Electronics Engineering Technology

Associate in Applied Science Degree

The Electronics Engineering Technology program is a two-year career-oriented curriculum that prepares students for positions in electronics industries and related electronics service. Job activities center on technical problem-solving and the practical application of engineering.

The program educational objectives of the Electronics Engineering Technology program are to:

a. Produce graduates who are employed and operate effectively in positions that lie between those of the skilled crafts-person and those of the graduate electrical engineer.
b. Produce graduates who can successfully transfer and complete a baccalaureate degree program in Electronics Engineering Technology.

A student in the program is expected to be able to meet the following outcomes at the time of graduation:

a. an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve well-defined engineering problems appropriate to the discipline;
b. an ability to design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline;
c. an ability to apply written, oral, and graphical communication in well-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature
d. an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results; and
e. an ability to function effectively as a member of a technical team.

After obtaining an Associate in Applied Science degree, it is possible to continue at a four-year college and to complete a Bachelor of Science degree in Engineering Technology. No prior knowledge of electronics is necessary to enter the Electronics Engineering Technology program. Core electronics courses are sequenced along with applied mathematics and science to develop a broad background in the technology. Each electronics course contains a laboratory, which utilizes modern test instruments and applies classroom theory to practical applications.

In the second year of study, students interested in health-related fields may select the Biomedical Equipment option. Cooperative Education, a work-study program with local electronic firms, is available.

Articulation Agreements

An existing agreement with New Jersey Institute of Technology (NJIT) provides students with a local transfer opportunity. Students should check with the Transfer Office about the latest articulation agreements for this program both locally and nationally.

For more information, visit the Electronics Engineering Technology (https://www.ccm.edu/academics/divdep/bmet/department-of-engineering-technologies-and-engineering-science/electronics-engineering-technology/) website.

Accreditation

The Electronics Engineering Technology program and the Biomedical Equipment Option are accredited by the ETAC Accreditation Commission of ABET, https://www.abet.org (https://www.abet.org/), under the commission's General Criteria and Program Criteria for Electrical/Electronic(s) Engineering Technology and Similarly Named Programs.

Degrees

- AAS Electronics Engineering Technology (p. 1)
- AAS Electronics Engineering Technology - Biomedical Equipment Option (p. 2)

AAS Electronics Engineering Technology

(P3600)

General Education Foundation		
Communication		6
ENG-111	English Composition I	
ENG-112	English Composition II	
Math-Science-Technology		3
CMP-128	Computer Science I	
Social Science or Humanities		3
	This course must meet both the General Education and Diversity requirements.	
General Education		8
	Math Elective [1]	
General Education Foundation Credits		20
Electronics Core		
ELT-100	Circuit Analysis DC/AC	3
ELT-115	Active Circuit Components	3
ELT-110	Digital Principles	3
ELT-209	Advanced Digital and Microprocessors	4
ELT-210	Electronic Fabrication	1
ELT-213	Active Circuit Design	4
ELT-215	Industrial Electronics	4
ELT-231	Electronic Communication Systems	4
ENR-117	Computer-Aided Drafting I	2
PHY-111	Technical Physics I	4
ELT-102	Circuit Measurement and Fundamentals	1
ENR-132	Introduction to Experimentation and Design	3
PHY-112	Technical Physics II	4
Electronics Core Credits		40
Total Credits		**60**

1. Math Elective - any four credit math course except MAT-120.

AAS Biomedical Equipment

An Electronics Engineering Technology Option

(P3601)

General Education Foundation

Communication		6
ENG-111	English Composition I	
ENG-112	English Composition II	
Technology		3
CMP-128	Computer Science I	
Social Science or Humanities		3
This course must meet both the General Education and Diversity requirements.		
General Education		8
Math Elective [1]		
BIO-133	Human Biology	
General Education Foundation Credits		20
Electronics Engineering Technology Biomedical Equipment Option Core		
ELT-100	Circuit Analysis DC/AC	3
ELT-102	Circuit Measurement and Fundamentals	1
ELT-115	Active Circuit Components	3
ELT-200	Biomedical Electronics	3
ELT-209	Advanced Digital and Microprocessors	4
ELT-210	Electronic Fabrication	1
ELT-213	Active Circuit Design	4
ELT-215	Industrial Electronics	4
ELT-110	Digital Principles	3
ELT-227	Biomedical Clinical Experience [1]	3
ELT-231	Electronic Communication Systems	4
PHY-111	Technical Physics I	4
ENR-132	Introduction to Experimentation and Design	3
Electronics Engineering Technology Biomedical Equipment Option Core Credits		40
Total Credits		**60**

[1] Students placing into courses higher than pre-calculus (MAT-123) may take any four credit course except for MAT-120.
[2] Students must undergo a federal and state criminal background check and purchase professional liability insurance prior to the start of their clinical experience. A student denied clinical placement due to the results of the criminal background check will not be able to complete the program.

Certificates of Achievement

- Digital Technology - A Certificate of Achievement within Electronics Engineering Technology (p. 2)
- Basic Electronics - A Certificate of Achievement within Electronics Engineering Technology (p. 2)
- Advanced Electronics - A Certificate of Achievement within Electronics Engineering Technology (p. 2)

Digital Technology

A Certificate of Achievement within Electronics Engineering Technology

(P0629)

The Digital Technology Certificate of Achievement is designed for present or future professionals who seek to improve their technical knowledge and skills in certain areas. The certificate is balanced with theory and hands-on experience. This certificate provides a strong foundation in digital theories and applications. It's possible to complete the certificate within a year and the courses fully transfer to the Electronics Engineering Technology degree.

ELT-110	Digital Principles	3
ELT-209	Advanced Digital and Microprocessors	4
CMP-128	Computer Science I	3
TEL-110	Routing I	3
Total Credits		**13**

Basic Electronics

A Certificate of Achievement within Electronics Engineering Technology

(P0631)

The Basic Electronics Certificate of Achievement is designed for present or future professionals who seek to improve their technical knowledge and skills in certain areas. The certificate is balanced with theory and hands-on experience. This certificate provides an introduction to electronic theories and applications. It's possible to complete the certificate within a year and the courses fully transfer to the Electronics Engineering Technology degree.

MAT-110	College Algebra	3
ENR-132	Introduction to Experimentation and Design	3
ELT-115	Active Circuit Components	3
ELT-100	Circuit Analysis DC/AC	3
ELT-102	Circuit Measurement and Fundamentals	1
Total Credits		**13**

Advanced Electronics

A Certificate of Achievement within Electronics Engineering Technology

(P0637)

The Advanced Electronics Certificate of Achievement is designed for present or future professionals who seek to improve their technical knowledge and skills in certain areas. The certificate is balanced with theory and hands-on experience. This certificate provides an advanced introduction to the theories and techniques used in the analysis of electronic circuits. It is possible to complete the certificate within a year and the courses fully transfer to the Electronics Engineering Technology degree.

ELT-213	Active Circuit Design	4
ELT-215	Industrial Electronics	4
ELT-231	Electronic Communication Systems	4
Total Credits		**12**

Faculty

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Courses

ELT-100. Circuit Analysis DC/AC. 3 Credits.
LECT 30 hrs LAB 30 hrs
This course introduces the student to both DC and AC circuit theory. It includes Ohm's and Kirchoff's laws for analysis of series and parallel circuits. Computer circuit simulation of series-parallel, ladder and bridge networks in both DC and AC are analyzed. Resonance and frequency response are included along with some discussion of AC power and transformers. The laboratory experiments are designed to support the theory and obtain measurement skills.
Prerequisites: MAT-110/equivalent and ENR 119 and ENR-124 OR MAT-110/equivalent and ENR-132 OR MAT-123
Additional Fees: Course fee applies.

ELT-102. Circuit Measurement and Fundamentals. 1 Credit.
LAB 30 hrs
An introductory course in electrical circuit analysis and measurement. This course will cover topics in DC and AC circuits, as well as the instruments needed to properly characterize the behavior of these types of circuits. This course is required by the majors in the Electronics Engineering Technology and the Biomedical Equipment Options, and will serve as a supplement to material covered in the Circuit Analysis course.
Corequisites: ELT-100
Additional Fees: Course fee applies.

ELT-110. Digital Principles. 3 Credits.
LECT 30 hrs LAB 45 hrs
This course develops the fundamentals of the binary system. Circuit implementation from Boolean functions and map minimization. Course includes study of combinational logic, sequential logic circuits, flip-flops, counters and shift register. The laboratory allows the student to apply theory to practical digital circuits.
Additional Fees: Course fee applies.

ELT-115. Active Circuit Components. 3 Credits.
LECT 30 hrs LAB 60 hrs
This course introduces the behavior of semiconductor electronic devices and develops the device characteristics. Some DC and AC circuit theory is expanded upon so that the active devices can be properly analyzed. Biasing techniques and models of amplifier configurations are stressed for the bipolar transistor and field effect devices. Diodes, rectifiers, filtering and switching circuit applications are studied. Laboratory includes the verification of device characteristics and the testing of basic amplifier and switching configurations.
Prerequisites: ELT-201 OR ELT-100 AND ELT-102
Additional Fees: Course fee applies.

ELT-121. Circuit Analysis. 4 Credits.
LECT 45 hrs LAB 45 hrs
This course introduces the student to both DC and AC circuit theory. It includes Ohm's and Kirchoff's laws for analysis of series and parallel circuits. Computer circuit simulation of series-parallel, ladder and bridge networks in both DC and AC are analyzed. Resonance and frequency response are included along with some discussion of AC power and transformers. The laboratory experiments are designed to support the theory and obtain measurement skills.
Prerequisites: MAT-110 and ENR-124
Additional Fees: Course fee applies.

ELT-123. Studio Maintenance. 3 Credits.
LECT 30 hrs LAB 30 hrs
For Music Recording majors only. This course provides students an introduction to music studio electronics. Basic skills of working with electronic components are covered, including soldering, the use of electronic measuring equipment and troubleshooting procedures. Studio cabling and infrastructure are dealt with extensively. Various wiring schemes and grounding techniques are examined to give the student an understanding of the typical music studio layout found in the professional environment. This course is for Music Recording majors only and does not serve as a technical elective for the Electronics Engineering Technology major. This course is offered in the Fall semester.
Prerequisites: MUS-165
Additional Fees: Course fee applies.

ELT-200. Biomedical Electronics. 3 Credits.
LECT 45 hrs
This course is the study of the techniques and theory behind the instrumentation utilized in hospital and health-related laboratory work. Emphasis is placed on physiological signals derived from the body and the problems and safety issues associated with their measurement. Demonstrations are conducted in class.
Prerequisites: ELT-115 and ELT-201.

ELT-201. Electricity and Electronics. 4 Credits.
LECT 45 hrs LAB 45 hrs
This course is a fundamental study of electricity and electronics for Engineering Technology majors. The principles of electrical components and circuits are studied in class and laboratory. Topics include DC, AC series and parallel circuits, transformers and power supplies, solid state amplifiers and control components. The laboratory enables the student to apply the theory discussed in class and to gain some proficiency in the use of electronic measuring equipment.
Prerequisites: MAT-110 or equivalent and ENR-124
Additional Fees: Course fee applies.

ELT-209. Advanced Digital and Microprocessors. 4 Credits.
LECT 45 hrs LAB 45 hrs
This course is an extension of digital theory into the operation and interfacing of microprocessors. Major topics include sequential logic design, memory organization, microprocessor architecture, machine level programming, A/D and D/A conversion, and serial and parallel interfacing. An associated laboratory provides for hands-on microprocessor interfacing and the use of logic analyzers.
Prerequisites: ELT-110 and ENR-120 or CMP-128
Additional Fees: Course fee applies.

ELT-210. Electronic Fabrication. 1 Credit.
LAB 45 hrs
This course provides students with an opportunity to learn about the process involved in the fabrication of electronic circuit boards. Using computer-aided drafting tools, students create an electronic component layout and necessary art work for the construction of a printed circuit board. Students are introduced to project management concepts and techniques, soldering, test specifications and printed circuit board construction. A term project or a series of smaller projects enables students to manage, build and assemble a printed circuit board and develop test specifications.
Prerequisites: ENR-117
Additional Fees: Course fee applies.

ELT-213. Active Circuit Design. 4 Credits.
LECT 45 hrs LAB 45 hrs
This course covers analysis and design of solid-state amplifiers using bipolar and field effect transistors. Topics include frequency response using Bode plots and feedback analysis as applied to operational amplifiers and oscillators. Laboratory verification includes transistors, amplifiers, power amplifiers, IC operational amplifiers and oscillators.
Prerequisites: ELT-115
Additional Fees: Course fee applies.

ELT-215. Industrial Electronics. 4 Credits.
LECT 45 hrs LAB 45 hrs
This course covers operational amplifiers in linear, non-linear and active filter applications, pulse and wave-shaping techniques, power supplies and regulators, thyristor control of power and transducers. The laboratory includes experiments in design and tests to support the above topics.
Prerequisites: ELT-209 and ELT-115
Additional Fees: Course fee applies.

ELT-227. Biomedical Clinical Experience. 3 Credits.
LECT 45 hrs
This course provides the student with a 200-hour internship at a local hospital. The student assists in the maintenance and calibration of biomedical electronic equipment. The student must abide by any rules and regulations stipulated in the affiliation agreement with the partnering hospital. As a minimum, the student is required to purchase liability insurance and agree to a criminal background check.
Prerequisites: ELT-200 and permission of department chair
Additional Fees: Course fee applies.

ELT-230. Optoelectronics. 3 Credits.
LECT 30 hrs LAB 45 hrs
This course covers principles of light and linear optics characteristics of electro-optical light sources and detectors and their applications in industry, displays and communication (fiber optics). Lab experiments demonstrate electro-optical measurements and designs of typical applications of electro-optical devices.
Prerequisites: MAT-110
Additional Fees: Course fee applies.

ELT-231. Electronic Communication Systems. 4 Credits.
LECT 45 hrs LAB 45 hrs
This course covers A.M., F.M., and single side-band communication systems, including an introduction to digital transmission. Designed to familiarize the student with transmitters, receivers, modems, noise analysis, information theory, pulse modulation, sampling, coding, multiplexing and other signal processing techniques used in commercial broadcasting and data transmission systems. The course includes some coverage of transmission lines, antennas, microwaves and satellites. Includes laboratory work involving communication system components and techniques using industrial grade equipment.
Prerequisites: ELT-201 OR ELT-100 AND ELT-102
Additional Fees: Course fee applies.

ELT-239. Cooperative Work Experience Electronics Engineering Technology. 3 Credits.
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This course provides a field experience in the laboratory facilities of an industrial firm. The course is designed for students in the Electronics Engineering Technology programs to obtain industrial experience as a supplement to their college studies prior to career employment. Seminar evaluation visitations are included. Students must have completed 35 credits to enroll.
Prerequisites: Permission of department chair.

ELT-250. Solar Photovoltaic and Alternative Energy Systems. 3 Credits.
LECT 30 hrs LAB 30 hrs
Examines the scientific principles, engineering design and implementation of solar photovoltaic (PV) systems. Students will learn about site assessment, specifying and evaluating hardware components, and modeling the economic performance for a solar PV system. In addition to solar, other alternative energy solutions will be studied as well. The course has been designed to meet the standards established by the North American Board of Certified Energy Practitioners (NABCEP) for their associate level certification. This course can be applied as an elective in the engineering technology degree programs or in the certificate programs.
Prerequisites: ELT-100
Additional Fees: Course fee applies.

ELT-291. Special Topics in Electronics Engineering Technology. 3 Credits.
LECT 30 hrs LAB 45 hrs
This course provides an examination of selected topics or issues in Electronics Engineering Technology. Topics may differ each time the course is offered. Students should consult the department chair for further information.
Prerequisites: Permission of department chair.

ELT-292. Special Topics in Electronic Engineering Technology. 3 Credits.
LECT 30 hrs LAB 45 hrs
This course provides an examination of selected topics or issues in Electronics Engineering Technology. Topics may differ each time the course is offered. Students should consult the department chair for further information.
Prerequisites: Permission of department chair.

ENR-103. Basic Engineering Graphics I. 1 Credit.
LAB 45 hrs
Students learn fundamentals of engineering drawing through freehand sketching. Course includes developing orthographic views including auxiliary views, dimensioning, sectioning, tolerancing, threads, fasteners, springs and assembly drawings. Course includes creation of pictorial drawings.

ENR-117. Computer-Aided Drafting I. 2 Credits.
LECT 15 hrs LAB 60 hrs
This course is an introduction to the concepts and operation of engineering drawing preparation using CAD (computer-aided drafting). The emphasis is on how CAD can reduce drawing time and improve accuracy. Students learn to use the AutoCAD software program to prepare drawings.
Additional Fees: Course fee applies.

ENR-118. Computer-Aided Drafting II. 2 Credits.
LECT 15 hrs LAB 60 hrs
This course is a continuation and enhancement of Computer-Aided Drafting I. Topics include prototype drawings, blocks, attributes, x-reference, grips, paper space and development of 3-dimensional solid modeling.
Prerequisites: ENR-117 or ENR-121
Additional Fees: Course fee applies.

ENR-119. Technical Computer Applications. 1 Credit.
LAB 45 hrs
This course provides an introduction to the various technical tools available to help solve problems in the field of engineering technology. This is a hands-on laboratory course designed to provide students with experience in using scientific calculators, Windows Operating System, Microsoft Office and Internet search tools. Special emphasis is placed on the development of technical reports using Microsoft Office's EXCEL and Word programs.
Prerequisites: MAT-007 or equivalent
Additional Fees: Course fee applies.

ENR-120. Technical Computer Programming. 2 Credits.
LECT 30 hrs LAB 30 hrs
This course is an introduction to computer programming with application to engineering technology. Microcomputers are used to develop application programs in a programming language.
Prerequisites: MAT-007 or equivalent
Additional Fees: Course fee applies.

ENR-121. Engineering Graphics. 2 Credits.
LECT 15 hrs LAB 45 hrs
This course is an introduction to computer aided design software and hardware. Covered are geometric constructions, multiview orthographic projection, dimensioning, sectioning, auxiliary view and axonometric projection and principles of descriptive geometry. A brief introduction to solid modeling is also included. This course is intended for Engineering Science students; Engineering Technology students take ENR-117.
Prerequisites: MAT-123
Additional Fees: Course fee applies.

ENR-123. Introduction to Engineering. 0 Credits.
LECT 15 hrs
This course provides the entering engineering student with an overview of the engineering profession and the design process. Topics discussed include the engineering course of study, academic advisement and transfer processes, types of engineering disciplines, problem-solving techniques, typical software tools, reporting techniques, and study skills.

ENR-124. Instrumentation and Measurements. 2 Credits.
LECT 15 hrs LAB 45 hrs
This course is an introductory study in the concepts involving physical measurements utilizing hands-on electrical and mechanical measurement applications. Use of basic instruments and transducers, accuracy and precision, units and standards of measurements, accounting and presentation of errors in measurements.
Prerequisites: MAT-007 or equivalent
Corequisites: ENR-119
Additional Fees: Course fee applies.

ENR-125. Computer Programming for Engineers. 3 Credits.
LECT 30 hrs LAB 30 hrs
A course in structured and object-oriented programming, emphasizing engineering applications and numerical methods in assignments. Program assignments are coded and are implemented on personal computers.
Prerequisites: MAT-123
Additional Fees: Course fee applies.

ENR-126. Computer Aided Design and Applications. 2 Credits.
LECT 15 hrs LAB 60 hrs
An introductory course in computer aided design using parametric solid modeling software. Creation of solid models of parts, generation of orthographic views, sectional views and auxiliary views are covered. Dimensioning and tolerancing of parts is emphasized along with development of appropriate files to make the parts for product development using rapid prototyping (3-D printing) and to manufacture parts using computerized numerical control machines.
Prerequisites: ENR-117
Additional Fees: Course fee applies.

ENR-130. Introduction to Engineering. 1 Credit.
LECT 15 hrs
This course provides the entering engineering student with an overview of the engineering profession and the design process. In addition this course is designed to assist the first year engineering science student in their adjustment and success with the college experience. Topics discussed include the engineering course of study, academic advisement and transfer process, types of engineering disciplines, solving techniques, academic expectations, time management and study skills.

ENR-132. Introduction to Experimentation and Design. 3 Credits.
LECT 30 hrs LAB 30 hrs
A required course in the Engineering Technology programs that introduces students to the field of engineering. Students will be introduced to experimental techniques, data collection and representation, as well as the proper method for documenting experimental results. The course will also cover topics that will help students succeed in their field of study and in their college experience.
Corequisites: MAT-016 or placement into MAT 110, or beyond
Additional Fees: Course fee applies.

ENR-134. Robotics and Automation I. 3 Credits.
LECT 30 hrs LAB 30 hrs
This course provides an overview of control concepts, automation systems, and the application of robotic systems in modern industrial applications. Students explore coordinate systems, PLCs, types of automation, safety, equipment components, and various programming methods. Students are exposed to robotics-related applications and career options in the manufacturing, service, and medical industries.
Prerequisites: MAT-016 or placement into MAT 110, or beyond
Additional Fees: Course fee applies.

ENR-135. Robotics and Automation II. 3 Credits.
LECT 30 hrs LAB 30 hrs
This course is a continuation of Robotics and Automation I and provides a more in-depth exploration of automation systems, PLC programming using I/O devices, system design, and integration. An in-depth study of applications programming will be covered during the semester. Programming will include different methods of error handling and operator interfacing used in robotic applications.
Prerequisites: ENR-134 and (CMP-128 or CMP-131).

ENR-220. Hydraulics and Fluid Power. 3 Credits.
LECT 30 hrs LAB 30 hrs
This course is an exploration into the relationship between pressure, density and temperature as they relate to hydraulic and pneumatic systems. Topics include hydraulic pumps, motors and air compressors. The course emphasizes use of engineering standards and specifications for circuit design and component selection. Electrical controls and application to systems are covered. Lab sessions further expand upon lectures by providing students with physical evidence to support theories and ideas acquired in class.
Prerequisites: MAT-110
Additional Fees: Course fee applies.

ENR-222. Mechanics of Solids. 3 Credits.
LECT 45 hrs
Principles of strength of materials are derived for uniaxial stresses and strains, direct shear, torsion bending and combined stresses and column buckling. Also covered are axial force, shear moment and torque in structural members and in statically indeterminate systems. Elementary failure theory of structures and mechanical components is discussed.
Prerequisites: ENR-223.

ENR-223. Engineering Mechanics I (Statics). 3 Credits.
LECT 45 hrs
This course is a vector approach to statics in a plane and in three dimensions, equilibrium of particles and rigid bodies. Equivalent force systems, structural analysis, centroids and moments of inertia. Virtual work and applied engineering problems are incorporated.
Prerequisites: MAT-131 and PHY-130.

ENR-224. Engineering Mechanics II (Dynamics). 3 Credits.
LECT 45 hrs
This course is a calculus-based course in dynamics. Kinematics and kinetics of particles and rigid bodies, Newton's laws, work, energy, impulse and momentum are covered. Practical engineering problems are incorporated.
Prerequisites: ENR-223.

ENR-230. Engineering Strength of Materials. 4 Credits.
LECT 45 hrs LAB 45 hrs
Principles of strength of materials are derived for uniaxial stresses and strains, direct shear, torsion bending, and combined stresses and column buckling. Elementary failure theory of structures and mechanical components is discussed. Laboratory covers a variety of tensile stress-strain, impact and hardness tests, as well as shear stress-strain and the techniques of report writing.
Prerequisites: ENR-223
Additional Fees: Course fee applies.

ENR-232. Materials Science. 3 Credits.
LECT 45 hrs
This course covers the properties and structure of materials: atomic bonding, molecular, crystalline, noncrystalline structures and crystalline imperfections. It also covers metallic phases, equilibrium and nonequilibrium reactions, processing and properties of ferrous and non-ferrous metals, polymers, ceramics and composites. In addition, corrosion phenomenon is discussed.
Prerequisites: CHM-125 and CHM-126 and PHY-130.

ENR-234. Independent Study in Technology. 3 Credits.
LECT 45 hrs
This course is for students in Engineering Technologies. The student selects an area of interest and proposes a plan of study to a sponsoring faculty member who supervises and evaluates the student's progress.
Prerequisites: Permission of department chair.

ENR-235. Engineering Circuit Analysis I. 3 Credits.
LECT 45 hrs
This first course in engineering circuit analysis covers DC
circuit analysis including source transformations, mesh, nodal,
superposition, Thevenin and Norton theorems, and the maximum
power transfer theorem. Dependent as well as independent sources
are included. Transient response of RC, RL and RLC circuits
is introduced. Steady-state analysis of single and three phase
AC systems is studied using phasor diagrams and the network
theorems mentioned above. Real, reactive, apparent power and
power factors are included. Use of the computer as a problem-
solving tool is included in the course.
Prerequisites: MAT-132.

ENR-236. Engineering Circuit Analysis Laboratory I. 1 Credit.
LAB 45 hrs
This laboratory course includes experiments in DC, AC and
transients to accompany the course work in Engineering Circuit
Analysis I.
Corequisites: ENR-235
Additional Fees: Course fee applies.

ENR-237. Engineering Circuit Analysis II. 3 Credits.
LECT 45 hrs
This is a second course in engineering circuit analysis. Natural and
step response of RL, RC and RLC circuits, mutual inductance, ideal
transformers, series and parallel resonance are studied. Laplace
transform theory is covered and includes step and impulse response
in the S-domain. Bode diagrams of simple and quadratic factors
are plotted and the computer is used for actual frequency and
phase plots. Fourier Series are studied using both trigonometric and
exponential forms.
Prerequisites: ENR-235
Corequisites: MAT-232.

ENR-238. Engineering Circuit Analysis Laboratory II. 1 Credit.
LAB 45 hrs
This laboratory course includes experiments on transformers,
series and parallel resonance, filters and frequency/phase response
plots, and two-port hybrid models to accompany the course work in
Engineering Circuit Analysis II.
Prerequisites: ENR-236
Corequisites: ENR-237
Additional Fees: Course fee applies.

ENR-240. Engineering Technology Project. 3 Credits.
LECT 30 hrs LAB 45 hrs
This course covers the design of products and processes
considering functional requirements, manufacturing feasibility and
economy, and the use of technical literature and catalogs. Includes
design layout and working drawings and group and individual
projects.
Prerequisites: ENR-117 and MEC-110 and MEC-141
Additional Fees: Course fee applies.

ENR-241. Instrumentation and Control. 3 Credits.
LECT 30 hrs LAB 45 hrs
This course is an introduction to the study of measuring systems
and components, digital and analog signals and their characteristics.
Mechanical and electromechanical transducer elements are used
to measure pressure, temperature, displacement, velocity and
acceleration. Static and dynamic performance of instruments,
statistical analysis of experimental data are explored. A brief study
of process controllers, programmable logic controllers and final
control elements are also explored.
Prerequisites: ELT-201
Additional Fees: Course fee applies.

ENR-264. Machine Learning. 3 Credits.
LECT 15 hrs LAB 60 hrs
This course provides a practical understanding and foundational
principles of Machine Learning techniques. It offers the concepts,
the intuitions, and the tools the students need to implement
programs capable of learning from data. A large number of
techniques are covered, from supervised learning algorithms,
unsupervised learning algorithms to Deep Learning techniques and
applications. The main goal of this course is to equip students with
the skills to tackle real Machine Learning problems encountered in
real life and business and establish a project portfolio.
Prerequisites: MAT-114 AND CMP-131, OR Equivalent AND
Department Permission
Additional Fees: Course fee applies.

ENR-290. Special Topics in Technology. 1 Credit.
LECT 15 hrs
This course is for students in Engineering Technologies. The
student selects an area of interest and proposes a plan of study
to a sponsoring faculty member who supervises and evaluates
the student's progress when used for independent study. The
course is also used to cover either current or future topics of interest
in technology. Topics discussed will have relevance to either
electronics technology, mechanical technology or both, and may
vary each semester.
Prerequisites: Permission of department chair.

ENR-291. Special Topics in Engineering. 3 Credits.
LECT 45 hrs
This course is an examination of selected topics or issues in
engineering. Topics may differ each time the course is offered.
Students should consult the department chair for further information.

Prerequisites: Permission of department chair.

ENR-292. Special Topics in Engineering. 3 Credits.
LECT 45 hrs
This course is an examination of selected topics or issues in
engineering. Topics may differ each time the course is offered.
Students should consult the department chair for further information.

Prerequisites: Permission of department chair.