COURSE SYLLABI

ABET COURSE SYLLABI

Current Plan 2021 ☒					**New Plan 2024** ☒		
Course Code	202EE-3				**Course Code**	202-ELE-3	
Course Name	Engineering Mathematics						
Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Abdulkarem Hussein Almawgani

Textbook

Advanced Engineering Mathematics by P. O'Neil, International Student Edition. 2011

References

Mathematics for Electrical Engineering and Computing by Mary Attenborough, 2003

Other Supplemental Materials

Computer programming tools (MATLAB)

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Vector analysis including vector fields, gradient, divergence, curl, line and surface integrals, Gauss' and Stokes' theorems. Introduction to complex variables, eigenvalues and eigenvectors. Commonly used engineering functions, series and sequences.
2. **Prerequisites:** 203MATH-3 (Current Plan),
   203-MAT-3 (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Understand the definitions of Vector Space and its linear Independence
2. Solve Eigen value problems and apply Cayley Hamilton Theorem.
3. Study Curl and divergence with their applications.
4. Derive mathematical models of physical systems.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7
1	Identify, formulate, and solve engineering problems using mathematical theorem.	✓						
2	Apply knowledge of engineering mathematics to analyze the electrical systems.							✓
3	Solving electrical engineering applications by using mathematical theorem.						✓	

Brief List of Topics to be Covered

1. Complex numbers
   - Phasor rotation by $\pi/2$
   - Complex numbers and operations
   - Solution of quadratic equations
   - Polar form of a complex number
   - Applications of complex numbers to AC linear circuits
   - The importance of being exponential
2. Vectors
   - Vectors and vector quantities
   - Addition and subtraction of vectors
   - Magnitude and direction of a 2D vector – polar coordinates Application of vectors to represent waves phasors)
   - Multiplication of a vector by a scalar and unit vectors
   - Basis vectors
   - Products of vectors
   - Vector equation of a line
3. Vector calculus
   - The gradient of a scalar field
   - Differentiating vector fields
   - The scalar line integral
   - Surface integrals
4. Matrices
   - Systems of Equations
   - Gauss elimination
   - Systems of linear equations, matrices, and determinants
   - The inverse and determinant of a 3×3 matrix

ABET COURSE SYLLABI

Current Plan 2021 ☒							
Course Code	216EE-3						
New Plan 2024 ☒							
Course Code	216-ELE-3						
Course Name	Electrical Circuits I (Current Plan) Electrical Circuits (1) (New Plan)						
Current Plan Credits Hours	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
New Plan Credits Hours	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Ayman Hindi

Textbook

Boylestad, "Introductory Circuit Analysis", Twelfth Edition, Pearson Prentice Hall. 2010.

References

James W. Nilsson and Susan A. Riedel, "Electric Circuits", EIGHTH EDITION, Pearson Prentice Hall.

Fundamentals of Electric Circuits by C. D. Alexander and M. N. O. Sadiku, third Edition, Mc Graw-Hill Education, 2007.

Other Supplemental Materials

http://lib.nu.edu.sa/digitallibbrary.aspx

www. en.wikipedia.org/wiki/Electrical_network

www. allaboutcircuits.com

Specific Course Information

1. **brief description of the content of the course (catalog description)**
2. Basic circuit elements and concepts; Basic laws of circuit theory: Ohm's law, Kirchhoff's law; Circuit theorems: superposition principle, Thevenin and Norton theorems; maximum power transfer theorem Techniques of circuit analysis: Nodal and mesh analysis; Sinusoidal sources and the concept of phasor in circuit analysis; Introduction to concept of active, reactive, complex power and power factor.
3. **Prerequisites:** 106MATH-3 and 105PHIS-4 (Current Plan)
   106-MAT-3 and 105-PHY-3 (New Plan)
4. **Corequisites:** None
5. **Course Type**

   University ☐ College ☐ Department☒ Track☐ Others☐

   Required ☒ Elective☐ Selected Elective☐

Educational objectives

5. Explain basic circuit elements and concepts.
6. Explain basic laws of circuit theory.
7. Analyze series/parallel DC circuits using Ohm's and Kirchhoff's laws.
8. Analyze DC circuits using mesh and Nodal methods.
9. Analyze circuits using Thevenin's, Norton's, superposition, and maximum power transfer theorems.
10. Analyze AC circuits.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7
1	Identify and analyze Series/Parallel DC Circuits using Ohm's and Kirchhoff's Laws.	✓						
2	Analyze DC Circuits using Mesh and Nodal Methods of Analysis.						✓	
3	Solving electrical engineering applications by using mathematical theorem.						✓	

4	Analyze DC Circuits using Superposition, Thevenin's, Norton's and Maximum power transfer Theorems.						✓	
5	Analyze AC Circuits.						✓	

Brief List of Topics to be Covered

1. Current, voltage and resistance.Phasor rotation by $\pi/2$
2. Ohm's law, power and energy calculations.
3. Kirchhoff's current and voltage laws in series/parallel DC circuit analysis.
4. Mesh, nodal analysis and source transformation.
5. Superposition, Thevenin, Norton and maximum power transfer theorems.
6. Sinusoidal Alternating Waveforms and phasor representation.
7. Series, Parallel and Series/Parallel AC circuits.

ABET COURSE SYLLABI

Curren Plan 2021 ☒	**New Plan 2024** ☒
Course Code 213EE-1	**Course Code** 213-ELE-1

Course Name Electrical Circuits Lab

Credits Hours 0 **Lab** 2 **Tutorial** 0 **Contact Hours** 2

Instructor's or Course Coordinator's Name
Eng. Mesfer Abdullah Ali Alnajrani

Textbook
Boylestad , "Introductory Circuit Analysis" , Twelfth EDITION, Pearson Prentice Hall.

References
James W. Nilsson and Susan A. Riedel, "Electric Circuits", EIGHTH EDITION, Pearson Prentice Hall.
Fundamentals of Electric Circuits by C. D. Alexander and M. N. O. Sadiku, third Edition, Mc Graw-Hill Education, 2007.

Other Supplemental Materials
Lab manual.

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   In this course students will perform experiments to verify practically the theories and concepts learned in 216EE-3 and 217EE-3. This lab course introduces circuit using Ohm's law, KVL, KCL, Superposition, Thevenin's and Maximum power transfer theorems in DC circuits. Topics include also AC circuits, resonant circuits, transient response of 1st order circuits, magnetically coupled circuits and three phase circuits.
2. **Prerequisites:** None
3. **Corequisites:** 217EE-3 Electrical Circuits II (Current Plan)
   217-ELE-3 Electrical Circuits (2) (New Plan)
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Recognize electrical laboratory devices.
2. Recognize and analyze Electric Circuits using Fundamental laws: Ohm's law, Kirchhoff voltage law (KVL) and Kirchhoff current law (KCL).
3. Analyze of basic series, parallel and series-parallel Circuits.
4. Describe and analyze Electric Circuits using superposition, Thevenin, and maximum power transfer theorems.
5. Categorize the response of various types of resonant circuits.
6. Analyze Response of Transient Response of 1st Order Circuits.
7. Making use of the equipment's and techniques in the laboratory to translate the theory into reality.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Recognize electrical laboratory devices	✓						
2	Verify Ohm's and Kirchhoff's laws.						✓	
3	Apply Superposition, Thevenin and Maximum power transfer theorems.						✓	
4	Estimate experimentally the resonance frequency of series and parallel AC circuits.						✓	
5	Examine the transient response.						✓	
6	Communicate effectively in group discussion and oral examination.			✓				
7	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			
8	Work effectively as a member of the team.					✓		

Brief List of Topics to be Covered

8. Resistor Color Code

1. Ohm s Law, Series and parallel DC circuit (KVL & KCL)
2. Series-Parallel DC Circuits
3. Superposition Theorem
4. Maximum Power Transfer Theorem
5. (RC) Low pass and High pass filters
6. Resonant (RLC) band pass and band stop filters
7. Two-port Network
8. Transients in DC Circuits
9. Op-Amp (inverting & non inverting)

ABET COURSE SYLLABI

Current Plan 2021 ☒				**New Plan 2024 ☒**			
Course Code	217EE-3			**Course Code**	217-ELE-3		
Course Name	Electrical Circuits II (Current Plan) Electrical Circuits (2) (New Plan)						
Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4

Instructor's or Course Coordinator's Name

Dr. Mohammed Saeed Jalalah

Textbook

James W. Nilsson and Susan A. Riedel, "Electric Circuits", 11th Edition, Pearson Prentice Hall. 2018.

References

- Boylestad, "Introductory Circuit Analysis", Twelfth Edition, Pearson Prentice Hall. 2010.Behrouz A. Forouzan, (2007), Data Communications & Networking, Fourth Edition, McGraw-HilI, United States.
- Fundamentals of Electric Circuits by C. D. Alexander and M. N. O. Sadiku, third Edition, Mc Graw-Hill Education, 2007.Andrew J.Viterbi & Jim K Omura, (1979), Principles of digital communication and coding, McGraw-HilI, United States.

Other Supplemental Materials

http://lib.nu.edu.sa/digitallibbrary.aspx
www. en.wikipedia.org/wiki/Electrical_network
www. allaboutcircuits.com

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   This course provides student with basics and advanced techniques for electrical circuits, which are involves the following topics: Time domain transient responses for first and second order circuits, Resonance in Series and parallel AC circuits, Frequency domain analysis: bode plots and passive filters, Magnetically coupled circuits, Two port networks, Analysis of three-phase circuits with balanced conditions.
2. **prerequisites:** 216EE-3 Electrical Circuits I (current plan)
   217-ELE-3 Electrical Circuits (2) (new plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Analyze Response of First and Second-Order transient circuits.
2. Categorize the response of various types of resonant circuits.
3. Analyze low-pass, high-pass, band-pass, and stop-band filter circuits.
4. Recognize and analyze two-port networks.
5. Describe and analyze transformers.
6. Analyze balanced three-phase circuits applying single-phase equivalent circuits.
7. Make use of circuit analytical methods and techniques in electronic circuit analysis.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7
1	Identify the circuits containing magnetically coupled coils.	✓						
2	Analyze RL, RC and RLC circuits to determine transient response.						✓	
3	Design of low-pass, high-pass, band-pass, and stop-band filter circuits.		✓					
4	Analyze circuits consisting of two-port networks.						✓	
5	Analyze balanced three-phase circuits applying single-phase equivalent circuit.						✓	

6	Recognize ethical and professional responsibilities in engineering situations and make informed judgments.				✓			

Brief List of Topics to be Covered

1. Analysis of Response of First and Second-Order circuits.
2. Analysis of Frequency Response of RLC circuit.
3. Introduction to Filters.
4. Introduction to Two-Port Circuits.
5. Introduction to Mutual Inductance and Transformers.
6. Introduction to Three-Phase Circuits, and Electronic Devices Circuits.

ABET COURSE SYLLABI

Current Plan 2021 ☒				**New Plan 2024 ☒**			
Course Code	231EE-3			**Course Code**	231-ELE-3		
Course Name	Electronics I (Current Plan) Electronics (1) (New Plan)						
Credits Hours	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name
Dr. Salim Mursal

Textbook
Electronic Devices and Circuit Theory, Robert L. Boylestad, 11th Edition, 2013, Pearson Education.

References
- Electronic Devices, Tomas. L. Floyd, 9th Edition, 2011, Prentice Hall.
- Electronic Principles, Albert Malvino and David Bates, 7th Edition, 2006, McGraw-Hill Education.

Other Supplemental Materials
http://lib.nu.edu.sa/digitallibbrary.aspx
www. en.wikipedia.org
www. allaboutcircuits.com

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   This course introduces students to discrete semiconductor devices. It covers essential topics from basic semiconductor theory through to the application of diodes and transistors. It focuses the P-N junction and the Diode as a circuit element, the Bipolar Junction Transistor (BJT) as a circuit device, the Single stage BJT amplifier circuits, the Junction Field-Effect-Transistor (JFET) and the Metal Oxide Semiconductor Field Effect Transistor (MOSFET) as circuit element.
2. **prerequisites:** 216EE-3 Electrical Circuits I (current plan)
   216-ELE-3 Electrical Circuits (1) (new plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. The discrete semiconductor devices.
2. The essential topics from basic semiconductor theory through to the application of diodes and transistors.
3. The P-N junction and the Diode as a circuit element.
4. The Bipolar Junction Transistor (BJT) as a circuit device, the Single stage BJT amplifier circuits.
5. The Junction Field-Effect-Transistor (JFET) and the Metal Oxide Semiconductor Field Effect Transistor (MOSFET) as circuit element.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7
1	Recognize the basic operation and characteristics of a diode and its network applications.	✓						
2	Determine the operation principle and characteristics of BJTs.	✓						
3	Identify and formulate the operation principle and characteristics of JFET and MOSFET.	✓						
4	Apply configurations of BJT transistor to design different circuits.		✓					
5	Analyze and perform a small signal AC analysis using different techniques.						✓	

6	Use the techniques, skills, and modern engineering tools such as Multisim simulator to design electronic circuits.		✓					

Brief List of Topics to be Covered

1. Semiconductor Materials, Energy Levels, Intrinsic and Extrinsic, Materials—n- and p-Type.
2. Diode Resistance Levels, Diode Equivalent Circuits Diode Specification Sheets, Zener Diodes, Light-Emitting Diodes (LEDs), Varactor and Photodiode.
3. Half and Full-Wave Rectification, Clippers, Clampers, Zener Diodes, Gates.
4. Construction, Operation, Configuration, Limits of Operation, transistor Specification Sheet.
5. Operating Point for Fixed-Bias Circuit, Emitter Bias Circuit, Voltage-Divider Bias and Voltage Feedback.
6. Fixed-Bias Configuration, Common Emitter Configuration and Voltage-Divider Configuration.
7. Construction, operation, Characteristics of FETs, Bias and Amplifier Circuits Analysis.

ABET COURSE SYLLABI

Current Study Plan 2021 ☒				**New Study Plan 2024 ☒**			
Course Code	240EE-2			**Course Code**	240-ELE-3		
Course Name (Current Study Plan**)**	Electromagnetism I						
Course Name (New Study Plan)	Electromagnetism (1)						
Credits Hours (Current Study Plan**)**	2	**Lab**	0	**Tutorial**	1	**Contact Hours**	3
Credits Hours (New Study Plan)	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name
Dr. Adam Reda Hasan Alhawari

Textbook
Matthew N. O. Sadiku, "Elements of Electromagnetics", Oxford Edition, 7th Edition, Saunders College, 2018.

References
- William H. Hayt, Jr. John A. Buck, "Engineering Electromagnetics" Nineth Edition, 2019.
- Electronically lecture notes provided in e-board.

Other Supplemental Materials
None

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   Electrostatics: Coulomb's law, Electric flux density, Gauss's law and applications, Electric potential, Electric dipole, Current density and conductors, Polarization in Dielectrics, Boundary conditions, Poisson's and Laplace's equations, Resistance, Dielectrics and Capacitance, Image method.
   Magnetostatics: Biot-Savart law, Ampere's circuit law and applications, Magnetic flux density, Maxwell's equations for static fields, Magnetic scalar and vector potentials.
2. **Prerequisites:** 202EE-3 Engineering Mathematics (current study plan)
   202-ELE-3 Engineering Mathematics and 105-PHY-3 Advanced Physics (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Calculate electric field, force, potential, energy from various charges and charge distributions.
2. Calculate electric flux, flux density and total charge from Gaussian surfaces.
3. Calculate electric current density, electric current and resistance of conductors.
4. Calculate capacitance and polarization of dielectric materials.
5. Solve Laplace's equation and find capacitance and resistance of coaxial cables.
6. Use of different laws and equations to analyze electrostatic and magnetostatic fields.
7. Study Maxwell's equations and analyze magnetostatic fields.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7
1	Apply knowledge of the vector calculus and the fundamental laws of physics to understand the electric and magnetic fields.							✓
2	Identify conductive, dielectric and magnetic properties of materials.	✓						
3	Analyze electrostatic forces, fields and potentials on different material environment.						✓	
4	Analyze magnetostatic fields and derive Maxwell's equations.						✓	

Brief List of Topics to be Covered

1. Electrostatics: Coulomb's law, Gauss's law.
2. Electric potential and electric dipole.
3. Dielectrics and capacitance, current density and conductors.

4. Polarization in dielectrics, boundary conditions.
5. Poisson's and Laplace’s equations.
6. Magnetostatics: Biot-Savart, Ampere's circuit law and applications.
7. Magnetic flux density, Maxwell's equations for static fields.
8. Magnetic scalar and vector potentials.

ABET COURSE SYLLABI

Current Plan 2021 ☒				**New Plan 2024 ☒**			
Course Code	251EE-3			**Course Code**	251-ELE-3		
Course Name	Digital Logic Design						
Credits Hours	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Current Plan							
Credits Hours	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3
New Plan							

Instructor's or Course Coordinator's Name

Dr. Saifur Rahman

Textbook

Morris Mano , "Digital Design", Prentice Hall, Fifth edition, 2015.

References

- John F. Wakerly, Digital Design: Principles and Practices Package, 4th edition, Prentice-Hall, 2007.

Other Supplemental Materials

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Number systems & codes. Logic gates. Boolean algebra. Karnaugh maps. Analysis and synthesis of combinational systems, decoders, multiplexers, adders and subtractors. Types of flip-flops. Sequential circuit analysis and design. VHDL and its application in basic gates.
2. **Prerequisites:** None
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. The main purpose of this course is to identify how to analyze and design the digital systems.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Define number systems; decimal, binary, octal and hexadecimal.	✓						
2	Analyze Boolean algebra and Karnaugh map for logic circuits simplification.						✓	
3	Analyze combinational logic and sequential logic circuits.		✓					
4	Design combinational logic and sequential logic circuits.		✓					

Brief List of Topics to be Covered

1. Number systems
2. Boolean algebra and logic gates
3. Simplification of Boolean functions
4. Combinational logic circuits design and analysis
5. Digital combinational logic (decoders, encoders, multiplexers, demultiplexers)
6. Digital combinational logic (adders and subtractors)
7. Analysis of sequential circuits
8. Design of sequential circuits.
9. VHDL and its application in basic gates

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 252EE-1	**Course Code** 252-ELE-1

Course Name Digital Logic Design Lab

Credits Hours 0 **Lab** 1 **Tutorial** 0 **Contact Hours** 2

Instructor's or Course Coordinator's Name
Dr. Saifur Rahman

Textbook
Morris Mano , "Digital Design", Prentice Hall, Fifth edition, 2015.

References
- John F. Wakerly, Digital Design: Principles and Practices Package, 4th edition, Prentice-Hall, 2007.

Other Supplemental Materials

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Number systems & codes. Logic gates. Boolean algebra. Karnaugh maps. Analysis and synthesis of combinational systems, decoders, multiplexers, adders and subtractors. Types of flip-flops. Sequential circuit analysis and design. Simulation of basic gates (OR, NOT) using VHDL.
2. **Prerequisites:** None
3. **Corequisites:** 251EE-3 (Current Plan)
   251-ELE-3 (New Plan)
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives
The main purpose of this course is to identify how to analyze and design the digital systems.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Define logic circuits laboratory and logic gates.	✓						
2	Analyze basic Boolean function using logic gates						✓	
3	Analyze combinational logic and sequential logic circuits.						✓	
4	Design combinational logic and sequential logic circuits.		✓					
5	Communicate effectively in group discussion and oral examination.			✓				
6	Work effectively as a member of the team.					✓		
7	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			

Brief List of Topics to be Covered

1. Introduction To ETS-8000A
2. Experiment 1: Switch and LED
3. Experiment 2.1: OR Gate; NOT Gate; NOT-OR Gate;
4. Experiment 2.2:NOR Gate; 2-Input NAND Gate 4-Input NAND Gate ;AND-NOR Gate; Staircase Light Control;
5. Experiment 3.1: verifying X+0 =X and X+1=1; verifying X*0 =0 and X*1=X; X+X=X, X+X'=1; X*X=X, X*X'=0; (X*Y)'=X'+Y'; (X+Y)'=X'*Y';
6. Experiment 3.2: 2-Bit Magnitude Comparator; Voting Machine; Display Patterns;
7. Experiment 4.1: Half Adder; Full Adder; Half Subtractor; Full Subtractor

8. Experiment 4.2: 4-Bit Adder; 4-Bit Subtractor; BCD Adder
9. Experiment 5: 8-to-3 Encoder ; 3-to-8 Decoder
10. Experiment 6: Logic Unit; Implementing Logic Function with Multiplexer
11. Experiment 7.1: NAND Gate RS Flip-Flop; NOR Gate RS Flip-Flop
12. Experiment 7.2: JK Flip-Flop; T Flip-Flop; D Flip-Flop
13. Experiment 8.1: Converting JK to D Flip-Flop; Converting JK to T Flip-Flop;
14. Experiment 9: Simulation of basic gates (OR, NOT) using VHDL

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 314EE-2	**Course Code** 214-ELE-3

Course Name Instrumentation and Measurements

Credits Hours Current Plan	2	**Lab**	0	**Tutorial**	0	**Contact Hours**	2
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Saifur Rahman

Textbook

Electrical Measurements and measuring instruments by A. K. Sawhney, 2010**.**

References

- Measurement and Instrumentation Principles, by Alan.s.Moris , Butterworth-Heinemann (2001).

Other Supplemental Materials

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Measurement fundamentals: units and errors, statistical analysis: DC and AC analog digital meters constructions :DC and AC bridge : Oscilloscope: CRT, trigger sweep circuits: Oscilloscopes, Analog and Digital Multi meters to measure electrical parameters: Transducers and sensors; passive and active : specifications of Spectrum analyzer, Liquid crystal displays (LCDs) and optical fiber sensor**.**
2. **Prerequisites:** None
3. **Corequisites:** 216EE-3 (Current Plan)
   216-ELE-3 (New Plan)
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Define and classify units and errors.
2. Explain the principle work of analog and digital meters
3. Recognize and explain DC / AC bridge and oscilloscope used in measurement systems.
4. Use the Oscilloscopes, bridge , Analog and Digital Multi meters to measure electrical parameters
5. Classify and explain the sensors and transducer.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
5	Define and classify units and errors.	✓						
6	Identify the working principle of analog and digital meters.	✓						
7	Recognize and explain DC / AC bridge and oscilloscope used in measurement systems.	✓						
8	Classify the sensors and transducers.	✓						
9	Use the Oscilloscopes, bridges, Analog and Digital Multimeters to measure electrical parameters.						✓	

Brief List of Topics to be Covered

1. Measurements fundamentals: Basic and general terms in metrology, Units and standards, errors, Methods of measurements, statistical analysis.
2. Analogue meters: DC and Ac meters, loading effect and insertion effect.
3. Digital measurements: Data conversion principles, A/D conversion, D/A conversion, digital voltmeter, grounding, shielding and noise.
4. Difference and instrumentation DC/AC bridge ; Oscilloscopes circuits.
5. Characteristics and analysis of Sensors and Transducers types.

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 315EE-1	**Course Code** 215-ELE-1
Course Name Instrumentation and Measurements Lab	
Credits Hours 1 **Lab** 2 **Tutorial** 0 **Contact Hours** 2	

Instructor's or Course Coordinator's Name

Dr. Mohammed Saeed Jalalah

Textbook

Electrical Measurements and measuring instruments by A. K. Sawhney, 2010.

References

- Measurement and Instrumentation Principles, by Alan.s.Moris , Butterworth-Heinemann (2001).

Other Supplemental Materials

Lab notes are delivered to the students through online portal "Blackboard"

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   This course provides student with basics and advanced techniques for instrumentation and measurements lab, which are covering the following topics: Measurement fundamentals: units and errors, statistical analysis: DC current and voltage measurement, Use of Oscilloscope, Use of bridge circuit.
2. **Prerequisites:** None
3. **Corequisites:** 314EE-2 Instrumentation and Measurements (current plan)
   214-ELE-3 Instrumentation and Measurements (new plan)
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. To learn fundamentals of the instrumentation and measurements.
2. To be familiar with basic terms used in electrical measurements.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Identify the errors in measurements and do the statistical analysis.	✓						
2	Conduct experiment to measure DC voltages and current through the circuit.						✓	
3	Conduct experiments to measure amplitude, frequency and phase angle using oscilloscope.						✓	
4	Use different techniques to measure resistance using DC Bridge circuits.						✓	
5	Use techniques to measure the temperature of the tank using thermocouple sensor.						✓	
6	Communicate effectively in group discussion.			✓				
7	Work effectively as a member of the team.					✓		
8	Recognize ethical and professional responsibilities in engineering situations and make informed judgments.				✓			

Brief List of Topics to be Covered

1. Investigate sources of error in measurements and to observe the value of statistical analysis.
2. Measurement of DC voltages and current through the circuit.
3. Study and learn how to use multi-meter properly.
4. Using oscilloscope properly and to measure amplitude, frequency and phase angle by using oscilloscope.
5. Study of resistance measurement techniques using DC Bridge circuits.
6. Study and measure the temperature of the tank using thermocouple sensor.

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 320EE-3	**Course Code** 220-ELE-3
Course Name Electrical Machines I	
Course Name Electrical Machines (1)	

Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Hatim Alwadie

Textbook

Stephen J Chapman, Electrical Machinery Fundamentals, Publisher: McGraw-Hill Higher Education, 2011, 5th Edition.

References

- Denis O'Kelly, Performance and Control of Electrical Machines, Publisher: Mc-Graw Hill Book Company, 1991.
- Karsai, D Kereny, L Kiss, Studies in Electrical and Electronic. Engineering 25, Large Power Transformers, Publisher: Elsevier, 1987.
- A E Fitzgerald, Charles Kingsley, Stephen D Umans, Electric Machinery, Sixth Edition, Publisher: Mc-Graw-Hill Higher Education, 2002.
- Charles I Hubert, Electric Machines, Theory, Operation, Application, Adjustment and Control, Publisher: Macmillan Publishing Company, 1991.
- Dino Zorbas, Electric Machines, Principles, Applications, and Control Schematics, Publisher: West Publishing Company, 1989.

Other Supplemental Materials

NA

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Transformers (construction, operation of single-phase transformers, equivalent circuit, voltage regulation and efficiency, auto – transformers, three-phase transformers), AC machinery fundamentals, three-phase induction machines (construction, operation, equivalent circuit, performance calculations, starting of induction motors), small AC motors (single-phase induction motors).
2. **Prerequisites:** 217EE-3 Electrical Circuits II
   217-ELE-3 Electrical Circuits (2)
3. **Corequisites:** NA
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Analyze Single-phase transformers, auto – transformers and three-phase transformers.
2. Analyze three-phase induction machines.
3. Study the performance of the three-phase induction machines.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7

1	Define operation principles of electrical machines	✓						
2	Analyze fundamental characteristics of various types of machines						✓	
3	Evaluate equivalent circuit and characterize different electrical machines						✓	

Brief List of Topics to be Covered

1. Principles of operation; construction, equivalent circuit, elements of a transformer.
2. The ideal transformer, practical transformers, open circuit test, short circuit test, efficiency, regulation
3. Practical transformer, three-phase connections.
4. Measurement in three-phase, auto-transformer, taps, instrument transformer, parallel operation.
5. Basic theory and construction of squirrel-cage and wound-rotor motor.
6. Equivalent circuit, losses, power flow, efficiency.
7. Analysis of machine equations; speed/torque curves, starting performance, starting methods.
8. Single-phase induction motors

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 332EE-3	**Course Code** 332-ELE-3
Course Name Electronics II (Current Plan) Electronics (2) (New Plan)	
Credits Hours 3 **Lab** 0 **Tutorial** 1 **Contact Hours** 4	

Instructor's or Course Coordinator's Name

Dr. Salim Mursal

Textbook

Electronic Devices and Circuit Theory, Robert L. Boylestad, 11th Edition, 2013, Pearson Education.

References

- Electronic Devices, Tomas. L. Floyd, 9th Edition, 2011, Prentice Hall.
- Electronic Principles, Albert Malvino and David Bates, 7th Edition, 2006, McGraw-Hill Education.

Other Supplemental Materials

http://lib.nu.edu.sa/digitallibbrary.aspx
www. en.wikipedia.org
www. allaboutcircuits.com

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   This course is a continuation of 231EE-3 course. It focuses the analysis of amplifier frequency response, the operational amplifiers design and applications, the power Amplifiers and the feedback concept and oscillator circuits.
2. **Prerequisites:** 231EE-3 Electronics I (current plan)
   231-ELE-3 Electronics (1) (new plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. The analysis of amplifier frequency response.
2. The operational amplifiers design.
3. The power Amplifiers and the feedback concept.
4. About oscillator circuits.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Compute frequency responses of FET and BJT amplifiers.	✓						
2	Analyze operational amplifiers and its sub-circuits.						✓	
3	Analyze power amplifier circuits.						✓	
4	Analyze oscillators using feedback techniques.						✓	
5	Design operational amplifiers.		✓					

Brief List of Topics to be Covered

1. Frequency Response of Amplifiers: low and high frequency analysis of BJT and FET amplifier, multistage frequency effects.

2. Operational amplifiers: differential amplifier circuit, Op-amp basics and applications, common mode operation.
3. Power amplifier circuits: Class A, B, C, and D amplifiers.
4. Feedback and Oscillator Circuits: Feedback concept, Practical feedback circuits, feedback amplifier, oscillators operation, phase-shift, Wien bridge, Tuned, Unijunction, crystal.

ABET COURSE SYLLABI

Current Plan 2021 ☒		**New Plan 2024** ☒	
Course Code	342EE-3	**Course Code**	242-ELE-3

Course Name Signals and Systems Analysis

Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Muhammad Irfan

Textbook

Oppenheim, Willsky and Nawab,"Signals and Systems", Pearson New International Edition 2015.

References

Signals, Systems, and Transforms, 4th Ed. C. L. Phillips, J. M. Parr, and E. A. Riskin, 2008.

Other Supplemental Materials

Computer programming tools (MATLAB)

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Signal Classifications, Signal Operations, Eigen Functions; Theories of Fourier series for continuous and discrete time signals, Linear circuits and system concepts, impulse response, convolution and transfer function; Frequency response of systems, Fourier Transform, Laplace transform and z-transform with applications; Nyquist theorem for sampling of analog signals.
2. **prerequisites:** 202EE-3 (Current Plan)
   202-ELE-3 (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Distinguish between continuous and discrete time signals and systems.
2. Analyze the signal in both time and frequency domains.
3. Evaluate fundamental signal and system parameters, such as energy, power and bandwidth.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Distinguish between continuous and discrete time signal and systems.	✓						
2	Evaluate different signal transformation techniques.						✓	
3	Evaluate fundamental signal and system parameters, such as energy, power and bandwidth						✓	
4	Assess continuous linear time invariant system response, analytically and using different techniques						✓	

Brief List of Topics to be Covered

1. Signal Classifications, Signal Operations, Eigen Functions.

2. Theories of Fourier series for continuous and discrete time signals.
3. Linear circuits and system concepts, impulse response, convolution and transfer function.
4. Frequency response of systems, Fourier Transform with applications
5. Laplace transform and z-transform with applications.
6. Nyquist theorem for sampling of analog signals.

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 351EE-3	**Course Code** 253EE-3

Course Name Computer Applications in Electrical Engineering

Credits Hours 2 **Lab** 2 **Tutorial** 0 **Contact Hours** 4

Instructor's or Course Coordinator's Name

Dr. Seif Shebl Seif

Textbook

Holly Moore, "MATLAB for Engineers," 3rd Edition, ISBN-10: 0132103257, ISBN-13: 9780132103251, Prentice Hall, 2012.

References

- Ronald W. Larsen, "LabVIEW for Engineers," ISBN-10: 0136094295, ISBN-13: 9780136094296, Prentice Hall, 2011.

Other Supplemental Materials

- At least MATLAB R2016a with Simulink Software. www.mathworks.com
- At least LabVIEW 2011, Course manual, Course software version 2011, www.ni.com/LabVIEW

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Introduction to MATLAB system, generate matrices and perform operations on them, plot data, annotate graphs, create scripts and functions, construct and manipulate data structures, set up basic data analysis. Interacting Simulink Software with MATLAB, creating a Simulink model, modeling a dynamic control system.
   Introduction to LabVIEW virtual instruments (VIs), LabVIEW environments, creating, editing and debugging a VI, creating a sub VI, loops and charts, arrays, graphs, clusters, case and sequence structures, formula nodes.
2. **Prerequisites:** 204GE-3 (Current)
   204-GEC-3 (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☒ Department ☐ Track☐ Others☐
   Required ☒ Elective ☐ Selected Elective☐

Educational objectives

After completing this course, the students should be able to:

1. Use the MATLAB GUI and development environment effectively.
2. Design programs to solve engineering and mathematical problems.
3. Build block diagrams in Simulink to model engineering systems.
4. Understand LabVIEW environment and use built in VI's.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Formulate the MATLAB GUI.	✓						
2	Carry out computations and visualize data in MATLAB.						✓	
3	Design programs to solve engineering and mathematical problems.		✓					
4	Design graphical programming environment using LabVIEW		✓					
5	Design Simulink models to simulate engineering systems.		✓					

6	Communicate effectively to perform the presentation.			✓				
7	Perform as an effective team-player in executing related project with imposed design constraints.					✓		
8	Recognize ethical and professional responsibilities in engineering situations and make informed judgments					✓		

Brief List of Topics to be Covered

1. Introduction to the MATLAB system
2. Generating matrices and performing operations on them
3. Plotting data and annotating graphs
4. Constructing and manipulating data structures
5. Setting up basic data analysis
6. Creating a Simulink model and modeling dynamic systems
7. Introduction to LabVIEW, virtual instruments, and LabVIEW environments
8. Creating, editing, and debugging a VI, creating a sub-VI, and using loops and charts

ABET COURSE SYLLABI

Current Study Plan 2021 ☒		**New Study Plan 2024** ☒	
Course Code	343EE-3	**Course Code**	343-ELE-3
Course Name	Principles of Communication Systems		
Credits Hours	3 **Lab** 0	**Tutorial** 1	**Contact Hours** 4

Instructor's or Course Coordinator's Name

Dr. Adam Reda Hasan Alhawari

Textbook

Communications Systems, Simon Haykin, John Wiley, 2010.

References

- Modern digital and analog communication systems, B. P. Lathi, Zhing, 2010.
- Fundamentals of telecommunications, 2¬nd Edition, Roger L. Freeman, 2005.
- Telecommunication and Data Communications Handbook, Ray Horak, 2008.

Other Supplemental Materials

Computer programing tools (MATLAB)

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
2. This course covers fundamental concepts of communication systems, which are essential for the understanding of advanced courses in digital/ wireless communications. Beginning with basic elements of Communication systems and Transmission through Systems and channels, the course will also cover several important modulation techniques such as Amplitude Modulation, Frequency Modulation, Phase Modulation etc., Superheterodyne receiver, Sampling process and Quantization, including Nyquist criterion and reconstruction of the original signal from the sampled signal, Pulse Modulation (PAM, PWM, PPM); TDM; Pulse Code Modulation (PCM); DPCM and DM. Further, the course will also cover concepts and advantages of Digital Communications, Line Coding (Binary Signaling), as well as Introduction to Digital Modulation (ASK, FSK, PSK).
3. **Prerequisites:** 342EE-3 Signals and Systems Analysis (current study plan)
   242-ELE-3 Signals and Systems Analysis (new study plan)
4. **Corequisites:** None
5. **Course Type**

   University ☐ College ☐ Department☒ Track☐ Others☐

   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Categorize components of communication system.
2. Make use of signal analysis techniques in communication systems.
3. Analyze linear systems in time and frequency domains.
4. Categorize modulations techniques.
5. Analyze simple modulation systems.
6. Categorize multiplexing techniques.
7. Identify and analyze pulse code modulation systems.
8. Describe and analyze delta modulation systems.
9. Explain digital modulation techniques.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7
1	Explain digital modulation techniques.	✓						

2	Analyze linear systems in time and frequency domains.						✓	
3	Analyze analog modulation techniques.						✓	
4	Evaluate fundamental communication system parameters.						✓	
5	Design Analog communication systems.		✓					

Brief List of Topics to be Covered

1. Introduction to communication systems
2. Review of Signals and signal space
3. Analysis and Transmission of Signals
4. Amplitude Modulation and Demodulations
5. Angle Modulation & Demodulation
6. Sampling and Analog-to-Digital Conversion
7. Principles of Digital Data Transmission

ABET COURSE SYLLABI

Current Study Plan 2021 ☒				**New Study Plan 2024** ☒			
Course Code	344EE-2			**Course Code**	340-ELE-3		
Course Name (Current Study Plan**)**	Electromagnetism II						
Course Name (New Study Plan**)**	Electromagnetism (2)						
Credits Hours (Current Study Plan**)**	2	**Lab**	0	**Tutorial**	1	**Contact Hours**	3
Credits Hours (New Study Plan)	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4

Instructor's or Course Coordinator's Name

Dr. Adam Reda Hasan Alhawari

Textbook

Matthew N. O. Sadiku, "Elements of Electromagnetics", Oxford Edition, 7th Edition, Saunders College, 2018.

References

- William H. Hayt, Jr. John A. Buck, "Engineering Electromagnetics" Nineth Edition, 2019.
- Electronically lecture notes provided in e-board.

Other Supplemental Materials

None

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   This course covers forces due to magnetic fields, magnetic torque and moment, Magnetic dipole, magnetic boundary conditions, Inductors and inductances, magnetic energy and circuits. Time varying fields: Faraday's law, Transformer and motional emfs, Displacement current, Maxwell's equations and time harmonic fields, Wave equation, Power transfer and Poynting vector, Plane wave propagation in free space, in lossy dielectrics and in good conductors, Reflection of plane wave at normal and oblique incidences.
2. **Prerequisites:** 240EE-2 Electromagnetism I (current study plan)
   240-ELE-3 Electromagnetism (1) (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Analyze forces due to magnetic fields, magnetic torque and moment.
2. Study magnetic dipole, magnetic boundary conditions.
3. Calculate inductances and magnetic energy.
4. Apply Faraday's law to analyze the transformer and motional EMFs.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7
1	Recognize magnetic torque, moment and boundary conditions.	✓						
2	Analyze forces due to magnetic fields, magnetic energy and circuits						✓	
3	Analyze the motional EMFs, time-varying electric and magnetic fields.						✓	
4	Characterize the behavior of the wave propagation in reflection and refraction.						✓	
5	Evaluate wave propagation in different types of materials.						✓	

Brief List of Topics to be Covered

1. Forces due to magnetic fields, magnetic torque and moment
2. Magnetic dipole, magnetic boundary conditions
3. Inductors and inductances, magnetic energy and circuits
4. Faraday's law, transformer and motional emfs, displacement current, Maxwell’s equations, time-harmonic fields.
5. Wave equation, wave propagation in lossy dielectrics
6. Plane wave propagation in lossless dielectrics, free space, and good conductor
7. Power transfer and Poynting vector.
8. Reflection of a plane wave at normal and oblique incidences.

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 354EE-3	**Course Code** 354-ELE-3

Course Name Introduction to microprocessor

Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Saifur Rahman

Textbook

Walter A. Triebel and Avtar "Singh The 8088 and 8086 Microprocessors: Pearson New International Edition: Programming, Interfacing, Software, Hardware, and Applications",2013.

References

- The 80X86 IBM PC and Compatible Computers: Assembly Language, Design, and Interfacing Volumes I & II", Prentice Hall.

Other Supplemental Materials

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Microprocessors architecture; Addressing modes and techniques; Instruction set; Assembly language programming; Interrupt systems; Input/output devices and timing; Memory devices; Future trends in microprocessors.
2. **Prerequisites:** 251EE-3 (Current Plan)
   251-ELE-3 (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Describe the major components of a computer system and state their function and purpose.
2. Recognize the hardware and software model of microprocessors.
3. Identify addressing modes, instruction set of microprocessors.
4. Demonstrate the ability to program a microprocessor in assembly language.
5. Identify interrupt, memory and input/output interfaces.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
6	Identify the computer system and the 8086 architecture model	✓						
7	Identify memory, i/o devices and interfaces, and the interrupt.	✓						
8	Classify addressing modes and the instruction set.						✓	
9	Demonstrate the ability to program using the assembly language.						✓	

Brief List of Topics to be Covered

1. Introduction to microprocessors and microcomputers
2. Software architectures of the 8088 and 8086 microprocessors.
3. Assembly language programing
4. The 8086 microprocessor programing instructions and program structures.
5. The 8086 microprocessor and their memory and input/output interfaces.

6. Modern microcontrollers like Arduino.

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 355EE-1	**Course Code** 355-ELE-1
Course Name Microprocessor Lab	
Credits Hours 0 **Lab** 1 **Tutorial** 0 **Contact Hours** 2	

Instructor's or Course Coordinator's Name

Dr. Saifur Rahman

Textbook

Walter A. Triebel and Avtar "Singh The 8088 and 8086 Microprocessors: Pearson New International Edition: Programming, Interfacing, Software, Hardware, and Applications",2013.

References

- The 80X86 IBM PC and Compatible Computers: Assembly Language, Design, and Interfacing Volumes I & II", Prentice Hall.

Other Supplemental Materials

Lab notes are delivered to the students through online portal "Blackboard"

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Microprocessors architecture; Addressing modes and techniques; Instruction set; Assembly language programming; Interrupt systems; Input/output devices and timing; Memory devices; Future trends in microprocessors; Modern microcontrollers like Arduino.
2. **prerequisites:**
3. **Corequisites:** 354EE-3 (Current Plan)
   354-ELE-3 (New Plan)
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Identify the 8086 training kit and demonstrate the basic operations and assembly commands.
2. Develop microprocessors arithmetic and logic instructions.
3. Implement hardware interfaces to practical systems.
4. Recognize the microprocessor interrupts.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Identify the 8086 training kit and demonstrate the basic operations and assembly commands.	✓						
2	Design a program for microprocessors arithmetic and logic instructions.		✓					
3	Implement hardware interfaces to practical systems.						✓	
4	Communicate effectively in group discussion.			✓				
5	Work effectively as a member of the team.					✓		
6	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			

Brief List of Topics to be Covered

1 Introduction to 8086 microprocessors
5. Experiment #1: Introduction to MDA – 8086 Training Kit
6. Experiment #2: Basic operations of MDA 80x86 trainer kit
7. Experiment #3: different commands of MDA 80x86 trainer Kit
8. Experiment #4: Explore kit mode functionality
9. Experiment #5: Explore PC mode functionality
10. Experiment #6: Write a program to display the digits in decimal, from 0-7 into 7-segment
11. Experiment #7: initialize DOT MATRIX DISPLAY
12. Experiment #8:A/D convertor application
13. Experiment #9:D/A convertor application
14. Experiment #10: Modern microcontrollers like Arduino

ABET COURSE SYLLABI

Current Plan 2021 ☒		**New Plan 2024** ☒	
Course Code	361EE-3	**Course Code**	361-ELE-3
Course Name	Automatic Control		

Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Turki Alsuwian

Textbook

Modern Control Systems, by Richard C. Dorf and Robert H. Bishop, Pearson Education, 15. October 2013.

References

- Modern Control System Theory and Design 2nd edition, Stanley Shinner, Interscience, 1998.
- Automatic Control Systems, Benjamin Kuo, Prentice-Hall, 2002.
- Control System Engineering, by Normon S Nise, 2008.

Other Supplemental Materials

Computer programming tools (MATLAB)

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   Review of mathematical background (complex variables, Laplace, Diff. Equations); System representation (block diagram, transfer functions, signal flow graph) Modeling of electric and mechanical systems; State variable analysis; Stability; Time domain analysis; Root locus; Frequency domain analysis; Introduction to PID control.
2. **Prerequisites:** 342EE-3 Signal and Systems Analysis (current study plan)
   242-ELE-3 Signal and Systems Analysis (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Represent a system using (block diagram, transfer functions, signal flow graph).
2. Analyze a system for both Time domain and Frequency domain.
3. Construct the state-space model.
4. Evaluate the control system stability.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Represent a system using block diagram, transfer functions, signal flow graph.	✓						
2	Design and analyze a system both in time domain and frequency domain	✓						
3	Evaluate the control system stability.		✓					
4	Construct the state-space model.						✓	

5	Perform as an effective team-player in executing related project with imposed design constraints.			✓				
6	Communicate effectively to perform the presentation.					✓		

Brief List of Topics to be Covered

1. Introduction to Control Systems.
2. Differential Equations of Physical Systems.
3. Transfer Function of Linear Systems-Block Diagram Models-Signal Flow Graphs [SFG].
4. State Variable Models- SFG State Models-TF from State Equations-State Transition Matrix.
5. Performance of Feedback Control Systems.
6. Stability of Linear Feedback Systems.
7. Root Locus Technique.
8. Frequency Response Method & Stability in the Frequency Domain.

ABET COURSE SYLLABI

Current Plan 2021 ☒		**New Plan 2024** ☒	
Course Code	362EE-1	**Course Code**	362-ELE-1
Course Name	Automatic Control Lab		
Credits Hours	1 **Lab** 2	**Tutorial** 0	**Contact Hours** 2

Instructor's or Course Coordinator's Name

Dr. Muhammad Irfan

Textbook

Dorf and R. Bishop "Modern Control Systems", Addison-Wesley, 13th Edition 2016.

References

Lab Manual

Other Supplemental Materials

Computer programming tools (MATLAB); Cassy Control System

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Experiments to support control theory using physical processes; Control system simulation using Matlab; Modeling and simulation of physical system; Steady State & Transient analysis; PID control.
2. **Prerequisites:** None
3. **Corequisites:** 361EE-3 (Current Plan)
   361-ELE-1 (New Plan)
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Evaluate modern control techniques.
2. Perform simulations and experiments related to control systems with application such as to light intensity control, air flow control, level control, temperature control etc.
3. Analyze the PID Controller.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Analyze the control system using MATLAB simulation tools.						✓	
2	Analyze the control system using Cassy-Lab real-time simulation tools.						✓	
3	Analyze PID and two-position controller.						✓	
4	Verify modern control concepts						✓	
5	Communicate effectively in group discussion and oral examination.			✓				
6	Work effectively as a member of the team.					✓		

Brief List of Topics to be Covered

1. Introduction to the Computer-Aided Design Package MATLAB
2. Matlab Simulation of a Second Order System
3. Unit Step Response of Proportionate, Integrator and Differentiate Controller
4. PID Controller
5. Air Flow Control
6. Light Intensity Control
7. Temperature Control

8. Water level control

ABET COURSE SYLLABI

Current Plan 2021 ☒					**New Plan 2024** ☒		
Course Code	420EE-3				**Course Code**	320-ELE-3	
Course Name Current Plan	Electrical Machines II						
Course Name New Plan	Electrical Machines (2)						
Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Tareq Kareri

Textbook

Stephen J Chapman, Electrical Machinery Fundamentals, Publisher: McGraw-Hill Higher Education, 2011, 5th Edition.

References

- Principles of Electric Machines and Power Electronics, P. C. Sen, John Wiley &Sons, Second Edition, 1997.
- Denis O'Kelly, Performance and Control of Electrical Machines, Publisher: Mc-Graw Hill Book Company, 1991.
- Karsai, D Kereny, L Kiss, Studies in Electrical and Electronic. Engineering 25, Large Power Transformers, Publisher: Elsevier, 1987
- A E Fitzgerald, Charles Kingsley, Stephen D Umans, Electric Machinery, Sixth Edition, Publisher: Mc-Graw-Hill Higher Education, 2002.
- Charles I Hubert, Electric Machines, Theory, Operation, Application, Adjustment and Control, Publisher: Macmillan Publishing Company, 1991.
- Dino Zorbas, Electric Machines, Principles, Applications, and Control Schematics, Publisher: West Publishing Company, 1989.

Other Supplemental Materials

None

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Synchronous machines (construction, internal voltage, equivalent circuit, Phasor diagram, performance of turbo-alternator, generator operating alone, parallel operation of AC generators, synchronous motor, steady-state operation, starting), DC machines (construction, classification, performance, motor characteristics, starting of DC motors, speed control of DC motors).
2. **Prerequisites:** 320EE-3 Electrical Machines I (Current Plan)
   220EE-3 Electrical Machines (1) (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

After completing this course, the students should be able to:

1. To understand the basic principles of DC and synchronous machines.
2. To know the operation and testing of DC and synchronous machines

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Classify the synchronous machines and dc machines.	✓						
2	Explain the principle of operation of synchronous generators, motors and dc machines.	✓						
3	Analyze the performance of synchronous machines and dc machines						✓	
4	Design the equivalent circuits of synchronous machines and dc machines.		✓					

Brief List of Topics to be Covered

1. Introduction to synchronous machines and its construction, Voltage Induced in the Armature Winding of Synchronous Machine, Equivalent Circuit of Synchronous Machine and its Phasor Diagram, Performance of Synchronous Generator.
2. Synchronous Generator Operating Alone, Parallel Operation of Synchronous Generators.
3. Synchronous Motor Analysis, Steady State Operation, Starting.
4. Introduction to DC Machines and its construction, Classification of DC Machines, DC Generators Operation and Performance.
5. DC Motors Characteristics, Starting of DC Motors.

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 421EE-1	**Course Code** 321-ELE-3
Course Name Electrical Machines Lab	
Credits Hours 1 **Lab** 2 **Tutorial** 0 **Contact Hours** 2	

Instructor's or Course Coordinator's Name

Dr. Ayman Hindi

Textbook

Stephen J Chapman, Electrical Machinery Fundamentals, McGraw-Hill Higher Education, 2011, 5th Edition.

References

A E Fitzgerald, Charles Kingsley, Stephen D Umans, Electric Machinery, Sixth Edition, Mc-Graw-Hill Higher Education, 2002.Electronic Devices and Circuit Theory (7th ed.) by R. Boylestad and L. Nashelsky.

Other Supplemental Materials

None

Specific Course Information

1. Hands-on exercises to set up circuits along with measurement and observation capabilities to explore the operating principles and characteristics of transformers, DC and AC Motors and Generators.
2. P**rerequisites:** None
3. **Corequisites:** 420EE-3 Electrical Machines II (Current Plan)
   320-ELE-3 Electrical Machines (2) (Current Plan)
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Gain an engineering appreciation of electrical machines' operation and their applications. To conduct power flow and short circuit studies.
2. Develop practical skills for measuring electrical and mechanical quantities (Current, voltage, power, efficiency, regulation, torque, speed)

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Perform the experiment for operating characteristics of transformers.						✓	
2	Obtain the operating characteristics of rotating machines.						✓	
3	Measure torque, power and parameters of electrical machines.						✓	
4	Communicate effectively in group discussion and oral examination.			✓				
5	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			
6	Work effectively as a member of the team.					✓		

Brief List of Topics to be Covered

1. Experiments with the Single-phase Transformer, Voltage and Current Transformation, Voltage Behavior with Resistive Load, Evaluating Efficiency
2. Experiments with the Single-phase Transformer, Equivalent circuit of transformer, Open circuit test, Short circuit test
3. Three-phase transformer, voltage regulation, efficiency.
4. DC machines starting and loading tests.
5. Squirrel-cage induction motor, Locked-rotor test, No-load test, DC Test
6. Squirrel-cage induction motor, Torque-speed characteristics.
7. Synchronous generator, Measurement of no-load characteristics , Measurement of short-circuit characteristics, Measurement of load characteristics, Measurement of circuit parameters.
8. Synchronous motor, Synchronous motor as mechanical driver, Synchronous motor as compensator

ABET COURSE SYLLABI

Current Plan 2021 ☒		**New Plan 2024** ☒	
Course Code	426EE -3	**Course Code**	324-ELE -3
Course Name	Power System Analysis I (Current Plan) Power System Analysis (1) (New Plan)		

Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Muneer Abu Saq

Textbook

Power System Analysis, John J. Grainger and William D. Stevenson, Jr.-McGraw-Hill, 1994.

References

Husain, "Electrical power Systems", CBS Publisher & Distributors, 1994.

Other Supplemental Materials

Computer programming tools (MATLAB)

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Power system components and representation; Transmission line and cable parameters; Analysis of transmission and distribution lines; Power factor correction, Electric insulators; Grounding systems.
2. **Prerequisites:** 217EE-3 Electrical Circuits II (Current Plan)
   217EE-3 Electrical Circuits (2) (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. To understand basic concepts in power system.
2. To conduct power transmission and distribution calculations.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Recognize power system structure and operation.							✓
2	Recognize electrical insulators and power system grounding.							✓
3	Analyze transmission lines performance.						✓	
4	Design per-unit model of power systems.		✓					

Brief List of Topics to be Covered

1. Introduction to electrical energy systems
2. Analysis of single-phase and three-phase circuits
3. Calculation of transmission line parameters
4. Transmission lines modeling and performance evaluation
5. Electrical insulators
6. Grounding systems
7. Power factor correction
8. Introduction to power system modeling and per-unit system

ABET COURSE SYLLABI

Current Plan 2021 ☒		**New Plan 2024** ☒	
Course Code	425EE-1	**Course Code**	325-ELE-1
Course Name	Power Systems Lab		
Credits Hours	1 **Lab** 1	**Tutorial** 0	**Contact Hours** 2

Instructor's or Course Coordinator's Name

Dr. Muneer Abu Saq

Textbook

Power System Analysis, John J.Grainger and William D. Stevenson, Jr.-McGraw-Hill, 1994.

References

Husain, "Electrical power Systems", CBS Publisher & Distributors, 1994.

Other Supplemental Materials

Computer programming tools (MATLAB)

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   This lab course includes ten experiments to study various aspects of power systems: measurement of the characteristics data of a transmission line and an assessment of its voltage drop and losses; synchronization and steady state operation of a generator connected to an infinite bus system; load characteristics of a synchronous motor and effect of field excitation on reactive power load; effect of voltage levels on power transmission and effects of various load types on power plants; load flow data preparation and system study; analysis of symmetrical and unsymmetrical faults; power factor correction; performance and connections of power transformers.
2. **Prerequisites:** 424EE-3 Power System Analysis I (Current Plan)
   324EE-3 Power System Analysis (1) (Current Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. To understand basic concepts in power system.
2. To conduct experimental work.
3. To measure electrical quantities and analyze data.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Analyze the effect of active and reactive loading on the voltage drop and the power handling capability of a transmission line.						✓	
2	Experiment paralleling of generators and connecting a generator to the grid.						✓	
3	Carry out a short circuit analysis study for symmetrical and unsymmetrical faults and interpret the results of the analysis.						✓	
4	Measure and calculate: complex power, real and reactive power; lagging and leading power factor, apparent power						✓	
5	Manipulate the control of voltage, frequency, and power of an AC generator						✓	
6	Practice the procedure used in preparing transmission line, load and generator data for a load flow system study.						✓	
7	Communicate effectively in group discussion and oral examination.			✓				
8	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			
9	Work effectively as a member of the team.					✓		

Brief List of Topics to be Covered

1. Transmission line model and voltage drop evaluation.
2. Load characteristics of a synchronous motor.
3. Load effect on power plants.
4. Phase sequence measurements.
5. Power factor correction.
6. Synchronizing an alternator and connecting it to the power system
7. Real and reactive power control of an alternator
8. Writing Matlab subroutines to solve the load-flow problem.
9. Using commercial software to determine fault currents and voltages in 14-bus system.
10. Three-phase transformer connections.

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 444EE-3	**Course Code** 344-ELE-3

Course Name Digital Communications

Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Abdulkarem Hussein Almawgani

Textbook

Digital Communications Fundamentals and Applications, by Bernard Sklar, Second Edition, Hall P T R, United States, 2017.

References

- John G. Proakis and MasoudSalehi, (2008), Digital Communications, Fifth Edition, McGraw-Hill, United States.
- Behrouz A. Forouzan, (2007), Data Communications & Networking, Fourth Edition, McGraw-HilI, United States.
- Todd K. Moon, (2005), Error Correction Coding Mathematical Methods and Algorithms, A John Wiley & Sons, Inc, Canada.
- Andrew J.Viterbi & Jim K Omura, (1979), Principles of digital communication and coding, McGraw-HilI, United States.
- Upamanyu Madhow, (2008), Fundamentals of Digital Communication, Cambridge University, UK.

Other Supplemental Materials

Computer programming tools (MATLAB)

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   This course provides student with basics and advanced techniques for digital communication, which are the basic elements of modern communication systems. It presents the basic elements to implement any communication system and different digital technique such as source coding, channel coding, digital modulation and detection, noise and wireless channel. Examples of modern Communication Systems.
2. **Prerequisites:** 444EE-3 Digital Communications (current plan)
   344EE-3 Digital Communications (new plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Categorize the basic elements of modern communication systems.
2. Classify of the advanced techniques for digital communication
3. Categorize digital modulations techniques.
4. Analyze digital modulation and demodulation systems.
5. Categorize wireless channel.
6. Analyze channel coding and error correction.
7. Explain modern communication systems

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Identify the main element of digital communication systems.	✓						
2	Apply knowledge of mathematics, science, and engineering to the analysis of digital modulation techniques							✓
3	Analyze the process of digital communications transmission and reception and the effect of noise on signal quality.						✓	
4	Analyze the baseband signal coding, bandpass coding and channel coding in digital communications.						✓	
5	Design the basic digital communication systems.		✓					
6	Communicate effectively to perform the presentation.			✓				
7	Perform as an effective team-player in executing related project with imposed design constraints.					✓		
8	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			

Brief List of Topics to be Covered

1. Review of probability theory and random variables
2. Introduction digital communication system
3. Line and block code
4. Pulse Code Modulation (PCM) and Delta Modulation (DM)
5. Digital Modulation Techniques (ASK, FSK, PSK, GMSK and QAM)
6. Error Detection and Correction
7. Information Theory and Source Coding.
8. Cryptography
9. Transmission impairment & the wireless channels characteristics
10. OFDM
11. Modern communication system

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 445EE-1	**Course Code** 345-ELE-1
Course Name Communications Lab	
Credits Hours **1** **Lab** **2** **Tutorial** **0** **Contact Hours** **2**	

Instructor's or Course Coordinator's Name

Dr. Abdulkarem Hussein Almawgani

Textbook

Communications Systems, Simon Haykin, John Wiley, 2010.

References

- Modern digital and analog communication systems, B. P. Lathi, Zhing, 2011.
- Fundamentals of telecommunications, 2¬nd Edition, Roger L. Freeman, 2005.
- Telecommunication and Data Communications Handbook, Ray Horak, 2008.

Other Supplemental Materials

- AM Manual
- FM Manual
- PCM Manual
- The COM3LAB-Board 700 74 Manual
- CASSY Lab 2 System
- COM3 Lab for digital communication
- Computer programing tools (MATLAB)

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Experiments on signal representation and filtering, amplitude modulation and demodulation, delta modulation (DM) and demodulation, frequency modulation and detection, sampling and quantization, pulse amplitude modulation (PAM), pulse code modulation (PCM) and demodulation, Time Division Multiplexing (TDM).
   Digital modulation and demodulation for ASK, FSK, 2PSK, 4PSK, Shift Keying Noise, Susceptibility error detection, error correction, and modem operating modes.
2. **prerequisites:** None
3. **Corequisites:** 444EE-3 Digital Communications (current plan)
   344EE-3 Digital Communications (new study plan)
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Know the primary communication resources, namely, transmission power and bandwidth
2. Know the communication channel for signals transmission
3. Define the modulation process
4. Know the continuous modulation techniques, amplitude and angle modulation
5. Define sampling, which is basic to all forms of pulse modulation
6. Define quantization, which when combined with sampling represents analog signals in the form of amplitude and time

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7

1	Apply Fourier transform to different type of signals in communication systems.						✓	
2	Analyze and evaluate different analogue modulation and demodulation techniques like AM, FM and DM, in time and frequency domains using lab modules.						✓	
3	Apply sampling to achieve Pulse Amplitude Modulation (PAM) and Pulse Code Modulation (PCM) using lab modules.						✓	
4	Recognize the Time Division Multiplexing (TDM) using lab modules.						✓	
5	Communicate effectively in group discussion and oral examination.			✓				
6	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			
7	Work effectively as a member of the team.					✓		

Brief List of Topics to be Covered

1. Getting started with Communications Lab modules and devices.
2. Experiment #1: DSB-LC modulation and demodulation experiment on CASSY2 LAB
3. Experiment #2: DSB-SC modulation and demodulation experiment on CASSY2 LAB
4. Experiment #3: SSB modulation and demodulation experiment on CASSY2 LAB
5. Experiment #4: Pulse Amplitude Modulation (PAM) experiments on CASSY2 LAB
6. Experiment #5: FM modulation and demodulation experiment on CASSY2 LAB
7. MID Exam
8. Experiment #6: ASK and FSK modulation and demodulation on COM3LAB-Board 700 74
9. Experiment #7: 2PSK and 4PSK modulation and demodulation
10. Experiment #8: Differential Phase Coding (DPSK) modulation and demodulation on COM3LAB-Board 700 74
11. Experiment #9: Shift Keying Noise Susceptibility on COM3LAB-Board 700 74
12. Experiment #10: Error detection and error correction on COM3LAB-Board 700 74
13. Experiment #11: Influence of the Transmission Channel on COM3LAB-Board 700 74
14. Experiment #12: Modem Operating Modes on COM3LAB-Board 700 74
15. Final Exam

ABET COURSE SYLLABI

Current Study Plan 2021 ☒		**New Study Plan 2024** ☒	
Course Code	491EE-2	**Course Code**	391-ELE-2
Course Name (Current Study Plan**)**	Graduation Project I		
Course Name (New Study Plan**)**	Graduation Project (1)		

Credits Hours (Current Study Plan**)**	1	**Lab**	2	**Tutorial**	0	**Contact Hours**	3
Credits Hours (New Study Plan)	1	**Lab**	2	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Faculty members supervising students

Textbook

Any available books in the library related to project work.

References

- The students review the literature of the project from Published research articles.
- Youtube channel for project concepts.
- The work is done by the students on the software related to the project (like MATLAB, Pspice, Lab view, ARDUINO).

Other Supplemental Materials

None

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   The graduation project is a culminating handy course work for which the students are expected to integrate and apply what they have learned through previous academic work and field experiences, with faculty supervision. These projects may be "new," continuation of work done in previous courses; or maybe projects started in a previous course that become significantly expanded and enhanced for the thesis. It has two phases- to be taken in consecutive two semesters at senior level. At the beginning of the semester, the students propose a topic on which they are supposed to work as a group. Project students meet in class weekly, discuss their research, and screen their progress for peer and faculty critique and suggestions. At the end of the semester, students present their thesis projects to the supervising committee.
2. **Prerequisites:**
   353EE-3 Computer Applications in Electrical Engineering and 361EE-3 Automatic Control or completion of 100 hours out of 163 hours (new study plan)
   253-ELE-3 Computer Applications in Electrical Engineering and 308-GEC-3 Economics and Engineering Management or completion of 120 hours out of 158 hours (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Ability to formulate design projects and manage them.
2. Ability to review related data and knowledge from credible sources.
3. Ability to communicate orally and to report technically.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7
1	Review the available literature in the project domain.							✓

2	Identify and formulate engineering problems in the area of electrical engineering	✓						
3	Design a system, component or process with defined constraints.		✓					
4	Solve engineering problems and implement designed solution		✓					
5	Communicate effectively in written engineering report and in oral presentation.			✓				
6	Work effectively as a member of the team					✓		
7	Plan a project effectively using project-planning techniques to ensure proper timing, budgeting and professional ethics.				✓			

Brief List of Topics to be Covered

1. Choose a project and write a proposal.
2. Initial Student Presentations: project title, description, motivation and aims.
3. Project planning, process, management activities, work breakdown, time estimation, milestones, activity sequencing, activity network, scheduling, Gantt charts and re-planning.
4. Literature survey: search and review, tracing the information, critical evaluation, writing literature review, ethics and responsibilities.
5. Software development, life cycle, models, assistance in writing the progress report
6. Student presentations: project proposal: problem definition, objectives, justification, and approach.
7. Final presentation & final report (committee).

ABET COURSE SYLLABI

Current Study Plan 2021 ☒				**New Study Plan 2024** ☒			
Course Code	492EE-3			**Course Code**		492-ELE-2	
Course Name (Current Study Plan**)**	Graduation Project II						
Course Name (New Study Plan**)**	Graduation Project (2)						
Credits Hours (Current Study Plan**)**	2	**Lab**	2	**Tutorial**	0	**Contact Hours**	4
Credits Hours (New Study Plan)	1	**Lab**	2	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Faculty members supervising students

Textbook

Any available books in the library related to project work.

References

- The students review the literature of the project from Published research articles.
- Youtube channel for project concepts.
- The work is done by the students on the software related to the project (like MATLAB, Pspice, Lab view, ARDUINO).

Other Supplemental Materials

None

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   The graduation project is a culminating handy course work for which the students are expected to integrate and apply what they have learned through previous academic work and field experiences, with faculty supervision. This is the continuation of graduation project-I, and consequently graduation project-II is supposed to be taken in the consecutive semester. Throughout the semester, the students try to implement what they proposed in graduation project-I as a group. Project students meet in class or lab weekly, segregate the work into sub-projects, and integrate the individual works to reach their target and faculty critique and suggestions. At the conclusion of the semester, students present their design projects along with the thesis to the supervising committee.
2. **Prerequisites:**
   491EE-2: Graduation Project I and 407GE-2 Management of Engineering Projects (current study plan)
   391-ELE-2 Graduation Project (1) (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Identify and formulate engineering problems in the area of electrical engineering.
2. Work effectively as a member of the team
3. Conduct enough literature review in the project domain.
4. Design a system, component, or process with defined constraints.
5. Solve engineering problems and implement designed solutions.
6. Collect and analyze data and draw conclusions though experiments while testing a project.
7. Communicate orally and in writing the project design details in a technical report.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Conduct enough literature review in the project domain.							✓
2	Identify and formulate engineering problems in the area of electrical engineering.	✓						
3	Design a system, component or process with defined constraints.		✓					
4	Collect and analyze data, and draw conclusions though experiments while testing a project						✓	
5	Solve engineering problems and implement designed solution		✓					
6	Communicate orally and in writing the project design details in a technical report.			✓				
7	Work effectively as a member of the team.					✓		
8	Recognize ethical and professional responsibilities in engineering situations and make informed judgments.				✓			

Brief List of Topics to be Covered

1. Prepare a roadmap, collect the necessary equipment/software for the project that was proposed, planned and studied in graduation project I.
2. Planning and implementation, peer review, critical comments and suggestions from the supervisor.
3. Design and investigation of complex problems using proper techniques, tools and resources
4. Testing, data analysis, validation and critical thinking
5. Results and discussion including societal/health/safety impact
6. Comparison, conclusion, recommendation and assessment on implication to society/environment
7. Submit the report along with the project work to the committee.

ABET COURSE SYLLABI

Current Study Plan 2021 ☒				**New Study Plan 2024** ☒			
Course Code	490EE-0			**Course Code**	490-ELE-3		
Course Name (Current Study Plan**)**	Field Training						
Course Name (New Study Plan**)**	Cooperative Training						
Credits Hours (Current Study Plan**)**	0	**Lab**	0	**Tutorial**	0	**Contact Hours**	8 weeks
Credits Hours (New Study Plan)	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	Full Semester

Instructor's or Course Coordinator's Name

Faculty members supervising students

Textbook

None

References

None

Other Supplemental Materials

None

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   During the full semester of industry work, students are expected to apply the knowledge and skills they acquired in their undergraduate program while developing professional competencies relevant to their assigned roles. Students must submit both progress reports and a final report to their designated academic cooperative training advisor.
2. **Prerequisites:** Completed 8th level or completed 100 credit hours (Current Plan), All courses (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☒ Elective☐ Selected Elective☐

Educational objectives

1. Comply with the industrial company's rules and regulations.
2. Execute engineering tasks assigned by your industrial supervisor with professionalism.
3. Collaborate effectively with your team to accomplish assigned projects.
4. Timely submit all required reports and forms to the academic cooperative training advisor via email.
5. Coordinate with your cooperative training supervisor for the final evaluation and ensure it is forwarded to the department head promptly.
6. Prepare and submit your final cooperative training report by the specified deadline.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7
1	Relate practical work to previous knowledge from basic sciences, engineering fundamentals, and discipline related courses.		✓		✓		✓	

2	Apply the theoretical knowledge practically.		✓		✓		✓	
3	Exhibit integrity, punctuality, and ethical behavior in engineering practice and relationships.				✓		✓	✓
4	Communicate effectively within the working environment in a teamwork.				✓		✓	✓

Brief List of Topics to be Covered

Cooperative Training

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 430EE-3	**Course Code** 430-ELE-3

Course Name Electrical Drives

Credits Hours	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4

Current Plan

Credits Hours	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4

New Plan

Instructor's or Course Coordinator's Name

Dr. Muhammad Irfan

Textbook

Krishnan, "Electric Motor Drives", Prentice Hall, 2001.

References

Electrical Machines and Drives, Melkebeek, Jan, Springer, 2018.

Other Supplemental Materials

Computer programming tools (MATLAB)

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Principles of electric drive; Definitions; Electrical considerations: running, starting, braking; Mechanical considerations: type of enclosure, noise, drive transmission, motor selection; Electric traction; DC & AC solid state drives.
2. **Prerequisites:** 420EE-3 (Current Plan)
   220-ELE-3 (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. Recognize the structure and operation of different types of electric drive systems.
2. Study the characteristics and use of electric drives.
3. Design models of DC, AC motors and speed controller

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Define and classify the different electrical machines and drive systems.	✓						
2	Analyze solid state power electronic circuits for DC and AC drive systems.						✓	
3	Design models of DC, AC motors and speed controller.		✓					
4	Analyze the AC motor speed controller.						✓	
5	Communicate effectively to perform the presentation.			✓				
6	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			
7	Perform as an effective team-player in executing related project with imposed design constraints.					✓		

Brief List of Topics to be Covered

1. Introduction to electrical drives and solid-state power converters.
2. Basic components of electrical drive systems.
3. Analysis of the basic criterion of selecting an electric motor for a given drive system.
4. DC solid state drive systems.
5. AC solid state drive systems.
6. Application of control methods to regulate motor speed, position, and torque.

ABET COURSE SYLLABI

Current Plan 2021 ☒				**New Plan 2024** ☒			
Course Code	434EE-3			**Course Code**	434-ELE-3		
Course Name	VLSI Design						
Credits Hours	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Saifur Rahman

Textbook

- By John P. Uyemura "Introduction to VLSI Circuits and Systems", 1st Edition, 2010 Wiley Pub.

References

- David Westen Neil H.E "CMOS VLSI Design: A Circuits and Systems Perspective". Harris 3rd Edition, Addison-Wesley Pub.
- Pucknell, "Basic VLSI Design", Prentice Hall Publication, 3rd Edition 1995.

Other Supplemental Materials

Notes of the concerned instructor on blackboard

• http://lib.nu.edu.sa/digitallibbrary.aspx

• www. en.wikipedia.org

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   Introduction to Integrated Circuit, Lambda Design Rules, NMOS and CMOS Inverters, NMOS and PMOS transistors, P -Well process, N -Well process, CMOS logic, CMOS Technologies, CMOS fabrication and Layout, Integrated Circuit Design using Verilog/VHDL.
2. **Prerequisites:** 332EE-3 Electronics II (current study plan)
   332-ELE-3 Electronics (2) (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. Lambda Design Rules for NMOS and CMOS Inverters.
2. NMOS and PMOS transistors, P -Well process, N -Well process.
3. CMOS logic, CMOS Technologies.
4. CMOS fabrication and Layout.
5. Integrated Circuit Design using Verilog/VHDL.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7
1	Apply knowledge to understand the basic design rules.	✓						
2	Design basic gates using the CMOS.		✓					
3	Distinguish among different design technologies.		✓					
4	Build basic logic circuits using VHDL.						✓	

Brief List of Topics to be Covered

1. Introduction to Integrated Circuits and Design Rules.

2. NMOS and CMOS Inverters.
3. NMOS and PMOS transistors.
4. P -Well process, N -Well process.
5. CMOS technologies.
6. CMOS logic, CMOS fabrication and Layout.
7. Integrated Circuit Design using Verilog/VHDL.

ABET COURSE SYLLABI

Current Plan 2021 ☒				**New Plan 2024** ☒			
Course Code	441EE-3			**Course Code**	441-ELE-3		
Course Name	Microwave Engineering						
Credits Hours	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Prof. Dr. Adam Alhawari

Textbook

- Pozar, D. M. (2011). Microwave Engineering. 4th Edition. New York: John Wiley & Sons.

References

- Awang, Z. (2013). Microwave System Design. Last Edition. New York: Springer.
- Kizer, G. (2013). Digital Microwave Communication: Engineering Point-to-Point Microwave Systems. Last Edition. New Jersey: John Wiley & Sons.
- Collier, R. L. & Skinner, A. D. (2007). Microwave Measurements. 3rd Edition. Herts: Institution of Engineering and Technology.

Other Supplemental Materials

- 3D EM simulator such as Computer Simulation Technology (CST).
- MATLAB Program.

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   Theory, analysis and design of transmission lines, transmission line propagation, impedance matching techniques using Smith chart, waveguides, microwave network analysis using S-Parameters, analysis and design of passive and active components, measurement techniques and application of microwave systems.
2. **Prerequisites:** 344EE- 2 Electromagnetism II (current study plan)
   340-ELE-3 Electromagnetism (2) (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. Describe the impacts and applications of microwave circuits.
2. Analysis and design of transmission lines.
3. Explain transmission line propagation.
4. Analyze impedance matching techniques using the Smith chart.
5. Study and analyze waveguides.
6. Study and investigate microwave network analysis using S-Parameters.
7. Analysis and design of passive and active components.
8. Explain and perform the measurement techniques.
9. Describe the applications of microwave systems.
10. Utilize computer simulation tools in solving problems.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	**Student Outcomes**						
		1	2	3	4	5	6	7

1	Describe the basic principles, impacts, and applications of microwave circuits.	✓						
2	Apply various microwave circuit analysis techniques in solving problems.							✓
3	Perform the microwave measurement techniques.						✓	
4	Design active and passive microwave components.		✓					
5	Utilize computer simulation tools in solving problems related to applications of microwave circuits.						✓	
6	Communicate effectively to perform the presentation.			✓				
7	Perform as an effective team-player in executing related project with imposed design constraints.					✓		
8	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			

Brief List of Topics to be Covered

1. Transmission lines
2. Smith Chart
3. Waveguides
4. Microwave Network Analysis
5. Matching Networks
6. Microwave Filter Design
7. Microwave Amplifier Design
8. Microwave Measurements
9. Application of Microwave Systems

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 446EE-3	**Course Code** 446-ELE-3
Course Name Embedded Systems	
Credits Hours 2 **Lab** 2 **Tutorial** 0 **Contact Hours** 4	

Instructor's or Course Coordinator's Name

Dr. Abdulkarem Almawgani

Textbook

- Embedded System Design: A unified Hardware/Software Introduction, Frank Vahid and Tony Givargis. Wiley. 2001.
- Designing Embedded Systems with Arduino, Tianhong Pan and Yi Zhu, Springer, 2018.

References

- Ganguly, A.K. (2013). Embedded System: Design, Programming and Applications. Oxford: Alpha Science Intl Ltd.
- Iniewski, K. (2012). Embedded System: Hardware, Design and Implementation. New Jersey: John Wiley & Sons.
- Sanchez, J. & Canton, M.P. (2012). Embedded Systems Circuits and Programming. Boca Raton: CRC Press.

Other Supplemental Materials

- MATLAB Program.

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   This course covers the main elements of embedded systems design. Emphasis given includes hardware and firmware design, hardware selection, hardware testing, development tools and software, firmware development and firmware debugging.
2. **Prerequisites:** 354EE-3 Introduction to Microprocessor (current study plan)
   354-ELE-3 Introduction to Microprocessor (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

11. Analyze and design embedded systems.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Identify embedded systems and their components and characteristics.	✓						
2	Identify Arduino microcontroller	✓						
3	Design embedded systems using Arduino		✓					
4	Communicate effectively to perform the presentation.			✓				
5	Perform as an effective team-player in executing the related project with imposed design constraints.					✓		
6	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			

Brief List of Topics to be Covered

1. Introduction to embedded systems.

2. Microprocessors and microcontrollers
3. Memory.
4. Interfacing.
5. Introduction to Arduino.
6. Programming using Arduino.
7. Designing embedded systems using Arduino.

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 456EE-3	**Course Code** 456-ELE-3

Course Name Digital Signal Processing

Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Seif Shebl Seif

Textbook

Sanjit K. Mitra, "Digital Signal Processing: A Computer Based Approach", McGraw-Hill, 4th Edition, 2010.

References

- Vinay K. Ingle, John G. Proakis, "Digital Signal Processing using MATLAB" Cengage Learning, 4th Edition, 2016.

Other Supplemental Materials

- Computer programing tools (MATLAB)

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Review of discrete-time signals and systems; The Discrete-Time Fourier transform, Fast Fourier Transform, Z Transform, Recursive and no recursive digital filters design and realization; Decimation and interpolation; Applications of digital signal processing in communications.
2. **Prerequisites:** 342EE-3 Signals and Systems Analysis (Current Plan)
   242-ELE-3 Signals and Systems Analysis (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department ☒ Track☐ Others☐
   Required ☐ Elective ☐ Selected Elective☒

Educational objectives

After completing this course, the students should be able to:

1. Understand and use different theories and tools for digital signal processing.
2. Design digital filters.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Apply knowledge of sampling theorem to reconstruct signals.	✓						
2	Define and execute different discrete transform techniques.							✓
3	Execute the theories and properties of discrete LTI systems.							✓
4	Design different types of system responses.		✓					
5	Design analog and digital filters.		✓					
6	Communicate effectively to perform the presentation.			✓				
7	Perform as an effective team player in executing related projects with imposed design constraints.					✓		

8	Recognize ethical and professional responsibilities in engineering situations and make informed judgments.				✓			

Brief List of Topics to be Covered

1. Review of discrete-time signals and systems.
2. Tabular method of convolution; correlation and its properties.
3. The Discrete-Time Fourier transform: its definition, implementation of the transform technique in some basic and advanced sequences, its application.
4. Fast Fourier Transform and Z Transform; Region of convergence (ROC), convolution using z-transform.
5. Analyze different discrete-time system response.
6. Recursive and non-recursive digital filters design and realization.
7. Sampling theorem, applications of digital signal processing in communications.

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 418EE-3	**Course Code** 418-ELE-3

Course Name Renewable Energy System

Credits Hours 2 **Lab** 2 **Tutorial** 0 **Contact Hours** 4

Instructor's or Course Coordinator's Name

Dr. Hisham Alghamdi

Textbook

Design of Smart Power Grid Renewable Energy Systems, Ali Keyhani , John Wiley 2011, ISBN 978-0470-62761-7.

References

- The Integration of Distributed Generation in the Power System , Math Bollen. Fainan Hassan, John Wiley 2011, ISBN 978-0470-64337-2.
- Renewable Energy Technologies, edited by J.C.Sabonnadiere, Wiley, 2009,ISBN 978-1-84821-135-3
- Sustainable Energy Systems and Applications, Springer, 2011, 978-0-387-95860-6

Other Supplemental Materials

NA

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Introduction, Energy and Civilization, Distributed Generation Technologies & Economics, Fundamentals of Solar Power Systems, Concentrated Solar Power, Fundamentals of Wind Power Systems, Energy Storage, Integration of Distributed Generation into the Grid, Impact of Distributed Generation on Power System Operation, Applications.
2. **prerequisites:** 424EE-3 (Current Plan)
   324-ELE-3 (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☒ Selected Elective☐

Educational objectives

1. Recognize how the renewable energy resources can help the economy and environment
2. Categorize types of renewable energy resources.
3. Describe the principles of the most common renewable energy systems
4. Recognize and analyze of Solar Power Systems
5. Recognize and analyze of Wind Power Systems
6. Design of renewable energy systems
7. Making use of the equipment and techniques in the Renewable Energy Laboratory to translate the theory into reality.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Recognize the need of renewable energy technologies and their role.	✓						
2	Classify the different types of Renewable Energy Sources	✓						
3	Design Renewable Energy Systems.		✓					
4	Analyze and perform experiment related to Renewable Energy Systems meeting residential and industrial needs.						✓	

5	Communicate effectively to perform the presentation.			✓				
6	Perform as an effective team-player in executing related projects with imposed design constraints.					✓		

Brief List of Topics to be Covered

1. Energy and Civilization
2. Distribution Generation Technologies & Economics
3. Fundamentals of Solar Power Systems
4. Concentrated Solar Power
5. Fundamentals of Wind Power Systems
6. Energy Storage
7. Integration of Distribution Generation into the Grid
8. Impact of Distribution Generation on Power System Operation
9. Applications of Renewable Energy
10. Experiment 1: Determining the no-load characteristics of the generator: To understand the relationship between the generator's output voltage and rotation speed.
11. Experiment 2: Operation of a real, small wind power plant
12. Experiment 3: Operation of the Inverters under various loads: To examine operation in the storage mode at various loads and wind speeds.
13. Experiment 4: Operation with different loads: To examine operation in the storage mode at various loads and wind speeds.
14. Experiment 5: Converting light into electricity: In this experiment, we will demonstrate how a solar cell converts sunlight or electric light into a different form of energy.
15. Experiment 6: Solar radiation's angle of incidence: In this experiment, we will examine a solar cell's response to the radiated light's angle of incidence.
16. Experiment 7: Shading : In this experiment, we will examine the effect of shading on a solar module connected in series to three further modules.
17. Experiment 8 : Loads in direct operating mode: In this experiment, we will examine the response of a PV module connected to a variety of loads (consumers) in the direct operating mode.

ABET COURSE SYLLABI

Current Plan 2023 ☒		**New Plan 2024 ☒**	
Course Code	491EE-3	**Course Code**	419-ELE-3
Course Name	Energy Efficiency		

Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Belqasem Hassan Aljafari

Textbook

Kennedy, William J., Turner, Wayne C., and Capehart, Barney L. Guide to Energy Management, The Fairmount Press, 8th edition, 2016.

References

Steve Doty and Wayne C. Turner. Energy Management Handbook, 8th Edition.

Other Supplemental Materials

MATLAB Program.

Specific Course Information

1. **brief description of the content of the course (catalog description)**
2. This course will provide the student with a practical understanding of the energy efficiency measures which can be implemented by large and medium industrial and commercial energy users, and domestic users. It will cover energy technologies including energy auditing, rate structures, economic evaluation techniques, lighting efficiency improvement, HVAC optimization, combustion and use of industrial waste, steam generation, distribution system performance, process energy management, and maintenance considerations.
3. **Prerequisites:** 324-ELE-3 (New Plan)
4. **Corequisites:** 418EE-3 (Current Plan)
5. **Course Type**

   University ☐ College ☐ Department☒ Track☐ Others☐

   Required ☐ Elective☐ Selected Elective☒

Educational objectives

Identify and describe the energy conservation opportunities in industrial and commercial systems

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Define operation principles of electrical machines.	✓						
2	Describe the energy rate structures.	✓						
3	Use advanced technology to monitor and control energy use.							✓
4	Present energy efficiency and demand management projects and proposals.						✓	
5	Apply energy auditing techniques.						✓	
6	Examine the economic evaluation of energy conservation solutions.				✓			

Brief List of Topics to be Covered

1. Introduction to energy efficiency and conservation measures, low cost/ no cost energy conservation measures.
2. Energy management program.
3. The energy audit process.
4. Understanding energy bills.
5. Lighting, heating, ventilation, and air conditioning.
6. Energy efficiency in pumps, fans, motors, belt drives, variable speed/frequency drives.
7. Combustion process and industrial waste.
8. Control systems & computers to monitor energy use.

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 431EE-3	**Course Code** 431-ELE-3

Course Name Power System Protection

Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Ayman Hindi

Textbook

Power system relaying. Horowitz & Phadke. (2nd Ed.) J. Wiley, 1995.

References

Power system protection, P. Andersen, Wiley, 1999.

Other Supplemental Materials

- MATLAB Program

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   The course provides comprehensive concepts of power system protection including an understanding of the principles of the operation of protection system components, e.g. fuses, relays, circuit breakers, instrument transformers and their applications for the design of protection systems for transmission lines, busbars, motors, generators, and transformers.
2. **Prerequisites:** 424EE-3 (Current Plan)
   324-ELE-3 (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. To understand basic concepts in power system protection.
2. To conduct relay selection and setting calculations

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Explain the principles of operation of protective devices	✓						
2	Apply the fundamental principles of power system protective devices						✓	
3	Analyze the performance of power system transducers						✓	
4	Design of protection systems for transmission lines, busbars, transformers, generators and motors		✓					
5	Communicate effectively to perform the presentation.			✓				
6	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			
7	Perform as an effective team-player in executing related project with imposed design constraints.					✓		

Brief List of Topics to be Covered

1. Symmetrical and Unsymmetrical fault calculations
2. Introduction to protective relaying and switchgear
3. Relay types and operating principles
4. Current and voltage transformers
5. Over-current protection of lines
6. Distance protection of lines
7. Pilot line protection
8. Rotating machine protection
9. Transformer protection
10. Busbar protection

ABET COURSE SYLLABI

Current Plan 2021 ☒				**New Plan 2024** ☒			
Course Code	432EE-3			**Course Code**	432-ELE-3		
Course Name	Power System Analysis II (Current Plan) Power System Analysis (2) (Current Plan)						
Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Ayman Hindi

Textbook

Power System Analysis, John J. Grainger and William D. Stevenson, Jr.-McGraw-Hill, 1994.

References

Husain, "Electrical power Systems", CBS Publisher & Distributors, 1994.

Other Supplemental Materials

None

Specific Course Information

1. This course provides students with a working knowledge of power system problems and computer techniques used to solve some of these problems. Topics covered include power system components and modeling, optimal dispatch of generation, symmetrical three-phase faults, symmetrical components, unsymmetrical faults, power flow, and power system stability.
2. **Prerequisites:** 424EE-3 Power System Analysis I (Current Plan)
   324-ELE-3 Power System Analysis (1) (Current Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. To understand basic concepts in power system operation.
2. To conduct power flow and short circuit studies.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
8	Recognize power system components and models.	✓						
9	Solve basic economic dispatch problem.	✓						
10	Design power flow system.		✓					
11	Estimate fault currents.						✓	
12	Analyze the power system stability.						✓	
13	Communicate effectively to perform the presentation.			✓				
14	Perform as an effective team player in executing related projects with imposed design constraints.					✓		

Brief List of Topics to be Covered

1. Introduction to interconnected power systems, components, and models.Ohm's law, power and energy calculations.
2. Optimal dispatch of generation. Mesh, nodal analysis and source transformation.
3. Formation of power system matrices. Sinusoidal Alternating Waveforms and phasor representation.
4. Power flow analysis.
5. Symmetrical three-phase faults.
6. Symmetrical components.
7. Unbalanced fault analysis.
8. Power system stability.

ABET COURSE SYLLABI

Current Plan 2021 ☒						**New Plan 2024** ☒		
Course Code	442EE-3					**Course Code**	442-ELE-3	
Course Name	Antenna and Wave Propagation							
Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4	
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3	

Instructor's or Course Coordinator's Name

Prof. Dr. Adam Alhawari

Textbook

- Das, S.K., and Das, A. (2013). Antenna and Wave Propagation, Last Edition. New Delhi: Tata McGraw Hill Education Private Limited.

References

- Carr, J. J., and Hippisley, G. W. (2011). Practical Antenna Handbook. 5th Edition, New York: McGraw-Hill.
- Pozar, D. M. (2011). Microwave Engineering. 4th Edition. New York: John Wiley & Sons.
- Granatstein, V. L. (2012). Physical Principle of Wireless Communications. 2nd Edition, Boca Raton: CRC Press.

Other Supplemental Materials

- MATLAB Program.
- 3D EM simulator.

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   Introduction to antennas, theory of wave propagation, fundamental parameters of antenna, radar range equation, half-wave dipole antenna, antenna arrays, planar antennas, broadband antennas, methods of antenna measurements, matching techniques, principle of designing different types of antenna and antenna arrays.
2. **Prerequisites:** 344EE-3 Electromagnetism II (current study plan)
   340-ELE-3 Electromagnetism (2) (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. Explain various types of antennas and applications.
2. Understand the fundamental parameters of the antenna.
3. Realize the radar range equation, a half-wave dipole antenna, antenna arrays, planar antennas, and broadband antennas.
4. Explain methods of antenna measurements.
5. Understand matching techniques.
6. Describe the principles of designing different types of antennae, and the design of antenna arrays.
7. Explain and understand the theory of wave propagation.
8. Construct an antenna system to satisfy the requirements of a wireless system.
9. Utilize computer simulation tools in solving problems.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Explain various types of problems and propagation theory in a telecommunication system.	✓						
2	Summarize the principle of sustainable design of antenna and wave propagation.	✓						
3	Design an antenna system or component to satisfy the requirements of a wireless system.		✓					
4	Utilize computer simulation tools in solving antenna-related problems.						✓	
5	Communicate effectively to perform the presentation.			✓				
6	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			
7	Perform as an effective team-player in executing related project with imposed design constraints.					✓		

Brief List of Topics to be Covered

1. Antenna Basic Concept
2. Antenna Parameters
3. Dipole Antenna
4. Antenna Types
5. Antenna Array
6. Antenna Measurement
7. Antenna in Systems
8. Wave Propagation

ABET COURSE SYLLABI

Current Plan 2021 ☒		**New Plan 2024** ☒	
Course Code	447EE-3	**Course Code**	447-ELE-3
Course Name	Data Communications and Networks		
Credits Hours	2 **Lab** 2	**Tutorial** 0	**Contact Hours** 4

Instructor's or Course Coordinator's Name

Dr. Abdulkarem Almawgani

Textbook

- Data Communications and Networking, B. A. Forouzan, S. C. Fegan, McGraw-Hill, 5th Edition, 2013.

References

- Albert Leon-Garcia and Indra Widjaja, Communication Networks: Fundamental Concepts and Key Architectures, 2nd ed., McGraw-Hill, 2004.
- Peterson & Davie, "Computer Networks, A Systems Approach", 3rd ed, Harcourt, 2005.
- Andrew S. Tanenbaum, "Computer Networks", 4th ed., Prentice Hall, 2003.
- Bertsekas and Gallagher "Data Networks," PHI, 2000.

Other Supplemental Materials

- MATLAB Program.

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   Network Architectures. Network Layers: OSI Model and TCP/IP Model. Physical Layer Protocols and Digital Transmission Fundamentals. Data Link Layer Protocols. Network Layer Protocols: IP Protocols. Medium Access Control systems. Packet Switching and Circuit Switching. Routing in Packet Switching Network Architectures. Network Layers: OSI Model and TCP/IP Model. Physical Layer Protocols and Digital Transmission Fundamentals. Data Link Layer Protocols. Network Layer Protocols: IP Protocols. Medium Access Control Systems. Packet Switching and Circuit Switching. Routing in Packet Switching. Network security.
2. **Prerequisites:** 444EE-3 Digital Communications (current study plan)
   344-ELE-3 Digital Communications (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. Build an understanding of the fundamental concepts of computer networking.
2. Introduce students to the evolution of computer networks and the concepts of data communication.
3. Introduce students to the general principles of network design and compare the different network topologies.
4. Introduce students to the wireless Local Area Networks.
5. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
6. Introduce the student to advanced networking concepts, preparing the student for entry into Advanced courses in computer networking.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Identify problems regarding computer and network security, and their impact on society.	✓						
2	Identify, formulate, and solve engineering problems related to telecommunications Networks.	✓						
3	Design of telecommunication systems.		✓					
4	Use techniques, and skills of modern programming tools in the engineering practice of Telecommunication Networks.						✓	

Brief List of Topics to be Covered

1. Communication Theory Review
2. TCP/IP Suite & ISO OSI Model
3. Logical (IP) Addressing
4. Internet Protocol
5. Network Layer Protocols
6. Routing
7. Wired LAN: Ethernet
8. Wi-Fi Networks
9. Connecting and Extending LANS
10. WANs
11. TELEPHONE NETWORK: Network Elements, Multiplexing, Switching, Signaling, Traffic Analysis, Cellular Networks
12. Network security

ABET COURSE SYLLABI

Current Plan 2021 ☒				**New Plan 2024** ☒			
Course Code	448EE-3			**Course Code**	448-ELE-3		
Course Name	Wireless Communications						
Credits Hours Current Plan	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours New Plan	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Prof. Dr. Adam Alhawari

Textbook

- Theodore S. Rappaport (2001). Wireless Communications Principles and Practice. 2nd Edition, Prentice Hall.

References

- Kolawole, M. O. (2013). Satellite Communication Engineering. 2nd Edition, Boca Raton: CRC Press.
- Montenbruck, O. & Grill, E. (2011). Satellite Orbits: Model, Methods and Applications. Last Edition. New York: Springer.
- Maral, G., Bousquet, M. & Sun, Z. (2010). Satellite Communications Systems: Systems, Techniques, and Technology. 5th Edition. New York: John Wiley & Sons.

Other Supplemental Materials

- MATLAB Program.

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   Introduction to wireless communications, Channel models, large- and small-scale fading, Diversity, cellular system analysis (frequency planning, capacity, sectorization, etc.), Link budget analysis, Multiple access techniques (TDMA, FDMA, CDMA), technology and applications of satellite communications, Standards of wireless communications.
2. **Prerequisites:** 444EE-3 Digital Communications (current study plan)
   344-ELE-3 Digital Communications (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. Explain the basic concepts of wireless communications.
2. Describe channel models.
3. Understand large- and small-scale fading.
4. Explain and understand diversity.
5. Understand cellular system analysis (frequency planning, capacity, sectorization, etc.).
6. Recognize link budget analysis.
7. Explain multiple access techniques (TDMA, FDMA, CDMA).
8. Describe the technology and applications of satellite communications.
9. Understand the standards of wireless communications.
10. Evaluate problems related to mobile radio and satellite communication.
11. Explain the mobility management of mobile radio communication systems.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Explain the mobility management of mobile radio communication system.	✓						
2	Evaluate problems related to mobile radio and satellite communication.						✓	
3	Develop a system using components and processes for the need of wireless communication systems design.		✓					
4	Communicate effectively to perform the presentation.			✓				
5	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			
6	Perform as an effective team-player in executing related project with imposed design constraints.					✓		

Brief List of Topics to be Covered

1. Introduction to wireless communication systems
2. Fundamental of Cellular System Design
3. Architecture and Access Network Planning
4. Multipath Fading and Dispersion
5. Introduction of Orbital Satellite System
6. Propagation and Link Budget
7. Satellite Services
8. Mobility management of wireless communication systems

ABET COURSE SYLLABI

Current Plan 2021 ☒		**New Plan 2024** ☒	
Course Code	451EE-3	**Course Code**	451-ELE-3
Course Name	Digital Image Processing		
Credits Hours	2 **Lab** 2	**Tutorial** 0	**Contact Hours** 4

Instructor's or Course Coordinator's Name

Dr. Abdulkarem Almawgani

Textbook

- Digital Image Processing, R. Gonzalez and R. Woods, Pearson; 4 Edition, 2017.

References

- Gonzalez, Rafael C., Eddins, Steven L., Woods, Richard E, Digital Image Processing Using MATLAB, 1st Ed., Pearson Prentice-Hall, 2004.
- Milan Sonka, Vaclav Hlavac, Roger Boyle, Image Processing, Analysis, and Machine Vision, Thomson Learning, 2008, ISBN 0-495-08252-X.

Other Supplemental Materials

- MATLAB Program.

Specific Course Information

1. **Brief description of the content of the course (catalog description)**
   Fundamentals; review of DSP algorithms such as DFT; intensity transforms, frequency domain filtering; image restoration and reconstruction; color image processing; multiresolution processing; image compression; morphological image processing.
2. **Prerequisites:** 342EE-3 Signal and System Analysis (current study plan)
   242-ELE-3 Signal and System Analysis (new study plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. Study the fundamentals of digital image processing.
2. Apply image transform.
3. Categorize and apply image enhancement techniques.
4. Analyze image restoration techniques and methods.
5. Classify and apply Image compression and Segmentation.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Identify the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.	✓						
2	Design spatial-domain and frequency-domain image filtering		✓					
3	Apply frequency transformations, such as DFT and DCT for images						✓	
4	Design a filter to restore the noisy image.		✓					
5	Communicate effectively to perform the presentation.			✓				
6	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			

7	Perform as an effective team-player in executing related project with imposed design constraints.					✓		

Brief List of Topics to be Covered

1. The digital image processing field: Introduction, definitions, and applications
2. Image fundamentals: Models, sampling, quantization, and basic operations
3. 1-D and 2-D Discrete Fourier Transform and properties of DFT
4. Image Enhancement: Background, Point processing, Histogram equalization and specification
5. Intensity Transformations and spatial domain filtering: Smoothing, Median, & Sharpening. Frequency Domain Filtering: Low & high-pass
6. Frequency Domain Filtering: Low & high-pass
7. Image restoration and reconstruction
8. Image compression
9. Image segmentation
10. Object recognition

ABET COURSE SYLLABI

Current Plan 2021 ☒	**New Plan 2024** ☒
Course Code 463EE-3	**Course Code** 463-ELE-3

Course Name Applied Control

Credits Hours	3	**Lab**	0	**Tutorial**	1	**Contact Hours**	4
Credits Hours	3	**Lab**	0	**Tutorial**	0	**Contact Hours**	3

Instructor's or Course Coordinator's Name

Dr. Muhammad Irfan

Textbook

Modern control systems. Richard C. Dorf, Robert H. Bishop. 13th ed. 2016.

References

Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall 2010.

Other Supplemental Materials

Computer programming tools (MATLAB)

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   Basics of system modeling and analysis; PID controller design; Transducers and actuators; Real-time control; Control applications (power systems, robotics, etc.), Introduction of Programming Logic Controller (PLC).; Control design project.
2. **Prerequisites:** 361EE-3 (Current Plan)
   361-ELE-3 (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. Define and classify applied control strategies for industrial applications.
2. Analyses of different control method such as root locus, frequency domain, state space for different electrical and mechanical systems.
3. Model and Analyze different electrical and mechanical systems.
4. Compute the PID controller parameters via MATLAB Simulink and control toolbox
5. Introduction of Programming Logic Controller (PLC).

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
1	Introduction of Programming Logic Controller (PLC)	✓						
2	Analyze different control methods such as root locus, frequency domain for different electrical and mechanical systems.						✓	
3	Design of PID, and lead-lag controllers using various control methods.		✓					
4	Communicate effectively to perform the presentation.			✓				
5	Recognize ethical and professional responsibilities in engineering situations and make informed judgments				✓			
6	Compute the PID controller parameters via MATLAB Simulink and control toolbox					✓		

Brief List of Topics to be Covered

1. Introduction to control and its industrial applications.
2. Modeling and analysis of dynamic models of different systems such as mechanical and electrical systems including models of motor position and speed, and cruise control systems.
3. Analyze different control methods such as root locus, frequency domain, state-space for different electrical and mechanical systems.
4. Design of PID, and lead-lag control strategies.
5. Introduction of Programming Logic Controller (PLC).
6. MATLAB for control applications

ABET COURSE SYLLABI

Current Plan 2021 ☒		**New Plan 2024** ☒	
Course Code	464EE-3	**Course Code**	464-ELE-3
Course Name	Introduction to Robotics		
Credits Hours	2 **Lab** 2	**Tutorial** 0	**Contact Hours** 4

Instructor's or Course Coordinator's Name

Dr. Muhammad Irfan

Textbook

Introduction to Robotics, mechanics and control by John J. Graig, Pearson, 4th Edition, 2017.

References

- Saha, S.K., Introduction to Robotics, 2nd Edition, 2014, Tata McGraw-Hill.

Other Supplemental Materials

Computer programming tools (MATLAB); Roboanalyzer

Specific Course Information

1. **brief description of the content of the course (catalog description)**
   This course provides an overview of robotics, basic elements of the robot, basics of the robot design, programming and vision in robotics and applications of robots in biomedical, deep water and manufacturing.
2. **prerequisites:** 361EE-3 (Current Plan)
   361-ELE-3 (New Plan)
3. **Corequisites:** None
4. **Course Type**
   University ☐ College ☐ Department☒ Track☐ Others☐
   Required ☐ Elective☐ Selected Elective☒

Educational objectives

1. Identify the robotic elements and spatial description & transformations.
2. To learn the fundamentals and design of robots.
3. To be familiar with applications of robotics in the industry.
4. Design and simulate robots of various degrees of freedom.

Course Learning Outcomes and Mapping with Student Outcomes

	Course Learning Outcomes	Student Outcomes						
		1	2	3	4	5	6	7
7	Identify the main element of robot design	✓						
8	Identify the spatial description and transformations	✓						
9	Design kinematic and dynamic response of robotic systems		✓					
10	Simulate robots of various degrees of freedom						✓	
11	Communicate effectively to perform the presentation.			✓				
12	Perform as an effective team-player in executing related project with imposed design constraints.					✓		

Brief List of Topics to be Covered

1. An overview of robots
2. Spatial description and transformations
3. Robot manipulator kinematics
4. Robot manipulator dynamics
5. Velocity and torque parameters
6. Manipulator-mechanism design
7. Modern trends and applications of robots