University of Sistan and Baluchestan

Department of Mechanical Engineering-Mechatronics

Fundamentals of Electrical and Electronic Engineering I

Instructors: **Tahereh Fanaei Sheikholeslami**
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Description and Importance of the Course

This course **aims** to provide students with a sound knowledge of electrical circuits, circuit analysis techniques and application. Electric circuit theory and electromagnetic theory are the two fundamental theories upon which all branches of electrical engineering are built. Many branches of electrical engineering, such as power, electric machines, control, electronics, communications, and instrumentation, are based on electric circuit theory.

The unit covers fundamentals of Electrical and Electronic Engineering for **non-electrical engineering students** from Mechanical, Architectural and Building Engineering courses, which includes the fundamental laws and theorems, circuit techniques, and passive and active elements.

Circuit theory is valuable to students specializing in other branches of the physical sciences because **circuits are a good model for the study of energy systems in general**, and because of the applied mathematics, physics, and topology involved.

Evaluations

- Assignments: 20%
- Quiz (1-6): 20%
- Midterm Exam (Monday, 19/08/99, 18:00-19:30): 30%
- Final Exam: 30 %

Reference

- Charles K. Alexander, Matthew N. O. Sadiku, “Fundamentals of Electric Circuits”, 5th Edition, Mc Grow Hill, 2013.

Course Details

Weeks	Contents	Chapters
1	Basic Concepts: Systems of Units, Charge and Current, Voltage, Power and Energy, Circuit Elements, Applications: TV Picture Tube, Electricity Bills	1
2	Basic Laws: Ohm's Law, Nodes, Branches, and Loops, Kirchhoff's Laws, Series Resistors and Voltage Division, Parallel Resistors and Current Division ……**Quiz1**	2
3	Basic Laws: Wye-Delta Transformations, Delta to Wye Conversion, Wye to Delta Conversion, Applications: Lighting Systems, Design of DC Meters	2
4	Methods of Analysis: Nodal Analysis, Nodal Analysis with Voltage Sources……**Quiz2**	3
5	Methods of Analysis: Mesh Analysis, Mesh Analysis with Current Sources, Nodal Versus Mesh Analysis, Applications: DC Transistor Circuits	3
6	Circuit Theorems: Linearity Property, Superposition, Source Transformation, Thevenin's Theorem, Norton's Theorem ……**Quiz3**	4
7	Circuit Theorems: Maximum Power Transfer, Applications: Source Modeling, Resistance Measurement Reviews and Questions	4
8	Operational Amplifiers: Ideal Op Amp, Inverting Amplifier, Noninverting Amplifier, Summing Amplifier, Difference Amplifier	5
Midterm exam (based on the subjects of the weeks 1 to 8)		
9	Operational Amplifiers: Cascaded Op Amp Circuits, Applications: Digital-to-Analog Converter, Instrumentation Amplifiers	5
10	Capacitors and Inductors: Series and Parallel Capacitors, Series and Parallel Inductors……**Quiz4**	6
11	First-Order Circuits: The Source-Free RC Circuit, The Source-Free RL Circuit, Singularity Functions	7
12	Second-Order Circuits: Step Response of an RC Circuit, Step Response of an RL Circuit, Applications ……..….. **Quiz5**	7
13	Second-Order RLC Circuits and Applications	7
14	Sinusoids and Phasors: Sinusoids, Phasors, Phasor Relationships for Circuit Elements……. **Quiz6**	9
15	Sinusoids and Phasors: Impedance and Admittance, Kirchhoff's Laws in the Frequency Domain, Impedance Combinations	9
16	Review, Questions and Discussion	5-9