APPENDIX A: Course Syllabi

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Nile Higher Institute for Engineering and Technology

Communication and Electronics Engineering Department

Core Classes

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1. Course Number and Name

ELP 112 – Electrical Measurements and Testing.

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Mohammed, Warda

4. Textbook and Supplemental Materials

- M.L. Anand, Electrical Measurements and Measuring Instruments, s.kkataria& sons, 2011.
- M. M. S. Anand, Electronic instruments and Instrumentation technology, PHI Learning Pvt, Ltd, 2004.

5. Course Information

Catalog Description: Introduce an overview about the fundamentals of electrical measurements, and understanding of the International System of units and the electrical quantities measuring standards. discuss the sources of errors in measurements. Measure current, voltage, energy, and power for AC and DC circuits. Use a cathode ray oscilloscope to determine the phase, frequency, amplitude, and other characteristics of a given waveform and identify different electrical circuits and its principles.
Prerequisites: BAS 022. **Corequisites:** None. **Pre or Corequisites:** None
Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Provide** an overview about measurements, measuring instruments and **statistical analysis** of errors in measurements.
- **Discuss** and m**easure** all electrical quantities for ac and dc circuits. Also measure time period, voltage and frequency using an oscilloscope.
- **Design** multi-range ammeters and voltmeters.
- **Assess** and evaluate effectively the characteristics and performance of components, systems and processes.
- **Identify** the International System of units and the electrical quantities measuring standards.
- **Use** computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✓
3. An ability to communicate effectively with a range of audiences.	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	✓
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Introduction about measurements, Errors in measurements.
- Statistical analysis of errors in measurements
- Measurements of all electrical quantities (current, voltage, energy, and power) for dc and ac current.
- Measurement of resistances and capacitors
- The multi-meter.
- The oscilloscope, Signal generators
- Measurements of time period and frequency.
- Spectrum and Logic Analyzer
- Energy transducer

1. Course Number and Name

ELP 115 – Electrical Materials

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Mohammed, Warda

4. Textbook and Supplemental Materials

- Dr.C.S. indulkar, An introduction to electrical engineering materials, S.K.Kataria &Sons, 2010.

5. Course Information

Catalog Description: An introduction to atomic structure and materials classification. Study and Measurement of Electrical and Optical Properties of Materials

Prerequisites: BAS 022. **Corequisites:** None. **Pre or Corequisites:** None

Type of course: Required

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Provide** an overview about atomic structure, and types of materials.
- **Apply** knowledge of chemistry, and physics to electrical material.
- **Discuss** and **identify** Electrical, Magnetic and Optical Properties of Materials.
- **Apply** knowledge of basic science of electrical materials and materials classification**.**
- **Respond** and **present** subject knowledge based on recovered electrical materials topics.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✔
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Atoms and atomic structure.
- Materials Classification.
- Conductors.
- High/low - Resistive Materials.
- Semiconductors.
- Insulators.
- Magnetic Materials
- Study and Measurement of Electrical, Magnetic and Optical Properties of Materials.
- Materials of electronic component

1. Course Number and Name

ELC 221 – Computer Programming

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Sakr, Hesham.

4. Textbook and Supplemental Materials

- Robert W. Sebesta, Programming Languages, 7th Ed, Pearson, Boston, 2006.
- https://www.tutorialspoint.com/cplusplus/index.htm

5. Course Information

Catalog Description: Study computer hardware in order to use techniques, skills, and appropriate engineering tools, necessary for computer engineering practice and project management. As well as, design digital and analog, coding and decoding computerized systems.

Prerequisites: None **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- Identify programming standards and concepts.
- Discuss the principles of computer programming analysis with a variety of context and scales.
- Use a wide range of software packages to compile programming projects.
- Create new programming projects via teamwork.
- Employ contemporary software to solve engineering problems.
- Apply code practices using functions and advanced programming techniques.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✓
3. An ability to communicate effectively with a range of audiences.	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	✓
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✓
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Numbering systems.
- Computers HW and SW.
- Flow Charts.
- Introduction to C++ programming language.
- Types of Variables.
- Operators and Expressions.
- Console Input and Output.
- Conditional statements.
- Looping methods.
- Arrays.

1. Course Number and Name

ELP 113 – Electrical Circuits (1)

2. Credits (Contact Hours/Week for Fall/Spring Semester)

2 (28) – Spring Semester

3. Course Coordinator

Ibrahim, Hegazi
Lashin, Samy

4. Textbook and Supplemental Materials

- J. W. Nilsson and S. A. Riedel, Electric Circuits, Prentice - Hall, 8th. Ed., 2008.
- N. C. Jegan and C. lakshminarayana, Electrical Circuit Analysis, BS Publications/BSP Books, 2011.
- Charles K. Alexander,Matthew n. o. Sadiku, Fundamentals of Electric Circuits, Raghothaman Srinivasan, 5th 2012.

5. Course Information

Catalog Description: Prepare simple sketches and specifications for electric DC and AC circuits, **Principles of magnetic circuits,** Develops low voltage power systems.
Prerequisites**:** BAS 022**. Corequisites:** None. **Pre or Corequisites:** None.
Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Apply** knowledge of basic science and mathematics to define the physical meaning of electrical systems.
- **Identify** appropriate methods to deal with electrical elements in **the** experimental field by using measuring instruments.
- **Discuss** suitable analysis principles for electrical circuits.
- **Demonstrate** relationship between electrical and magnetic circuits by using appropriate analytical methods.
- **Implement** basic electrical circuits by using electrical elements, sources and measuring tools.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Current, Voltage, Power and Energy
- Constant and Controlled Current/Voltage Sources
- Series and Parallel Circuit Analysis
- DC Circuits analysis
- Circuit Theorems
- Capacitance and Inductance
- Alternating Current
- Analysis of AC Circuits using Vectors
- Computation of Power
- Resonant Circuits and Magnetic circuits.

1. Course Number and Name

ELP 114 – Electrical Circuits (2)

2. Credits (Contact Hours/Week for Fall/Spring Semester)

2 (28) – Fall Semester

3. Course Coordinator

Azmy, Ahmed

4. Textbook and Supplemental Materials

- **O. Ergul, Introduction to Electrical Circuit Analysis, John Wiley & Sons, Jun 26, 2017**
- V.K.Mehta, Basic Electrical Engineering, S.Chand & company, New Delhi,1st Ed., 2008.
- Rajendra Prasad, Fundamentals of electrical engineering. PHI Learning, New Delhi, 2nd Ed., 2011
- N C Jagan, electrical circuit analysis, Aditya Offset, **I**ndia,1st Ed., 2012.
- Jimmie J Cathery,Basic Electrical engineering, tata Mcgraw Hill, New York, 3rd Ed., 2006.
- M.L.Soni, A course in Electrical circuit analysis, Dhanpat Ral, New Delhi,7th Ed., 2011.
- **https://www.allaboutcircuits.com/textbook/direct-current/chpt-16/electrical-transients/**

5. Course Information

Catalog Description Network structures, Transient **in first order series and parallel circuits, Transient in second order series and parallel circuits,** Three-phase Circuits, Mutual Inductance, Laplace and Fourier Transforms in Electric Circuits, Two port Networks.

Prerequisites: ELP 112. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- Select appropriate mathematical and computational methods for modeling and analyzing different types of electric circuits.
- Discuss concepts of magnetic circuits for analyzing mutual circuits by using appropriate mathematical methods.
- Demonstrate relationship between first order and second order circuits by using appropriate analytical methods.
- Identify appropriate methods to analyze and deal with electrical elements in experimental fields by using PSPICE Software.
- Simulate electrical circuits by using PSPICE Software.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Network structures
- Operational Amplifier
- Response of First Order Circuits
- Response of Second Order Circuits
- Three - phase Circuits
- Mutual Inductance
- Laplace and Fourier Transforms in Electric Circuits
- Transfer Function
- Two port Networks
- Introduction to Frequency Selective Circuits,
- Fourier Series
- Circuit Analysis using PSPICE Software.

Course Number and Name

ELC 311 – Computer Organization & Architecture

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42)

3. Course Coordinator

Ibrahim, Hegazi

4. Textbook and Supplemental Materials

- Linda Null, Computer Organization & Architecture, Jones & Bartlett, Jones & Bartlett, 2012.
- https://classroom.google.com/ (**Official Electronic Platform**)
- https://www.geektonight.com/computer-organization-and-architecture-notes/

5. Course Information

Catalog Description: Study computer hardware in order to use techniques, skills, and appropriate engineering tools, necessary for computer engineering practice and project management. As well as, design digital and analog, coding and decoding computerized systems.

Prerequisites: ELC 221. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Discuss** suitable concepts of computer systems for modeling and analyzing discipline problems.
- **Describe** CPU circuits using different digital devices.
- **Model and Analyze** computer systems and circuits based on suitable concepts and instructions.
- **Design** appropriate mathematical and computational methods for required computer architecture.
- **Construct and design** computer architecture and systems with consideration of environmental and economic factors
- **Demonstrate** self-learning skills to all students with some topics related to registers and instructions

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✓
3. An ability to communicate effectively with a range of audiences.	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	✓
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	✓

7. List of Topics

The major topics covered in this course are:

- Computer CPU basics
- Computer CPU organization
- Design of Basic Computer
- MANO's instruction processing
- Programming the basic computer
- Assemblers of MARIE's & MANO's computer
- Control computer memory
- Memory address sequencing

1. Course Number and Name

ELC 331 – Computer Networks

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Sakr, Hesham.

4. Textbook and Supplemental Materials

- Andrew S. Tanenbaum, Computer Networks, Prentice Hall, 3rd. Ed, 1996.
- James F. Kurose, Computer Networking, Pearson, Boston, 1st. Ed, 2013.
- Modules: Free Online Internet Protocol Networks Diploma Course | Alison

5. Course Information

Catalog Description: Study computer networks' models in order to Use the techniques, skills, and appropriate engineering tools, necessary for computer networks engineering practice and networks project management. As well as, demonstrate knowledge of contemporary networks engineering issues and in self-and life-long learning and display professional and ethical responsibilities; and contextual understanding for computer networks models.

Prerequisites: ELC 221. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- Model and Design appropriate specifications for required computer networks.
- Use networking tools to observe and determine behaviors of networking protocols.
- Describe the essential principles of network protocols and structures.
- Represent and discuss different scenarios related to the latest topics of Networking.
- Identify and Analyze Apply suitable national and international standards of TCP/IP and OSI to design, build, operate, inspect and maintain computer networks and services

This course supports student outcomes by developing:

	Outcomes	Selected
1.	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2.	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✓
3.	An ability to communicate effectively with a range of audiences.	✓
4.	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5.	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6.	An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	
7.	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Network Layers
- TCP / IP Network Protocol
- Routing Protocols
- Network Design
- Network Management
- Congestion, Examples of LAN's and WAN's
- High Speed Networks
- Other Network Protocols.

1. Course Number and Name

ELC 251 – Modeling & simulation of engineering systems

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Elksas, Mohamed

4. Textbook and Supplemental Materials

- Shali Endra jain, Modeling and simulation using matlab _simulink, Wiley, 1st. Ed., 2013
- Online (Classroom & WhatsApp Group)

5. Course Information

Catalog Description: Introduction Mathematical modeling for systems; transfer function and impulse response function; Modeling of mechanical, electrical, Modeling in state space; State - space representation of scalar differential equation systems; State - space representation of transfer function systems.

Prerequisites: BAS 111. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Development** learning specially the self-learning to try to understand the material more to deal with different systems.
- **Select** suitable concepts of digital systems for modeling and analyzing discipline problems.
- **Formulate** suitable mathematical and computational methods to solve problems using Laplace transform.
- **Analyze** system models usin Matlab in team works.
- **Model** appropriate specifications for required mechanical, electrical, fluid and thermal systems.
- **Respect** all alternative solutions in modeling various systems depending on knowledge and experience after analyzing.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	✓
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	✓

7. List of Topics

The major topics covered in this course are:

- Revision on Laplace Transform and inverse Laplace.
- Revision on Partial Fraction.
- Types of engineering systems.
- Transfer Function.
- MATLAB Programmng.
- Block Diagram.
- Time Response.

1. Course Number and Name

ELP 181– Energy conversion

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Azmy, Ahmed & El-Saed, Gamal El-Deen

4. Textbook and Supplemental Materials

- D . Yogi goswami, Energy Conversion, New York, CRC PRESS, 2007
- G. Rizzoni, Electrical Engineering, New Delhi, McGraw-Hill, 2007.

5. Course Information

Catalog Description: Fundamentals of energy conversion, Photovoltaic Energy Conversion, Energy Conversion in Fuel Cells, Fuel and Combustion, Electric Traction Systems, Illumination Engineering, Thermoelectric Power Generation, Thermo Ionic Power Generation, Electro Ionic Power Generation, Electromechanical Power Generation, Nuclear Power Generation, Hydroelectric power generation, Environmental Effects of Energy Resources.

Prerequisites: BAS 022, ELP 112. **Co-requisites:** None. **Pre or Corequisites:** None.
Type of Course: Required.

6. Course Objectives and Outcomes:

Students who successfully complete this course will be able to:

- **Identify** the principles of energy conversion.
- **Analyze** different renewable energy resources as energy generation.
- **Discuss** the residential interior lighting calculations.
- **Assessment** the environmental impacts of energy resources.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✓
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Fundamentals of Energy conversion.
- Photovoltaic Energy Conversion.
- Energy Conversion in Fuel Cells.
- Electric Traction Systems.
- Illumination Engineering.
- Fuel and Combustion.
- Thermoelectric Power Generation.
- Magneto Hydrodynamic Power Generation.
- Thermo-ionic Power Generation.
- Electro Ionic Power Generation.
- Electromechanical Power Generation.
- Hydro electrical power generation,
- Nuclear Power Generation.
- Environmental Effects of Energy Resources.

1. Course Number and Name

ELE 222 – Electronic Devices

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Mohammed, Warda.

4. Textbook and Supplemental Materials

- Albert Paul Malvino, David J. Bates, Patrick E. Hoppe, Electronic Principles, 9th Edition, 2020
- Boylestad al, Electronic devices and circuit theory, Pearson, 2014.
- D.A. Neama, Semiconductor Physics and Devices, McGraw Hill, 4th. Ed., 2011.

5. Course Information

Catalog Description: The course will cover the fundamentals of basic electronic circuits and key components: their device characteristics, mathematical modeling and representation and behavioral patterns as well as the extension of the circuit analysis techniques. Provide an overview about PN junction semiconductor and demonstrate the construction of Bipolar Junction Transistor and Field effect transistor. Analyze and investigate electronic elements using different methods.

Prerequisites: ELP 114. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- Identify and demonstrate the construction and operation of BJT, FET, and illustrating logic families based on BJT operations.
- Perform and analyze DC and small signal AC biasing BJT models.
- Apply and Analyze DC and small signal AC biasing FET models
- Select appropriate solutions for engineering problems based on analytical thinking.
- Assess effectively the characteristics and performance of components, systems and processes.
- Demonstrate the ability to conduct experiments related to electronic circuits, and discuss the results in written form.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✔
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- PN Junction diode, Special diode, diode circuits applications, rectifiers and peak detector
- Bipolar Junction Transistor, dc models, modes of operation, bias and stabilization, graphical analysis, small signal analysis
- Junction Field effect transistors (JFETs)
- Metal oxide semiconductors field effect transistors (MOSFET), DC models, modes of operation, bias and stabilization, small signal ac models, Amplifier configurations
- Logic circuits: BJT logic families construction, properties, speed and application

1. Course Number and Name

ELE 221 – Digital & Logic Circuits

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Ibrahim., Hegazi

4. Textbook and Supplemental Materials

- Alan B. Markowitz, Introduction to logic Design, McGraw-Hill, Boston 3rd Ed., 2010.

5. Course Information

Catalog Description: Study computer hardware in order to use techniques, skills, and appropriate engineering tools, necessary for computer engineering practice and project management. As well as, design digital and analog, coding and decoding computerized systems.

Prerequisites: ELP 113 **Co-requisites:** None. **Pre or Co-requisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Select** the appropriate solutions for logic circuits and operations problems.
- **Demonstrate** and **analyze** appropriate computational methods for digital and logic circuits' problems.
- **Design and implement** the digital and logic systems design to improve the performance of design digital circuits
- **Design, construct, operate, control and deal** with the digital circuits' hardware, software, operating systems and interfacing through multi-discipline team**.**
- **Conduct** logic circuit's experimentations based on the available lab tools.
- **Present** different projects related to the digital and logical circuits.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	✓
3. An ability to communicate effectively with a range of audiences	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	✓
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Numbering Systems
- Complements
- Decimal Codes
- Binary Logic and Boolean Algebra
- Canonical forms
- Simplification
- Karnaugh Map
- MSI
- Subtractors& Multipliers
- Decoders & Encoders
- Multiplexers

1. Course Number and Name

ELE 271 – Signal Analysis

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Ibrahim, Rehab & Abd El-Kader, Shimaa.

4. Textbook and Supplemental Materials

- Alan V.Oppenheim, signals &systems, Prentice Hall, USA,2nd Ed.,1983
- Dr. Sanjay sharma, signals and systems, S.K. Kataria &Sons, New Delhi, 9th Ed., 2019.
- Nadder Hamdy, Applied signal Processing, CBC Press, New York,1st Ed.,2009
- M. j. Robert, signals and systems, McGraw-Hill, New Delhi, 1st Ed., 2018.
- https://www.edx.org/course/signals-and-systems-part-1?index=product_value_experiment_a&queryID=f8925218053adba18e1cf917849e7edd&position=1

5. Course Information

Catalog Description: Introduction to Signals and systems and their properities .also, Linear Time Invariant Systems: continuous - time and discrete - time convolution, system properties. Fourier series representation of periodic signals: continuous - time and discrete - time. Continuous - time and discrete - time Fourier transforms and their properties. Frequency response of LTI systems.

Prerequisites: ELP 114. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Illustrate and use** different types of signals and systems using integration and power series principles.
- **Describe and utilize** basic signal properties in system design
- **Differentiate** between continuous time and discrete time LTI systems using Laplace and Z Transform
- **Explain and Evaluate** LTI system properties using integration theorems
- **Analyze and Model** continuous and discrete signals using Fourier transform
- **Use MATLAB software** to measure the performance of systems

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✔
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Introduction to signals and systems.
- Basic system properties
- Linear time-invariant systems.
- Laplace Transform
- Z Transform
- Fourier series representation of periodic signals:
- Properties of Fourier transform. & Frequency response of LTI systems.

1. Course Number and Name

ELP 141 – Electromagnetic fields

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Ibrahim, Hegazi

4. Textbook and Supplemental Materials

- U. S. Inan, A.Inan, and R. Said, Engineering Electromagnetics and Waves, 2nd edition, 2015.
- Salam, Md. Abdus, "Electromagnetic Field Theories for Engineering", Springer Singapore, 2014.
- R. Murugeshan, Electric and magnetism, S.Chand &company, 2013.

5. Course Information

Catalog Description: Introduction electromagnetic fields
Prerequisites: BAS 022, BAS 012. **Corequisites:** None. **Pre or Corequisites:** None.
Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Solve** mathematical and computational methods used in electromagnetic fields as vector analysis and transformation.
- **Demonstrate** the knowledge of physics to define the physical meaning of electromagnetic waves how to generate, propagate and its characteristics through integration theorems.
- **Illustrate** the electric and magnetic fields law's through presenting the major differences between both of two fields through group reports
- **Outlines design** methods by applying Laplace equations for capacitance and conductance.
- **Categorize** the different parameters of electromagnetic fields such as Electric Field Intensity, Electric flux density, and Current density, and magnetic field intensity using both gauss and Ampere law using principles of double and triple integrations, also verifying divergence theory to evaluate the electric charge.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	✔
3. An ability to communicate effectively with a range of audiences	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

7. List of Topics

The major topics covered in this course are:

- Vector Analysis,
- Coordinate Systems and Transformation
- Coulomb's Law, Electric Field Intensity due to line charge, ring and sheet of charge, Streamlines and Sketches of Fields, and Electric flux density
- Gauss Law and Applications, Maxwell's First Equation, Divergence Operator, Energy and Potential, Line Integration, Potential Gradient, Electric Dipole, Energy density in Electrostatic Fields.
- Applications of Electrostatics, Conductors, Dielectrics and Semiconductors Properties, Current density and Continuity of current, Boundary conditions, Method of Images, Capacitance, Capacitance of Two - Wire Line.
- Poisson's and Laplace's Equations
- Steady magnetic field; Biot Savart and Ampere circuital laws, Magnetic Forces, Torque, Magnetic Materials, Calculation of Self and Mutual inductance, and Time Varying Field and Maxwell.

1. Course Number and Name

291 – Field Training 1

2. Credits (Contact Hours/Week for Fall/Spring Semester)

1 (14)

3. Course Coordinator

Academic Supervisors

4. Textbook and Supplemental Materials

- Handouts and World Wide Web.

5. Course Information

Catalog Description: The purpose of this course is to help students to work successfully in the outside community and work environment, also this course introduces description of practical communication and electronics engineering problems, solution for real engineering problems, data interpretation and utilization, adaptation to write technical report.

Prerequisites: None. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Describe** practical electrical engineering problems
- **Reproduce** solution for real electrical engineering problem
- **Analyze** and Interpret data, and use engineering judgment to draw conclusions
- **Use** project management techniques to electrical systems
- **Show** the ability to work independently as a part of a team
- **Demonstrate** the ability to recognize ethical and professional responsibilities of electrical engineers
- **Operate** effectively with a range of audiences

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
3. An ability to communicate effectively with a range of audiences	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	✓
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	✓
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

7. List of Topics

The major topics covered in this course are:

- The major topics covered in this course are various in the field of electronics and communication engineering.

8. Topics Plan

List of Topics	No. of Weeks	Contact Hours
Joining Notification / Attendance Form and Weekly evaluation	1	Full Time
Attendance Form and Weekly evaluation	2	Full Time
Summer Training Follow - up Report # (1) / Attendance Form and Weekly evaluation	3	Full Time
Attendance Form and Weekly evaluation	4	Full Time
Report on student progress / Attendance Form and Weekly evaluation	5	Full Time
Attendance Form and Weekly evaluation	6	Full Time
Summer Training Follow - up Report # (2)	7	Full Time
Field Supervisor Evaluation / Attendance Form and Weekly evaluation	8	Full Time

1. Course Number and Name

ELE 321 – Electronic Circuits

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Ibrahim, Rehab

4. Textbook and Supplemental Materials

- Sedra, K. Smith, Microelectronic Circuits, Oxford Press, 8th. Ed., 2021. - R. Jaeger, T. Blalock, Microelectronic Circuit Design, McGraw Hill, 6th. Ed., 2022 .
- P. Grey, P. Hurst, S. Lewis, R. Meyer, Analysis and Design of Analog Integrated - Circuits, J.Wiley and Sons, 6th. Ed., 2017.
- Boylestad al, Electronic Devices and circuit theory, Person, 2014. - Charles A.Schuler
- Electronics Principles &Applications, McGraw-Hill, 2013.

5. Course Information

Catalog Description: Introduction to signals, Noise and Operational amplifiers. applying mathematical and computational methods for single stage BJT amplifiers, CE, CB, CC. MOS transistor single stage amplifiers.
Prerequisites: ELE 222. **Corequisites:** None. **Pre or Corequisites:** None.
Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Utilize** electric circuit's theory and measurement principles for BJT electronic components and processing.
- **Demonstrate** appropriate mathematical and computational methods for Single stage BJT & MOS amplifiers analyzing problems.
- **Select** all alternative solutions; changes in original plan of the electrical projects, differences in design methodologies of BJT & MOS circuits.
- **Outline** appropriate specifications for Op-Amps, linear and non – linear applications and electronic devices
- **Interpret** data related to electronic circuits topics.
- **Demonstrate** the ability to conduct experiments related to electronic circuits topics, and discuss the results in written and oral form.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✔
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Introduction to sources and signals.
- Single-stage BJT amplifiers, CE, CB, CC.
- MOS transistor single-stage amplifiers.
- Differential amplifiers
- Multistage amplifiers
- Power amplifiers.

1. Course Number and Name

ELP 361 – Power Electronics

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Azmy, Ahmed

4. Textbook and Supplemental Materials

- M.M. Rashid, power electronics, circuits, devices and applications, Prentice- Hall, 3rd Ed., Pearson Copyright: 2003 ISBN: 9780 13101 1403.
- Rowan Cabrera, Electronic Devices And Circuits, ED-TECH PRESS, 2018, ISBN-13 9781788820417
- S.B. Dewan and A. Straughen , power semiconductor circuits, J. Wiley& Sons, 1975.
- https://www.tutorialspoint.com/power_electronics/index.htm

5. Course Information

Catalog Description: Power **electronics**. This course cover**s** the Power Diodes - Diode Rectifier Circuits, Thyristors (Types, Turn on, Turn off and Protection), Thyristor Commutation Techniques, GTO Thyristors, Power Transistors, Controlled Rectifier Circuits, AC Voltage Controllers, Choppers, Inverters, UPS, Static Switches systems**,** cap**a**citances – Energy.

Prerequisites: ELE 222. **Corequisites**: None. **Pre or Corequisites**: None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Identify** general information about power diodes, diode rectifier Circuits, and thyristors.
- **Discuss** all alternative solutions in design**ing** electronic systems depending on knowledge and experience.
- **Implement** diodes and thyristors circuits for specific systems through teamwork reports.
- **Integrate** controllers, choppers, inverters, and switches for designing stable systems via lab Teams.
- **Conduct** different experiments to evaluate power electronics systems and performance.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✔
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Power Diodes
- Diode Rectifier Circuits
- Thyristors (Types, turn on, Turn off and Protection), Thyristor Commutation Techniques, GTO Thyristors.
- Power Transistors, Controlled Rectifier Circuits
- AC Voltage Controllers.
- Choppers,
- Inverters,
- UPS,
- Static Switches.

1. Course Number and Name

ELP 241– Electrical Machines & Transformers

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinators

Eid, Mohamed & El-Saed, Gamal El-Deen

4. Textbook and Supplemental Materials

- Bhag S.Guru, Electric machinery and transformers, New Delhi, Oxford, 2013.
- P.C.Sen, Principles of electric machines and power electronics, New Delhi, Wily, 2005.
- S. Ghosh, Electrical Machines. Pearson Education India, 2012.
- B.L. Theraja and A.K. Theraja, "Electrical Technology" Shanda & Company LTD, RamNagar New Delhi-110 055, Twenty Fourth Edition 2005; Multicolor Edition 2005, Reprint 2013.

5. Course Information

Catalog Description: Introduction to DC generators, motors and transformers
Prerequisites: ELP 141, 113. **Corequisites:** None. **Pre or Corequisites:** None.
Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Define** suitable concepts of electrical machines modelling for different types of DC machines and transformers.
- **Identify** suitable equivalent circuits for analyzing the performance of transformers at various operation conditions using appropriate mathematical methods.
- **Discuss** different types and application of DC machines and transformers.
- **Implement** different circuits for DC machines and transformers under different loading conditions.
- **Use** laboratory equipment for analyzing different types of DC machines and transformers circuits.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✔
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Direct Current Machines.
- Armature Winding.
- Armature Reaction and Commutation.
- Methods of Excitation.
- Characteristics of DC Generators and applications.
- Load Characteristics of DC Motors and applications.
- Speed Control of DC Motors.
- Construction of Single Phase Transformers and Equivalent Circuits.
- Determination of Transformer Parameters, Voltage Regulation, Efficiency.
- Autotransformers.
- Poly - phase Transformers and Their Connections.

1. Course Number and Name

ELE 241 – Microprocessors & Applications

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Elksasy, Mohamed

4. Textbook and Supplemental Materials

- Muhammed Ali Mazidi, the 8086 ibm PC and Compatible computers, Pearson, 1st Ed., 2003

5. Course Information

Catalog Description: The purpose of this course is present an overview of Microprocessor architecture, this course **describes** a definition of Microprocessor.

Prerequisites: ELE 221. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Design** suitable microcomputer for required digital devices.
- **Analyze** the digital systems for specific discipline.
- **Integrate** between software and hardware to increase system performance.
- **Use** suitable methods to evaluate system performance.
- **Apply** suitable national and international standards for systems design.
- **Respect** all alternative solutions for various systems depending on knowledge and experience.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✓
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	✓

7. List of Topics

The major topics covered in this course are:

- Introduction and historical review about microprocessors.
- Computer architecture.
- Difference between microprocessor and microcontroller.
- Definition of a CPU The 8 bits CPU.
- Assembly language for the used processor.
- Different busses of the microprocessor and the function and properties of each.
- Addressing modes.
- Interfacing with memory.
- Interfacing with input and output ports.
- Developing a simple microcomputer using an 8 bit CPU the 16 bit CPU Interfacing with memory and input and output ports.
- Assembly language of the 8086 CPU Architecture of the 80186, 80286, 80386, 80486, and Pentium microprocessors.
- Interrupts, Direct Memory Access, Cache memory, Register file.

1. Course Number and Name

ELE 322 – Electronics Engineering

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Ibrahim, Rehab

4. Textbook and Supplemental Materials

- Nilson Riedel, Electronic Circuits, Person, 9th Ed., 2011.
- Adel S. Sedra &smith, Microlelectronic circuits, Oxford, New York, 6th Ed., 2011.
- Boylestad al, Electronic Devices and circuit theory, Person, New Delhi,1st Ed., 2011
- Dharma Raj Cheruku, Electronic devices and circuit, Pearson, Delhi,1st Ed., 2008
- Thomas L.Floyd, Electronics fundamentals, Pearson, New Jersey,8th Ed., 2010

5. Course Information

Catalog Description: Small geometry effects in MOSFETs. BJT and MOS analog multipliers - Oscillators and waveform shaping - linear oscillators, MOS - Filters - feedback amplifiers - Voltage references - Phase locked loops.
Prerequisites: ELE 222. **Corequisites:** None. **Pre or Corequisites**: None.
Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Illustrate and Explain** Small geometry effects in MOSFET.
- **Demonstrate and Compare** BJT and MOS analog multipliers.
- **Illustrate and design** oscillators, MOS-C continuous-time filters, and Switched-C filters
- **Model** the appropriate specifications of various feedback and amplification systems.
- **Explain** and Use amplifiers and phase-locked loops in system design
- **Apply** suitable international standards and data sheets of components to design, operate and maintain oscillators and filtering equipment, systems, and services.
- **Conduct** appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions of feedback, oscillators, and filter circuits

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✔
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✔
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Introduction to MOSFET.
- MOSFET design considerations.
- BJT and MOS analog multipliers.
- Feedback circuits.
- Oscillators.
- Types of oscillators.
- Filters.
- Phase locked loops.

1. Course Number and Name

ELE 361 – Electrical Communications.

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Sakr, Hesham & Abd El-Kader Shimaa

4. Textbook and Supplemental Materials

- Simon Haykin, Communication Systems, John Wiley & Sons, Inc., 4th. Ed., 2001.
- Leon W. Couch, Digital and Analog Communication Systems, Prentice Hall, 6th. Ed., 2001.
- Leon W.Couch, Digital and Analog Communication Systems, Prentice Hall, 7th. Ed., 2001.

5. Course Information

Catalog Description: Introduction to communication system element and basic of digital communication. An overview of current communication systems, Communication channels properties,basics of analog communication: amplitude, angle, frequency and analog pulse modulation; frequency division multiplexing. Basics of digital communication: sampling, quantization, pulse code modulation, Delta Modulation, Differential PCM, time division multiplexing, binary signal formats.

Prerequisites: ELE 271. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Select** appropriate solutions based on analytical thinking for solving problems related to signal analysis and modulation techniques.
- **Apply** appropriate mathematical and computational methods for modeling and analyzing problems that they can inform design modern communication systems.
- **Design** analoge communication systems based on fourier analysis and principles.
- **Demonstrate** professional competence in and appropriate solutions of modern communication systems.
- **Analyze** the performance of analog communication systems by systems parameters as bandwidth – signal power – carrier frequency.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✓
3. An ability to communicate effectively with a range of audiences.	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Introduction to Communication system elements.
- Communications Channels Prosperities.
- Basics of analog communication: amplitude, angle, frequency.
- Division Multiplexing Techniques (TDM – FDM).
- Basics of Digital Communication: Sampling.
- Basics of Digital Communication: Quantization.

1. Course Number and Name

ELP 321– Electrical Power

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Eid, Mohamed

4. Textbook and Supplemental Materials

- Leonard L. Grigsby, Power systems, New York, CRC PRESS, 2007.
- Glover sarma, Power system analysis & design, Boston, Pws,1994.
- Bobert a.chipman,Theory and problems of transmission lines, New York, Schaum,s, 1986.
- B.L. Theraja and A.K. Theraja, "Electrical Technology" Shanda & Company LTD, RamNagar New Delhi-110 055, Twenty Fourth Edition 2005; Multicolor Edition 2005, Reprint 2013.
- Mehta V.K. & Mehta Rohit, Principles of Power System, S. Chand Publishing, 2022.

5. Course Information

Catalog Description: Introduction to Power System Components, Loads' characteristics Overhead Lines (modeling, Corona, Sag), Underground Cables, grounding systems, power factor improvement.

Prerequisites: ELP 241. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Identify** the basics of the power system.
- **Analyze** the models of Overhead Lines, Underground Cables.
- **Define** different issues related to Power Systems operation.
- **Present** teamwork report for different topics about power systems.
- **Use** laboratory equipment for analyzing performance of power systems.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✓
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Power System Components.
- Loads' characteristics.
- Load Power Factor Correction.
- Overhead Lines.
- Underground Cables (Construction, Types, Electric Stress Distribution, Fault Location).
- Power Transformers.
- Steady State Performance of Transmission Lines.
- HVDC Transmission.
- Traveling Waves.
- Transient Over – voltages.
- Corona, Radio and Audible Noise Effects of Corona on Power Lines.
- Mechanical Design of Transmission Lines.
- Distribution systems.
- Grounding of Power Systems.
- Role of Communication and Computers in Power Systems.

1. Course Number and Name

ELC 361 Automatic Control Systems

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Elksas, Mohamed

4. Textbook and Supplemental Materials

- Benjamin C. Kua, Automatic Control systems, Wiley, 4th Ed., 2003

5. Course Information

Catalog Description: Transient and steady state response analysis of continuous time feedback control systems; Routh's stability criterion; Error analysis of stable control systems; Effects of integral and derivative control action; Control systems analysis and design by root locus method; PID controllers; Control systems analysis and design by frequency response method; Bode Diagrams; Relative stability analysis; Lead, Lag, Lag - Lead compensation.

Prerequisites: ELC 251. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Select** suitable concepts of digital systems for modeling and analyzing discipline problems.
- **Use** appropriate mathematical and computational methods to solve problems.
- **Integrate** between software and hardware to increase system performance in team works.
- **Model** appropriate specifications for required mechanical, electrical, fluid and thermal systems.
- **Implement** the designed stable control systems using appropriate tools.
- **Respect** all alternative solutions in design control systems depending on knowledge and experience after analyzing through self-learning skills.
- **Evaluate** the suitability of control systems for required applications to acquire new knowledge to all students

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✔
3. An ability to communicate effectively with a range of audiences.	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✔
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	✔

7. List of Topics

The major topics covered in this course are:

- Revision on Laplace Transform and inverse Laplace.
- Revision on Partial Fraction.
- Types of engineering systems.
- Transfer Function.
- Block Diagram.
- Time Response.

1. Course Number and Name

391 – Field Training 2

2. Credits (Contact Hours/Week for Fall/Spring Semester)

1 (14)

3. Course Coordinator

Academic and Field Supervisors

4. Textbook and Supplemental Materials

Handouts and supported training Materials from the field supervisor

5. Course Information

Catalog Description: The purpose of this course is to help students to work successfully in the outside community and work environment, also this course introduces description of practical communication and electronics engineering problems, solution for real engineering problems, data interpretation and utilization, adaptation to write technical report.

Prerequisites: None. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Describe** practical electrical engineering problems
- **Reproduce** solution for real electrical engineering problem
- **Analyze** and Interpret data, and use engineering judgment to draw conclusions
- **Use** project management techniques to electrical systems
- **Show** the ability to work independently as a part of a team
- **Demonstrate** the ability to recognize ethical and professional responsibilities of electrical engineers
- **Operate** effectively with a range of audiences

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	✓
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✓
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

- The major topics covered in this course are various in the field of electronics and communication engineering.

8. Topics Plan

List of Topics	No. of Weeks	Contact Hours
Joining Notification / Attendance Form and Weekly evaluation	1	Full Time
Attendance Form and Weekly evaluation	2	Full Time
Summer Training Follow - up Report # (1) / Attendance Form and Weekly evaluation	3	Full Time
Attendance Form and Weekly evaluation	4	Full Time
Report on student progress / Attendance Form and Weekly evaluation	5	Full Time
Attendance Form and Weekly evaluation	6	Full Time
Summer Training Follow - up Report # (2)	7	Full Time
Field Supervisor Evaluation / Attendance Form and Weekly evaluation	8	Full Time

1. Course Number and Name

ELE461 – Antenna & Wave Propagation

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Ibrahim, Hegazi

4. Textbook and Supplemental Materials

- Simon Saunders, Alejandro Aragón - Zavala, Antennas and Propagation for Wireless Communication Systems, John Wiley & Sons, Inc, 2nd. Ed., 2007.
- Antenna Theory: Analysis and Design, 4th Edition,2016
- Sklar, Digital Communications: Fundamentals and Applications, Prentice Hall, 2nd. Ed., 2001.

5. Course Information

Catalog Description: Identify properties of electromagnetic waves: Maxwell's equations, Plane waves, Polarization. Propagation mechanisms: reflection, transmission and refraction, scattering, diffraction. Antenna fundamentals: antenna parameters, dipoles, arrays.

Prerequisites: ELP 141. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Compulsory.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Describe** important features of an antenna system.
- **Calculate** important antenna properties such as Radiation Power Density, Intensity, Beam width, directivity, Efficiency, Gain, Bandwidth, Polarization, PLF, Input impedance, Radiation efficiency, Effective Area, total received power
- **Analyze** various types of antennas including dipole, loop, arrays, etc
- **Evaluate** effects of different media on wave propagation and on antenna communication system.
- **Interpret** data related to wave propagation and antenna radiation pattern.
- **Demonstrate** the ability to conduct experiments related to wave propagation & antennas, and discuss the results in written and oral form.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✔
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Introduction to electromagnetic waves.
- Properties of electromagnetic waves: Maxwell's equations.
- Plane waves, Polarization.
- Propagation mechanisms: reflection, transmission.
- Refraction, scattering, diffraction.
- Antenna fundamentals: antenna parameters, dipoles, arrays.
- Loop antennas, helical antennas, patch antennas.
- Propagation models: path loss, free space loss, plan earth loss, link budget.
- Fading and shadowing.

1. Course Number and Name

ELE 471 Digital Signal Processing

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42)

3. Course Coordinator

Ibrahim, Rehab & Abd El-Kader, Shimaa

4. Textbook and Supplemental Materials

- James .H McClellan, DSP First, Person, 2017.
- Oppenheim and R. Schafer, Discrete - Time Signal Processing, Pearson, 3rd. Ed., 2014.
- S. Palani, Digital signal processing, Ane Books, 2010.
- John R. Buck, Computer Explorations in Signals and Systems Using MATLAB, Prentice Hall, 2nd. Ed., 2002.

5. Course Information

Catalog Description: Analysis and discuss for the basics of discrete signals and the transformations for signals in different domains and design analog and digital filters to meet the required needs within realistic constrains.
Prerequisites: ELE 271. **Corequisites:** None. **Pre or Corequisites:** None.
Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Apply** suitable methods for analyzing and modeling signals using Z – transform.
- **Analyze** signals using LTI systems.
- **Differentiate** between IIR and FIR.
- **Illustrate and Design** different filter techniques.
- **Model DFT** by using appropriate mathematical and computational methods
- **Use MATLAB** software to measure the performance under specific input.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✓
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Continuous and discrete signals.
- Z-transforms.
- Inverse Z-transform.
- Linear time-invariant systems.
- Analysis of response and stability.
- Digital filter design: FIR, IIR filters.
- Discrete-time Fourier transform.

1. Course Number and Name

ELE 462– Digital Communication Systems

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3(42) – Fall Semester

3. Course Coordinator

Mohammed, Warda

4. Textbook and Supplemental Materials

- Simon Haykin, Communication Systems, John Wiley & Sons, Inc., 5th. Ed., 2009.
- Sklar, Digital Communications: Fundamentals and Applications, Prentice Hall, 2nd. Ed., 2001.

5. Course Information

Catalog Description: The purpose of the course is to give students a comprehensive introduction to digital communication principles. The major part of the course is devoted to studying how to translate information into a digital signal to be transmitted, and how to retrieve the information back from the received signal in the presence of noise and inter-symbol interference (ISI). Various digital modulation schemes are discussed through the concept of signal space. Analytical models for digital modulation systems are designed and implemented in the presence of noise and ISI.

Prerequisites: ELE 361. **Corequisites:** None. **Pre or Corequisites:** None.
Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Demonstrate, Analyze,** and **discuss** principal features of digital communication systems.
- **Create** Presentations in some of the titles in the course by students.
- **Apply** suitable national and international standards of information theory, digital modulation and carrier modulation OFDM.
- **Discuss** different topics related to digital communication system
- **Implement** the designed communication system using laboratory equipment.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	✔
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✔
6. An ability to develop and conduct appropriate experimentation, analyses and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Baseband pulse transmission: Matched Filter and ISI.
- AWGN.
- Probability of Error for different Modulation Schemes.
- Spread - Spectrum Modulation.
- Multi - Carrier Modulation: OFDM.
- Information theory Fundamentals.

1. Course Number and Name

ELE 411 Integrated Circuits Design

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Mohammed, Warda

4. Textbook and Supplemental Materials

- S. Kang, Y. Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, McGraw, 4th Ed, 2014.
- N. H. E. Weste and D. Harris, CMOS VLSI Design: A circuit and Systems Prespective, Addison-Wesley, 3rd. Ed., 2004.
- J. M. Rabaey, A. Chandrakasan, B. Nikolic, Digital Integrated Circuits, Prentice hall, 2nd . Ed., 2003.

5. Course Information

Catalog Description: this course introduces an overview about integrated circuits methodologies and digital integrated circuits implementation methodologies. Also, an overview of CMOS technology, simple and extended circuit models for NMOS and PMOS transistors, combinatorial and sequential logic circuits including transistor level design of logic gates, the interconnect wire models and its parasitic effect. also tells about commonly used design methodology and process of digital ICs, focusing on the analysis and design optimization in aspects of circuit structure, speed and power for various circuit types of basic digital IC units.
Prerequisites: ELE 321. **Corequisites:** None. **Pre or Corequisites:** None.
Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Describe and discuss** important features of an integrated circuit and study of various types of digital MOSFET switches.
- **Demonstrate and explain** different design rules, noise margins, dynamic behaviors of digital MOSFET inverters
- **Implement** logic gate circuits using different types of digital MOSFET inverters.
- **Present** and discuss different scenarios related to the latest topics on integrated circuits.
- **Apply** national and international standard for CMOS fabrication and layout.
- **Communicate** with team members to establish the integrated circuit project.
- **Conduct** experiments related to integrated circuits, and discuss the results.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✔
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	✔
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✔
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✔
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Integrated circuits trends methodologies
- digital integrated circuits implementation methodologies
- MOS inverters, inverters switching characteristics
- MOS logic gates circuits
- Clocking and timing interconnects issues.
- power dissipation in digital circuits
- Memories and array circuits
- low power design, packaging
- power and I/O issues
- Testing and design for testability methodologies and tools& Full custom IC design project.

1. Course Number and Name

ELE 463 Mobile Communications

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Sakr, Hesham

4. Textbook and Supplemental Materials

- Dr. Sanjay sharma, Mobile &Wireless Communication, S.K.Kataria &Sons, New Delhi,1st Ed., 2012.
- Simon Haykin, Communication Systems, John Wiley & Sons, Inc., 4th. Ed., 2001.
- Dr. Sanjay sharma, Wireless Communication systems, S.K.Kataria &Sons, New Delhi, 2nd Ed., 2012.
- Vijay K.garg, Wireless Communications and Networking, ELSEVIER, New York,1st Ed., 2007.
- Andreas F. Molisch, Wireless Communications, John Wily, USA, 2nd Ed., 2011.

5. Course Information

Catalog Description: Principles of wireless communications: basic concepts of cellular communications. Wireless communications System capacity. Mobile Propagation: multipath interference, small and large scale fading, Doppler shift and spread, empirical models for path loss.

Prerequisites: ELE 361. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- Identify the different ways for signal processing with knowledge and experience to success communicate
- Demonstrate the efficiency for the whole communication system
- Design appropriate specifications for the cellular system and appropriate tools to measure system performance
- Determine parameters for community design into GSM and CDMA systems
- Outline national and international installation codes to design CDMA, GSM systems.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✓
3. An ability to communicate effectively with a range of audiences.	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	✓
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Principles of wireless communications: basic concepts of cellular communications, Wireless communications System capacity
- Mobile Propagation: multipath interference, small and large scale fading, Doppler shift and spread, empirical models for path loss
- The GSM cellular system: architecture, Air interface, signal processing and transmission, COMA system, CDMA modulation and demodulation, CDMA air links, Link protocol, Types of codes in CDMA, and Power control in CDMA, handoff, COMA soft capacity.

1. Course Number and Name

ELC 432– Information Security

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Sakr, Hesham.

4. Textbook and Supplemental Materials

- Mark Stamp, Information Security: Principles and Practice, Wiley, USA ,2011.

5. Course Information

Catalog Description: This course begins with an overview of information security and its evolution. Course introduces the core goals of information security, the CIA triad. Some common information security terms, processes and techniques used in the information security industry. Types of attacks and mitigation techniques which are used for securing systems such as encryption, firewalls, VPN , access lists and hashing are introduced in this course .

Prerequisites: ELC 331 and ELC 221. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Elective.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Explain** different information security systems to its major components.
- **Identify** and **Analyze** the principles suitability of information systems and securing techniques.
- **Describe** Usage of codes and protocols of encryption to construct well secured systems.
- **Use** suitable national and international standards of encryption to: design, build, operate, inspect and maintain information security services.
- **Represent** and **discuss** Model for appropriate specifications for required information systems.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✓
3. An ability to communicate effectively with a range of audiences.	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Symmetric encryption and decryption.
- Asymmetric encryption and decryption
- Firewall types
- DMZ.
- VPN.
- Access list types.
- VPN security protocols.
- Attack types.

1. Course Number and Name

ELE453 – Microwave Engineering.

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Ibrahim, Hegazi

4. Textbook and Supplemental Materials

- David M.Pozar, Microwave Engineering, John Wily, 2005.
- Annapurna Das, Microwave Engineering, tata Mcgraw Hill, 2009.
- R.E.Collin, Foundations for Microwave Engineering, Willey Interscience, 2001
- www.ekb.eg

5. Course Information

Catalog Description: Introduce an overview about the fundamentals of microwave engineering principles, and identifying microwave network analyses with its principles and concepts. discuss the sources of errors in measurements, also this course justifies the wave structures, TEM waves, Phase Velocity, and Transmission Line Matching Networks.

Prerequisites: ELP141. **Corequisites:** None. **Pre or Corequisites:** None

Type of Course: Elective B.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Identify** the components of wave structure and TEM waves.
- **Recognize** the types of transmission line matching networks.
- **Design** TE and TM modes of rectangular waveguide.
- **Analysis** performance considerations to demonstrate the efficiency of transmission line networks and waveguides.
- **Acquire** suitable knowledge based on the recent technologies and applications related with microwave engineering circuits and systems.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✓
3. An ability to communicate effectively with a range of audiences.	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	✓

7. List of Topics

The major topics covered in this course are:

- Introduction to guided wave structures.
- TEM waves in parallel plate transmission lines.
- Phase Velocity, group velocity, and dispersion.
- General transmission line equations: transmission line parameters, terminated transmission lines and standing wave ratio.
- The Smith Chart
- Transmission line matching networks.
- Waveguides

1. Course Number and Name

ELE454 – RADAR Systems

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Fall Semester

3. Course Coordinator

Ibrahim, Hegazi

4. Textbook and Supplemental Materials

- Principles of Modern Radar: Basic Principles, Richards, M.A. et al, 1st Edition, 2010

5. Course Information

Catalog Description: Introduces the fundamentals of radar such as the main concepts and techniques used in modern radar systems. The class is a survey course exposing students to a wide range of radar applications and design issues.
Prerequisites: ELP 141. **Corequisites:** None. **Pre or Corequisites:** None.
Type of Course: Elective.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Describe** important features of an antenna system.
- **Calculate** important RADAR antenna specifications and range.
- **Analyze** various types of RADAR categories
- **Design** RADAR, S-parameters, Z-parameters, Antenna Array, and Planner Antenna Arrays
- **Acquire and apply** new knowledge using appropriate learning mechanisms in RADAR applications.

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✔
3. An ability to communicate effectively with a range of audiences.	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	✔

7. List of Topics

The major topics covered in this course are:

- History and background of Radar
- The radar equation, detection and clutter
- MTI and pulse Doppler radar
- Pulse compression and waveform design
- CW and FM radar
- Tracking radar
- Radar antennas and arrays
- Synthetic aperture radar (SAR)

1. Course Number and Name

ELE 465 – Optical Communications.

2. Credits (Contact Hours/Week for Fall/Spring Semester)

3 (42) – Spring Semester

3. Course Coordinator

Ibrahim, Hegazi

4. Textbook and Supplemental Materials

- John m. senior, optical fiber communications Principles and practice, prentice Hall ,3th Ed., 2009

5. Course Information

Catalog Description: **Optical Communications** This course covers Components of optical fiber communication systems and its features. Optical fiber cables: types of cables and transmission characteristics. Signal attenuation and link budget calculations. Dispersion over optical fiber cables and limitations of transmission rates. Optical sources: light emitting diodes and laser diodes. Optical signal detectors. Receiver analysis, noise and limitations. Optical fiber communication standards: synchronous digital hierarchy. Wavelength division multiplexing systems capacitances – Energy**.**

Prerequisites: ELE 361. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Elective.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Understand** the light propagation and the physics of optical fiber.
- **Describe** the construction and working of light sources and photodetectors.
- **Construct** and design point to point optical Fiber link with consideration of environmental and economic factors.
- **Analyze** and differentiate between WDM and other conventional multiplexing techniques.
- **Present** and discuss different scenarios related to the latest topics on Optical Networking
- **Conduct** Optical Fiber experimentations based on the available lab tools.
- **Present** different scenarios for measuring signal attenuation and dispersion

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✔
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✔
3. An ability to communicate effectively with a range of audiences.	✔
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✓
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

7. List of Topics

The major topics covered in this course are:

- Components of optical fiber communication systems and its features.
- Optical fiber cables.
- Signal attenuation and link budget calculations.
- Dispersion over optical fiber cables and limitations of transmission rates.
- Optical sources: light emitting diodes and laser diodes.
- Optical signal detectors. Receiver analysis, noise and limitations.
- Optical fiber communication standards: synchronous digital hierarchy.
- Wavelength division multiplexing systems.

1. Course Number and Name

ELE 491– Project #1

2. Credits (Contact Hours/Week for Fall/Spring Semester)

2 (28) – Fall Semester

3. Course Coordinator

Ibrahim, Hegazi & Sakr, Hesham & Mohamed, Warda

4. Textbook and Supplemental Materials

None

5. Course Information

Catalog Description: Analysis of collected data regarding the proposed objective. Analysis and discussion of similar projects and preparing a technical report concerning the societal analysis of the project, comparative study with similar projects, problem which proposed project will contribute in solving.

Prerequisites: None. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Identify** the objectives and milestones of the assigned project and compare it with previous related work. **[Project Understanding and Objectives]** **SO1**
- **Analyze** problem statement through detail/in depth research and literature review. **[Problem Analysis and Literature Review]** **SO1**
- Systematically gather requirements and data, combine it, and **compose** the solution to **develop/ reproduce** the components and engineering systems for advance computing problems. **[Requirement Generation and Solution Development]** **SO2**
- Apply the composed solution to **construct/design** computing systems using specific IT/engineering tools and techniques. **[Construct/Design and Implementation]** **SO6**
- **Demonstrate** a wide range of technical skills by testing and evaluating a working prototype that has passed through design and implementation phases. **[Requirement Generation and Solution Development]** **SO2**
- **Perform** necessary tasks required in the completion of research/project work as an individual or a team member. **[Attitude towards work as an individual and/or a team member]** **SO5**
- **Present** his/her research/project work in logical and well-planned way by appropriate communication and presentation skills. **[Presentation]** **SO3**
- An ability of student to **integrate** the societal and environmental effects of the project into the proposed engineering solution. **[Societal and Environmental Effects]** **SO4**
- An ability of student to compile, **write** and **present** the project work carried out in the form of a project report. **[Report Writing]** **SO7**
- An ability of a student to complete a project by **practicing** management principles including punctuality, commitment and dedication **[Project Management]** **SO5**
- An ability of the student to **identify** personal professional goals that support lifelong learning, productivity and satisfaction in large framework of rapidly evolving technology. **[Life Long Learning]** **SO7**

This course supports student outcomes by developing:

Outcomes	Selected
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	✓
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	✓
3. An ability to communicate effectively with a range of audiences.	✓
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	✓
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✓
6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	✓

7. List of Topics

The major topics covered in this course are:

- Introduction about how to create a graduation project.
- Issue statement, Project Concept & SWOT analysis.
- Analysis of collected data regarding the proposed project.
- Analysis and discussion of similar projects
- Preparing a technical report concerning the environmental and societal analysis of the proposed project.
- comparative study with similar projects
- The Project Program
- Select the appropriate technique, tools & components to implement the project.
- The final report leads to the final program of the project.

1. Course Number and Name

ELE 492– Project #2

2. Credits (Contact Hours/Week for Fall/Spring Semester)

4 (56) – Spring Semester

3. Course Coordinator

Ibrahim, Hegazi & Sakr, Hesham & Mohamed, Warda

4. Textbook and Supplemental Materials

None

5. Course Information

Catalog Description: The student will build on the technical report presented by him regarding the graduation project. He is supposed to make use of all the skills, the fundamentals, and the technical information he gained during his study. The student will utilize all this background information in his project. He should prove through his work and at oral exam, his complete understanding of the elements of the project and his capability to apply them in his future career.

Prerequisites: ELE 491. **Corequisites:** None. **Pre or Corequisites:** None.

Type of Course: Required.

6. Course Objectives and Outcomes

Students who successfully complete this course will be able to:

- **Identify** the objectives and milestones of the assigned project and compare it with previous related work. **[Project Understanding and Objectives]** **SO1**
- **Analyze** problem statement through detail/in depth research and literature review. **[Problem Analysis and Literature Review]** **SO1**
- Systematically gather requirements and data, combine it, and **compose** the solution to **develop/ reproduce** the components and engineering systems for advance computing problems. **[Requirement Generation and Solution Development]** **SO2**
- Apply the composed solution to **construct/design** computing systems using specific IT/engineering tools and techniques. **[Construct/Design and Implementation]** **SO6**
- **Demonstrate** a wide range of technical skills by testing and evaluating a working prototype that has passed through design and implementation phases. **[Requirement Generation and Solution Development]** **SO2**
- **Perform** necessary tasks required in the completion of research/project work as an individual or a team member. **[Attitude towards work as an individual and/or a team member]** **SO5**
- **Present** his/her research/project work in logical and well-planned way by appropriate communication and presentation skills. **[Presentation]** **SO3**
- An ability of student to **integrate** the societal and environmental effects of the project into the proposed engineering solution. **[Societal and Environmental Effects]** **SO4**
- An ability of student to compile, **write** and **present** the project work carried out in the form of a project report. **[Report Writing]** **SO7**
- An ability of a student to complete a project by **practicing** management principles including punctuality, commitment and dedication **[Project Management]** **SO5**
- An ability of the student to **identify** personal professional goals that support lifelong learning, productivity and satisfaction in large framework of rapidly evolving technology. **[Life Long Learning]** **SO7**

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6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	✓
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	✓

7. List of Topics

The major topics covered in this course are:

- Introduction.
- Making plans for the Graduation Project
- Choosing appropriate Hardware required for the project.
- Software
- Integration between Software and Hardware
- Studies
- Post Production