | First- and Second-Order Transient Circuits | * calculate initial values for inductor currents and capacitor voltages in transient circuits * calculate voltages and currents in first-order, and in second-order transient circuits |
| 8 | AC Steady-State Analysis | * perform phasor and inverse phasor transformations and draw phasor diagrams * calculate impedance and admittance for basic circuit elements * combine impedances and admittances in series and parallel * draw the frequency-domain circuit for a given circuit with a sinusoidal source * apply circuit analysis techniques to frequency-domain circuits |
| 9 | Steady-State Power Analysis | * calculate instantaneous and average power in ac circuits * calculate the maximum average power transfer for a load in ac circuits * calculate the effective value for a periodic waveform * calculate real power, reactive power, complex power, and power factor in ac circuits |
| 10 | Polyphase Circuits | * know the characteristics of a balanced, three-phase circuit * know the basic wye and delta three-phase connections * calculate voltage and currents in balanced, three-phase circuits * calculate complex power in balanced, three-phase circuits |