DEPARTMENT OF ENGINEERING TECHNOLOGY

(330) 941-3287

The School of Engineering Technology offers "two-plus-two" programs in engineering technology. Students in these programs may work toward a two-year associate degree and then continue to earn a four-year bachelor's degree. The programs include both classroom and laboratory experiences that stress the application of established engineering and computer knowledge and methods to the solution of problems. They include study of the sciences and mathematics necessary to support a technology, as well as study of the methods, processes, skills, and materials used in that technology. The programs are designed to prepare graduates for job opportunities in industry and the public sector. Demands developed by an expanding technology place graduates of these programs in one of the fastest-growing occupational groups in the country.

Associate of Technical Study Degree

The School of Engineering Technology offers an Associate of Technical Study (ATS) degree in

- Power Plant (Electrical Utilities) Technology.

Students in this program are awarded academic credit for skills-related experience and training to compliment the academic coursework at YSU.

Associate of Applied Science Degree

The school offers two-year programs in:

- Civil and Construction Engineering Technology
- Drafting and Design Technology
- Electrical Engineering Technology
- Mechanical Engineering Technology

Graduates of these programs are awarded the Associate of Applied Science degree and may serve as engineering technicians.

Graduates of the associate degree programs are prepared to support scientists and engineers. Their work is in the design, drafting (CAD), development, testing, and production phases of engineering projects. Their tasks include laboratory testing, data gathering, evaluation, and instrument calibration. They may perform quality-control tests, serve as technical sales representatives, or serve as technical writers in the formulation of specifications or trade manuals.

Drafting and design graduates work with engineers, architects, and technicians in converting ideas, designs, and sketches into workable plans and specifications using 2D and 3D solid modeling CAD techniques.

Degrees in these programs may be earned in four semesters if students average 17-18 hours per semester.

Bachelor of Science in Applied Science Degree

The civil and construction engineering technology, electrical engineering technology, and mechanical engineering technology programs are based on the "two-plus-two" educational system which provides the student with the flexibility of earning an associate degree and a bachelor's degree according to his or her needs. After completing the requirements of the associate degree, the student may elect to either enter industry or, through an added two years of full-time study (averaging 17 hours per semester) or equivalent part-time study, earn the Bachelor of Science in Applied Science (BSAS).

Graduates of the BSAS degree program obtain employment as engineering technologists or engineering designers for government agencies, consulting engineers and architects, industry and manufacturing, and contractors. Because their education is more extensive, they are prepared for more responsibility and more-rapid advancement. BSAS engineering technologists and designers plan, design, inspect, and direct construction, production, and maintenance activities.

Based on an evaluation of their work, transfer students who have a related associate degree from a regionally accredited institution may be admitted to the bachelor's degree program at the junior level.

Accreditation and Registration

The civil and construction, electrical, and mechanical engineering technology associate and bachelor programs are accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org . Graduates are qualified to apply to the National Institute for Certification in Engineering Technologies (NICET) for certification procedures in various specialty areas, depending on academic major and employment area. In many states, including Ohio, West Virginia and Pennsylvania, bachelor's degree graduates are qualified to take the Fundamentals of Engineering (FE) exam, and, with sufficient work experience, the Professional Engineers (PE) exam.

Admission Requirements

Admission to all School of Engineering Technology programs requires at least one year of high school algebra and one year of high school geometry with grades of "C" or better. Transfer students must be in good standing at their previous institution. All freshmen must take the Mathematics Placement Test prior to admission into the School of Engineering Technology.

Students not meeting the admission requirements are enrolled as pre-majors in the College of Science, Technology, Engineering, and Mathematics. While advising is provided by professional advisors within the college, these students are also encouraged to see the coordinator of the program in which they are interested for further orientation.

Qualified engineering technology students must enroll in the ENTC 1505 Engineering Technology Concepts courses. It is designed to acquaint students with the nature of this career area, and therefore assist prospective students in determining the level of their interest. ENTC 1505 Engineering Technology Concepts is required of all engineering technology majors.

Power Plant (Electrical Utilities) Technology

This program prepares graduates to perform basic operating functions required in electric utility power plants and other related industries. Students gain knowledge in:

- electrical theory
- electrical machinery and controls
- power plant operations
- boiler, turbine, and generator operations
- power plant instrumentation
- pollution control equipment

In addition, college writing, oral communications, and general education form an integral part of the program. Upon successful completion of the program, students are prepared for entry-level employment in the utility industry.

For more information, visit **Power Plant (Electrical Utilities) Technology.**

Civil and Construction Engineering Technology

(330) 941-3287

Students in the civil and construction engineering technology (CCET) program may choose to complete two years of study and earn an Associate of Applied Science (AAS) degree. The AAS degree provides early access to employment in engineering support positions. Upon completion of the AAS degree, the student may continue on for the Bachelor of Science in Applied Science (BSAS) degree. This program provides additional coursework, continuing the student's growth to that of an engineering technologist or designer. Exceptional students may be eligible for enrollment in a Master of Engineering or Master of Business Administration program. Students interested in construction may choose a certificate program in construction management.

Program Educational Objectives

Educational objectives for the civil and construction engineering technology programs have been developed by faculty and the program industrial advisory committee to support the university, college, and School of Engineering Technology missions. Graduates of the CCET associate degree program are prepared to support civil engineers in:

- structural design
- public works
- construction
- inspection
- transportation
- environmental engineering

Bachelor's degree graduates are prepared to assist with planning, design, inspection, and direction of the construction of projects involving buildings, roads, dams, bridges, airports, and wastewater treatment facilities.

During their first few years after earning the civil and construction engineering technology degree at YSU, graduates will have demonstrated the ability to:

- Secure employment in a technical career related to their civil and construction engineering technology degree.
- Communicate effectively in a professional environment.
- Continue growth in professional knowledge and skills.
- Achieve recognition consistent with their educational achievements.

Program Outcomes

Graduates in civil and construction engineering technology will achieve the following learning outcomes by the time they graduate:

Associate of Applied Science Degree Program

Graduates of the associate degree in civil and construction engineering technology will possess the following competencies upon graduation:

- **Learning Outcome 1**: use graphic techniques to produce engineering documents and use modern instruments, methods, and techniques to implement construction contracts, documents, and codes
- **Learning Outcome 2**: conduct standardized field/laboratory testing on civil engineering materials and evaluate materials/methods for construction projects
- **Learning Outcome 3**: utilize modern surveying methods for land measurement and/or construction layout
- **Learning Outcome 4**: determine forces and stresses in elementary structural systems
- **Learning Outcome 5**: estimate material quantities and costs for technical projects
- **Learning Outcome 6**: employ productivity software to solve technical problems

Bachelor of Science in Applied Science Degree Program

Graduates of the bachelor degree in civil and construction engineering technology will possess the following competencies upon graduation.

- **Learning Outcome 1**: ability to plan, prepare, and utilize design, construction, and operations documents, such as specifications, contacts, change orders, engineering drawings, and construction schedules
- **Learning Outcome 2**: perform economic analyses and cost estimates related to design, construction, operations, and maintenance of systems related to civil and construction engineering
- **Learning Outcome 3**: ability to select appropriate construction and engineering materials/practices
- **Learning Outcome 4**: (Construction Engineering Technology) ability to apply principles of construction law and ethics
- **Learning Outcome 5**: apply basic technical concepts related to the civil and construction engineering technology field; such as hydraulics, hydrology, geotechnics, structures, material behavior, transportation systems, and water and wastewater systems
- **Learning Outcome 6**: perform standard analysis/design in at least one technical specialty within civil and construction engineering technology

Individualized Curriculum Program (ICP)

Drawing heavily from the civil and construction engineering technology program, students may develop an ICP in construction management that includes coursework from the Williamson College of Business Administration.

Drafting and Design Technology

YSU's drafting and design technology (DDT) program prepares students to function as design drafters in either the mechanical or civil field. They study various design aspects, such as determination of size, form, and clearance and CAD drafting where they convert ideas, sketches, and specifications into working drawings and plans. Graduates earn the associate degree and are employable in industries relating to manufacturing, quality control, materials, and the fabrication and production of building structures and metal products. Graduates interested in further technical education should consider the "two-plus-two" bachelor's degree program in civil and construction engineering technology or mechanical engineering technology.

During their first few years after earning the drafting and design technology degree at YSU, graduates will have demonstrated the ability to:

- Secure employment in a technical career related to their drafting and design technology degree.
- Communicate effectively in a professional environment.
- Continue growth in professional knowledge and skills.
- Achieve recognition consistent with their educational achievements.

Program Outcomes

Drafting and design technology students will demonstrate by the time of graduation:

- mastery of knowledge, skills, and tools of the discipline
- ability to apply knowledge to solve problems
- ability to conduct, analyze and interpret experiments
- ability to be creative in design
- ability to work effectively in teams
- ability to identify, analyze, and solve technical problems
- ability to communicate effectively
- recognition of the need to engage in lifelong learning
- ability to understand professional, ethical, and social responsibilities
- respect for diversity, professional, societal, and global issues
- commitment to quality, timeliness, and continuous improvement

For more information, visit **Drafting and Design Technology.**

Electrical Engineering Technology

Students in the electrical engineering technology (EET) program may choose to complete two years of study and earn an Associate of Applied Science (AAS) degree. The AAS provides early access to employment in engineering support positions. Upon completion of the AAS degree, the student may continue on for the Bachelor of Science in Applied Science (BSAS) degree. This program provides additional coursework, continuing the student's growth to that of an engineering technologist or designer. Exceptional students may be eligible for enrollment in a Master of Engineering or Master of Business Administration program.

program Educational Objectives

Educational objectives for the electrical engineering technology programs have been developed by faculty and the program industrial advisory committee to support the university, college, and School of Engineering Technology missions. Graduates of the EET associate degree program generally function as assistants to electrical engineers in the design, analysis, and laboratory testing of electrical and electronic systems and of rotating machinery. Bachelor degree graduates are prepared to assist in the design and testing of electrical systems and may function independently in some areas.

During their first few years after earning the electrical engineering technology degree at YSU, graduates will have demonstrated the ability to:

- Secure employment in a technical career related to their Electrical Engineering Technology degree.
- Communicate effectively in a professional environment.
- Continue growth in professional knowledge and skills.
- Achieve recognition consistent with their educational achievements.

Program Outcomes

Graduates in electrical engineering technology will achieve the following learning outcomes by the time they graduate:

Associate of Applied Science

Graduates of the Associate Degree EET program will possess the following competencies upon graduation.

- **Learning Outcome 1**: be able to apply principles of mathematics and applied science, to perform technical calculations and solve technical problems of the types commonly encountered in electrical engineering technology careers
- **Learning Outcome 2**: demonstrate the ability to identify, formulate, and present creative solutions to technical problems in a variety of specialty areas within the broad fields of electrical engineering technology
- **Learning Outcome 3**: be able to function competently in a laboratory setting, making measurements, operating technical equipment, critically examining experimental results, and properly reporting on experimental results, including their potential for improvement.
- **Learning Outcome 4**: be able to use modern computational tools for technical problem solving, including scientific calculators, computers, and appropriate software.
- **Learning Outcome 5**: demonstrate a broad education and knowledge of contemporary issues in a global and societal context, as necessary to develop professional and ethical responsibility, including responsibility to employers and to society at large
- **Learning Outcome 6**: recognize the need for life-long learning and possess the skills to maintain and improve technical and non-technical abilities
- **Learning Outcome 7**: demonstrate an ability to communicate and function effectively with members of multi-disciplinary teams from a variety of backgrounds.
- **Learning Outcome 8**: demonstrate an ability to utilize computer software applications used in electrical engineering technology such as CAD, spreadsheets, word processing, and basic programming

Bachelor of Science in Applied Science

Graduates of the bachelor's degree EET program will possess the following competencies upon graduation.

- **Learning Outcome 1**: be able to apply principles of mathematics and applied science, to perform technical calculations and solve technical problems of the types commonly encountered in electrical engineering technology careers
- **Learning Outcome 2**: demonstrate the ability to identify, formulate, and present creative solutions to technical problems in a variety of specialty areas within the broad fields of electrical engineering technology.
- **Learning Outcome 3**: be able to function competently in a laboratory setting, making measurements, operating technical equipment, critically examining experimental results, and properly reporting on experimental results, including their potential for improvement
- **Learning Outcome 4**: be able to use modern computational tools for technical problem solving, including scientific calculators, computers, and appropriate software.
- **Learning Outcome 5**: demonstrate a broad education and knowledge of contemporary issues in a global and societal context, as necessary to develop professional and ethical responsibility, including responsibility to employers and to society at large.
- **Learning Outcome 6**: recognize the need for life-long learning and possess the skills to maintain and improve technical and non-technical abilities
- **Learning Outcome 7**: demonstrate an ability to communicate and function effectively with members of multi-disciplinary teams from a variety of backgrounds
- **Learning Outcome 8**: the ability to identify, formulate, and solve engineering problems in the following major electrical engineering technology disciplines: analog and digital electronics, communication systems, power, aerospace and computer systems.
- **Learning Outcome 9**: the knowledge of professional practice issues, with an understanding of social responsibilities and a respect for diversity

Associate Degree Program

Graduates of the two-year electrical engineering technology program generally function as assistants to electrical engineers in the design, analysis, and laboratory testing of electrical and electronic systems and of rotating machinery. Most graduates are employed by electrical and electronic equipment manufacturers, utility companies, the aerospace industry, and manufacturing companies in general.

Bachelor's Degree Program

The bachelor's degree program in electrical engineering technology prepares students for employment as engineering technologists or engineering designers. The students focus on analog and digital electronics communication systems, smart grid and power distribution, and computer networking systems. Co-op programs with various local companies enable EET students to gain experience and income during their junior and senior years. Many students work full or part-time while completing the BSAS degree taking evening classes. Students are encouraged to take the Fundamentals of Engineering (FE) exam as the first step toward professional registration.

Mechanical Engineering Technology

The mechanical engineering technology (MET) program is designed as a "two-plus-two" program. Students may earn an Associate of Applied Science degree after two years of full-time study. With this degree, they may begin a career in industry. The associate degree graduate can continue for two more years of full-time study to earn the bachelor's degree.

program Educational Objectives

Educational objectives for the MET programs have been developed by faculty and the program industrial advisory committee to support the university, the college, and the School of Engineering Technology missions. Graduates of the MET associate degree program function as assistants in the design, drafting and testing of mechanical products, equipment and processes. Bachelor's degree graduates assume greater responsibility in the design and testing of mechanical products, processes, and equipment.

During their first few years after completion of the mechanical engineering technology program at YSU, graduates will have demonstrated the ability to:

- Work competently in technical and professional careers related to the field of mechanical engineering technology.
- Communicate effectively in a professional environment.
- Continue growth in professional knowledge and skills.
- Achieve recognition and/or compensation consistent with their educational achievements.

Program Outcomes

Associate of Applied Science

Graduates of the associate degree MET program will possess the following competencies upon graduation:

- mastery of knowledge, skills, and tools of the discipline
- ability to apply knowledge to solve engineering problems
- ability to conduct, analyze, and interpret experiments
- ability to work effectively in teams
- ability to identify, analyze, and solve technical problems
- ability to communicate effectively
- recognition of the need for professional development
- ability to understand professional, ethical, social, and diversity responsibilities
- commitment to quality, timeliness, and continuous improvement

Bachelor of Science in Applied Science

Graduates of the bachelor's degree MET program will possess the following competencies upon graduation:

- mastery of knowledge, skills, and tools of the discipline
- ability to apply knowledge to solve engineering problems
- ability to conduct, analyze, and interpret experiments
- ability to design systems, components, and processes
- ability to work effectively in teams
- ability to identify, analyze, and solve technical problems
- ability to communicate effectively
- recognition of the need for professional development
- ability to understand professional, ethical, social, and diversity responsibilities
- knowledge of engineering solutions in a societal and global context
- commitment to quality, timeliness, and continuous improvement

Chair

Carol M. Lamb, M.S.E., Chair

Professors

Theodore R. Bosela, Ph.D., Professor

Michael D. Costarell, M.S.M.E., Associate Professor

Robert J. Korenic, M.S.E., Associate Professor

Carol M. Lamb, M.S.E., Associate Professor

John D. Martin, M.S., Assistant Professor

Kin Ping Moy, M.S., Professor

Joseph S. Sanson, M.S., Assistant Professor

Brian D. Vuksanovich, M.S.M.E., Associate Professor

Jason Zapka, M.S., Assistant Professor

Instructors

Daniel P. Coyne, B.A., Instructor

Daryl D. Gross, M.S.E., Instructor

Majors

- Power Plant (Electrical Utilities) Technology (http://catalog.ysu.edu/archives/2016-2017/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-engineering-technology/ats-power-plant-technology) Associate of Technical Studies
- Civil and Construction Engineering Technology (http://catalog.ysu.edu/archives/2016-2017/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-engineering-technology/asas-civil-construction-engineering-technology) Associate Degree Program
- Civil and Construction Engineering Technology (http://catalog.ysu.edu/archives/2016-2017/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-engineering-technology/bs-civil-construction-engineering-technology) Bachelor Degree Program
- Drafting and Design (http://catalog.ysu.edu/archives/2016-2017/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-engineering-technology/asas-drafting-design) Associate Degree Program
- Electrical Engineering Technology Associate Degree Program (http://catalog.ysu.edu/archives/2016-2017/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-engineering-technology/electrical-engineering-technology-associate)
- Electrical Engineering Technology Bachelor's Degree Program (http://catalog.ysu.edu/archives/2016-2017/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-engineering-technology/electrical-engineering-technology-bachelors)
- Mechanical Engineering Technology Associate Degree Program (http://catalog.ysu.edu/archives/2016-2017/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-engineering-technology/mechanical-engineering-technology-associate)
- Mechanical Engineering Technology Bachelor's Degree Program (http://catalog.ysu.edu/archives/2016-2017/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-engineering-technology/mechanical-engineering-technology-bachelors)

Minors

- Minor in Electrical Engineering Technology (http://catalog.ysu.edu/archives/2016-2017/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-engineering-technology/minor-electrical-engineering-technology)

Civil and Construction Engineering Technology

CCET 2604 Properties and Strength of Materials 3 s.h.
Introduction to the physical and chemical properties of materials and their behavior under various loads and environments. Concepts of stress and strain developed and evaluated for the application of axial, shear, torsional, and bending loads.
Prereq.: ENTC 1505 and MATH 1513 grade of "C" or better.
Prereq. or concurrent: MET 1515.

CCET 2614L Materials Laboratory 1 2 s.h.
Use and care of testing equipment, data retrieval, data reduction and report preparation. Physical testing of metals, concrete, aggregates, asphalts, soils and woods. Three hours per week.
Prereq or concurrent: CCET 2604.

CCET 2617 Construction Methods and Materials 3 s.h.
Basic properties of construction materials. Processing and placement methods. Purchase, use and replacement of construction equipment. Application of engineering economics to construction. Use of building codes.
Prereq.: CCET 2604, MET 1515 both with a grade of "C" or better.

CCET 2620 Transportation Technology 3 s.h.
Transportation planning and highway system design. Familiarization with AASHTO design manuals; geometric design and signalization of highway segments; capacity analysis and route selection. Cost-benefit analysis for transportation projects.
Prereq.: CCET 2604.

CCET 3705 Computing for Technologists 3 s.h.
Development of computer techniques used in solutions to problems in all fields of engineering technology. Students write computer programs to solve problems with which they are familiar. Use of database management, spreadsheets. May be taken by non-CCET majors. Two hours lecture, three hours lab per week.
Prereq.: MATH 1570 grade of "C" or better and junior standing or consent of instructor.

CCET 3706 Structural Design 4 s.h.
Structural design using AISC, ACI and similar codes. Selection of members and connections in accordance with manuals and code specifications. Design and AutoCAD projects required. Three hours lecture and three hours computational lab per week.
Prereq.: DDT 1503, DDT 1504, MET 1515, MATH 1513, CCET 2604.

CCET 3708 Building Information Modeling 3 s.h.
Introduction and applications of Autodesk Revit 3D CAD program. Use of Revit software to assemble a complete building information model of a building and use the model to coordinate systems between disciplines, to create material take-offs, construction documents, and presentation drawings. Two hours lecture, three hours lab per week.
Prereq.: "C" or better in CCET 3706.

CCET 3708L Building Information Modeling Laboratory 0 s.h.
Building Information Modeling Laboratory.

CCET 3709 Structural Analysis 1 3 s.h.
Fundamental determination of member forces in trusses, beams, arches, frames and cables. Calculation of member stresses and defections. Two hours lecture, three hours computational lab per week.
Prereq.: ENTC 1505, MATH 1513, CCET 2604, all with a grade of "C" or better.

CCET 3711 Specifications and Estimating 3 s.h.
Fundamentals of writing and interpreting specifications for materials and construction methods. Estimating materials and labor costs for construction projects. Use of computer estimating packages. Two hours lecture and three hours computational laboratory.
Prereq.: ENTC 1505, MATH 1513, CCET 2604, MET 1515 all with grade of "C" or better.

CCET 3714 Soil Mechanics 2 s.h.
A study of soil properties, classifications, strength and behavior. Theory of consolidation, shear strength and stability analysis. Two hours lecture per week.
Prereq.: CCET 2614L, CCET 3706, CCET 3709.
Concurrent with: CCET 3714L.

CCET 3714L Soil Mechanics Laboratory 1 s.h.
Practice in soil identification and determination of soil properties. Use and care of basic soil testing equipment and standard test procedures. Three laboratory hours per week.
Concurrent with: CCET 3714.

CCET 3719 Environmental Impact of Abandoned Mines 3 s.h.
Mining methods, types of mines, information retrieval, mine stabilization, and the effects of abandoned mines on environmental and human activities, especially deep coal mines in the Mahoning Valley and adjacent areas. Two hours lecture and three hours of lab per week. Prereq. GEOL 1505 or equivalent or permission of instructor.

CCET 3724 Hydraulics and Land Development 3 s.h.
Study of hydraulics and hydrologic principles and their applications to drainage requirements, storm-water management, detention/retention basin design, erosion and sedimentation control plans and land-use planning. Use of computer software for analysis and design. Two hours lecture, three hours of computational lab per week.
Prereq.: DDT 1503, DDT 1504, ENTC 1505, MATH 1513, CCET 2604, MET 1515 all with a grade of "C" or better.

CCET 3735 Heavy Highway Technology 3 s.h.
Study of principles of heavy highway construction as it relates to the current highway system. The reading and comprehension of highway construction plans and specifications.
Prereq.: CCET 2620.

CCET 3740 Construction Management 3 s.h.
Design and construction office planning and scheduling techniques. Introduction to computer methods for program planning and updating. Financial, labor, and material resource allocation and tracking. Construction reports, contracts, specifications and general conditions. Relationships among owner, architect/engineer, and constructor.
Prereq.: "C" or better in CCET 3711.

CCET 4807 Project Planning & Scheduling 3 s.h.
Application of planning, scheduling, and control system techniques for an integrated project including theory, options, legal implications, and practices. Students plan and schedule projects using CPM computer software and set up control systems for the project. Three hours lecture, one hour laboratory per week.
Prereq.: "C" or better in CCET 3711.

CCET 4809 Structural Analysis 2 3 s.h.
Continuation of CCET 3709. Analysis techniques for common structures. Introduction to classical approaches to statically indeterminate structures and calculation of deflections. Use of standard computer programs such as StruCalc, SAP and SABLE. Three hours lecture, one hour computational lab per week.
Prereq.: "C" or better in both CCET 3709 and MATH 1570.

CCET 4810 Construction Surveying 3 s.h.
Theory and applications of advanced land surveying techniques for: route surveying and geometric design; topographic site surveys and mapping; civil engineering, utilities, and construction surveys; global positioning systems; and quantities and final surveys. Two hours lecture and three hours field surveying laboratory.
Prereq.: CEEN 2610, CEEN 2610L.

CCET 4812 Concrete Design 3 s.h.
Behavior and design of concrete elements subject to flexure, shear, axial and combined effects. Emphasis on reinforced concrete design in accordance with the ACI Code including beams, T-beams, slabs, walls, and columns. An introduction to prestressed and precast concrete design. Three hours lecture, one hour design lab per week.
Prereq.: "C" or better in both CCET 3706 and CCET 3709.

CCET 4813 Steel Design 3 s.h.
Loading and behavior of steel structures and design of standard rolled shapes in accordance with current LRFD and ASD specifications. Design of welded and bolted connections and an introduction to design of cold-formed steel members. Three hours lecture, one hour design lab per week.
Prereq.: "C" or better in both CCET 3706 and CCET 3709.

CCET 4814 Foundation Design 3 s.h.
Application of soil mechanics to the design of foundations. Topics include spread footings, drilled piers, piles, retaining walls, sheet piles walls and underground structures. Three hours lecture per week.
Prereq.: CCET 3714 and CCET 3714L.

CCET 4815 Masonry Design 3 s.h.
Design of beams, columns, shear walls and bearing walls using clay and concrete masonry units. Application of allowable stress design (ASD) and strength design (SD) in accordance with the MSJC Building Code Requirements for Masonry Structures. Additional topics include prestressed and autoclaved aerated concrete (AAC) masonry. Three hours lecture, one hour lab per week.
Prereq.: CCET 2617, "C" or better in both CCET 3706 and CCET 3709.

CCET 4816 Timber Design 3 s.h.
Design of beams, poles, piles, diaphragms, shear walls and fasteners using timber elements. Application of the National Design Specification for Wood Construction that incorporates a dual format using both allowable stress design (ASD) and load and resistance factor design (LRFD). Additional topics include glued-laminated members and design of mechanical connectors. Design, analysis, construction, and testing of scale models is required. Three hours lecture, one hour lab per week.
Prereq.: CCET 2617, "C" or better in both CCET 3706 and CCET 3709.

CCET 4824 Environmental Technology 3 s.h.
Application of environmental principles to land planning and development. Wastewater treatment processes and system design. Application of water and wastewater management to specific sites. Permitting and endangerment assessment. Three hours lecture, one hour computational lab per week.
Prereq.: "C" or better in CCET 3724 and junior standing.

CCET 4884 Civil/Structural Facilities Design 3 s.h.
Interdisciplinary capstone course. An overview of the requirements and design procedures for civil and structural systems. Includes the analysis and design for site development, utilities, foundation, wall systems, framing systems, floor system and the preparation of the plans, specifications and estimate package. Includes a major interdisciplinary group project. Two hours lecture, three hours design studio.
Prereq.: Senior standing in CCET or EET permission of instructor.
Concurrent: EET 4880.

CCET 4890 Special Topics in Civil and Construction Engineering Technology 1-4 s.h.
New developments in CCET. Subject matter, special prerequisites, and credit hours to be announced in advance of each offering. May be repeated with different subject matter to a maximum of 8 s.h.
Prereq.: Senior standing in CCET or consent of the instructor.

Drafting and Design Technology

DDT 1503 AutoCAD 1 2 s.h.
Basic instruction in the use of AutoCAD computer-aided drafting system. Includes primary 2D skills including dimensioning, blocks, external reference and plotting. Customization methods and an introduction to application programming. One and one-half hours lecture, one and one-half hours lab per week. Grading is A, B, C, NC.
Prereq.: or Corequisite MATH 1513 or at least Level 40 on the Mathematics Placement test.
Concurrent with: DDT 1504.

DDT 1504 Drafting and Plan Reading 2 s.h.
Drafting basics including plan, section, and elevation views; orthographic projections; line types and weights; drafting scales; dimensioning; tolerances; grading and contours, and construction layout for the civil, mechanical, and electrical technology disciplines. Development of skills in the interpretation and preparation of plans used for civil, mechanical, and electrical construction and fabrication. One and one-half hours lecture, one and one-half hours laboratory per week. Grading is A, B, C, NC. Prereq. or.
Coreq.: MATH 1513 or at least Level 40 on the Mathematics Placement test.
Concurrent with: DDT 1503.

DDT 1505 CAD Technology 1 4 s.h.
Basic instruction in the use of AUTOCAD computer-aided drafting system. Includes primary 2D skills including dimensioning, blocks, external reference and plotting. Customization methods and an introduction to application programming. Three hours lecture, three hours lab per week.
Prereq.: High school drafting or equivalent.

DDT 2606 CAD Solid Modeling 4 s.h.
Parametric solid modeling and other 3D techniques. Customization techniques and use of an application programming language within the CAD software. Three hours lecture, three hours lab per week.
Prereq.: DDT 1503 or DDT 1505.

DDT 2607 CAD Microstation 2 s.h.
Introduction and applications of Bentley Microstation CAD program. 2D and complex elements, dimensioning, patterning, plotting and development of basemaps. One hour lecture, three hours lab per week.
Prereq.: DDT 1503 or DDT 1505.

DDT 2608 Machine Elements 3 s.h.
Design and drafting of machine elements common to mechanical equipment, including bending, torsion, and bearing concepts. Application and interpretation of GD & T. Two hours lecture, three hours lab per week.
Prereq.: CCET 2604.

DDT 2609 Industrial Technology 3 s.h.
Materials planning and handling, applications of quality assurance, post-production control. Introduction to ergonomics and manufacturing standards. Two hours lecture, three hours lab per week.
Prereq.: MET 2630.

DDT 2610 Manufacturing Elements 3 s.h.
Mechanical power transmission, mechanisms and linkages. Hydrostatics, system losses, interpretation and analysis of hydraulic and pneumatic schematics. Two hours lecture, three hours lab per week.
Prereq.: PHYS 1501.

DDT 2690 Special Topics in DDT 1-4 s.h.
Special topics/new developments in drafting and design technology. Subject matter, special prerequisites, and credit hours to be announced in advance of each offering. May be repeated with different subject matter to a maximum of 8 s.h.
Prereq.: Consent of the instructor.

DDT 3701 Quality Improvement 3 s.h.
Quality improvement methods for industry and processes, statistical controls used to evaluate, improve, and maintain quality standards, sampling techniques and ensuring reliability in evaluation results.
Prereq.: "C" or better in the following courses: ENTC 1505, MATH 1513 or MATH 1510 and MATH 1511, CCET 2604, MET 1515.

Electrical Engineering and Technology

EET 1501 Circuit Theory 1 3 s.h.
Theoretical analysis of DC electrical circuits including units conversions, current voltage, power, Ohms Law, Kirchhoffs Laws, network theorems, capacitance, magnetic circuits, inductance and transient analysis of RL and RC circuits. Prerequisite or concurrent: ENTC 1505, MATH 1513 or MATH 1510 and MATH 1511; concurrent with EET 1501L. 3 s.h.

EET 1501L Circuit Theory 1 Lab 1 s.h.
Use of electrical components to construct circuits and use of electrical instrumentation including meters and oscilloscopes to analyze DC resistive series/parallel networks and basic RC & RL transient circuits. Computer circuit analysis with PSPICE. Three hours per week.
Concurrent with: EET 1501.

EET 1502 Circuit Theory 2 3 s.h.
Study of AC sinusoidal waveforms, phasor representations, phasor algebra and phasor diagrams. Solution of steady state single phase series/parallel networks including network theorems, power and power factor, resonant circuits, filters, mutual inductance, transformers and balanced three-phase systems.
Prereq.: "C" or better in EET 1501 and EET 1501L and MATH 1513, or MATH 1510 and MATH 1511, and ENTC 1505.
Concurrent with: EET 1502L.

EET 1502L Circuit Theory 2 Lab 1 s.h.
Measure effective values of AC currents and voltages, observe waveforms with oscilloscopes, verify impedance concepts and phasor diagrams for AC series/parallel networks and resonant circuits. Computer circuit analysis with PSPICE. Three hours per week.
Concurrent with: EET 1502.

EET 2605 Electronics 1 3 s.h.
Physical basis of semiconductor materials, diodes, rectifier circuits, Zener diode regulators, clippers, clampers, special purpose diodes. Bipolar junction transistors (BJT) characteristics, bias circuits, equivalent circuit models, amplifiers and field effect transistor (FET) characteristics.
Prereq.: EET 1502 and EET 1502L or concurrent; "C" or better in the following: MATH 1513, or (MATH 1510 and MATH 1511).
Concurrent with: EET 2605L.

EET 2605L Electronics 1 Laboratory 1 s.h.
Use of meters, oscilloscope, transistor curve tracer for experiments on diode characteristics, rectifier circuits, clippers, clampers, Zener regulators, BJT and FET characteristics, BJT bias circuits and amplifiers. Computer circuit analysis with PSPICE. Three hours per week.
Concurrent with: EET 2605.

EET 2620 Digital Electronics 2 s.h.
An introductory study of number systems and conversions, codes, Boolean algebra, and logic gates. Includes Boolean function simplification, truth tables, Karnaugh maps, and combination circuits.
Prereq.: "C" or better in MATH 1513 or MATH 1510 and MATH 1511, and EET 1501 and EET 1501L, and ENTC 1505.
Concurrent with: EET 2620L.

EET 2620L Digital Electronics Lab 1 s.h.
Experiments utilizing digital integrated circuits to implement various logic functions discussed in EET 2620. Three hours per week.
Concurrent with: EET 2620.

EET 2653 Fiber Optics 3 s.h.
Light propagation in fiber; connections, attenuation, and signal distortion; splicing and analysis of coupling losses; optical transmitters and receivers for analog and digital signals. Two hours lecture, three hours lab per week.
Prereq.: "C" or better in EET 1502 and EET 1502L and EET 2605 and EET 2605L and MATH 1570.

EET 2670 Process Instrumentation 4 s.h.
Introduction to the principles and practice of measurement and control of temperature, pressure, flow, level, and other process variables commonly encountered in industrial systems. Includes characteristics, installation, and troubleshooting of process transducers, sensors, and detectors. Three hours lecture, three hours lab per week.
Prereq. or concurrent: EET 2605, EET 2605L.

EET 2671 Computer Instrumentation and Control 4 s.h.
Use of personal computers as a data acquisition and control device in industrial processes. Specification, installation, troubleshooting or various I/O cards. Development of PC-based data acquisition and control system using commercially available software. Three hours lecture, three hours lab per week.
Prereq.: EET 2670.

EET 3700 Methods in Circuit Analysis 3 s.h.
Review of circuit analysis techniques using phasor algebra; mesh and nodal analysis; Thevenin and Norton equivalents; superposition theorem; three phase circuits; circuit solutions using matrix methods; and Fourier analysis of periodic waveforms with applications to circuit analysis. Two hours lecture and three hours computational lab per week. Taken concurrently with MATH 2670.

EET 3701 Transform Circuit Analysis 3 s.h.
Introduction to LaPlace transforms and the use of LaPlace transforms in circuit analysis, transfer functions, frequency response of networks, poles and zeroes, stability, Bode plots. Two hours lecture and three hours of computational lab per week.
Prereq.: MATH 2670 and EET 3700 with a grade of "C" or better.

EET 3706 Electronics 2 3 s.h.
Field effect transistor (FET) bias circuits and amplifiers, thyristor circuits, frequency effects (Bode plots), differential amplifiers, linear and non-linear op amp circuits, active filters, oscillators and regulated power supplies.
Prereq.: "C" or better in EET 1502 and EET 1502L and EET 2605 and EET 2605L and MATH 1570.
Concurrent with: EET 3706L.

EET 3706L Electronics 2 Laboratory 1 s.h.
Experiments involving field effect transistors (FETs), integrated circuits (ICs), operational amplifiers, frequency effects on gain, oscillator circuits and regulated power supplies. Computer circuit analysis with PSPICE. Three hours per week.
Concurrent with: EET 3706.

EET 3710 Electrical Machines 3 s.h.
Construction, operating principles and characteristics, efficiency and control of DC motors, generators, and specialized machines. AC single and 3-phase transformers, alternators, induction and synchronous motor principles, characteristics, efficiency and control.
Prereq.: "C" or better in EET 1502 and EET 1502L and ENTC 1505 and MATH 1570.
Concurrent with: EET 3710L.

EET 3710L Electrical Machines Lab 1 s.h.
Experiments with DC motors and generators and AC transformers, alternators, induction and synchronous motors to observe operation, efficiency, control and machine characteristics. Three hours per week.
Concurrent with: EET 3710.

EET 3712 Programmable Logic Controllers 3 s.h.
Development of ladder logic programming and application to programmable logic controllers (PLCs). Examination of input/output (I/O) device characteristics and interfacing including both digital and analog I/O. Installation, maintenance and safety practices for PLCs.
Prereq.: "C" or better in EET 1502 and EET 1502L and EET 2620 and EET 2620L and EET 3710 and EET 3710L and MATH 1513.
Concurrent with: EET 3712L.

EET 3712L PLC Laboratory 1 s.h.
Exercises in ladder logic programming for programmable logic controllers (PLCs) using concepts developed in EET 3712. Input/Output (I/O) concepts related to PLCs. Three hours per week.
Concurrent with: EET 3712.

EET 3725 Electromechanical Systems 3 s.h.
AC/DC circuit analysis techniques including network theorems, MultiSim computer circuit analysis with applications to AC/DC machinery, electronics, digital circuits and control systems. Three hours lecture per week.
Prereq.: C or better in MATH 1570 and ENTC 1505.
Concurrent with: EET 3725L.

EET 3725L Electromechanical Systems Lab 1 s.h.
Lab experiences to accompany EET 3725 Electromechanical Systems. Topics include lab safety, resistor color code, DC and AC circuits, oscilloscope and function generator, diode rectifiers, transistor switching circuits and amplifiers, three phase power measurements, transformer testing, DC and AC motor characteristics.
Prereq.: C or better in the following: MATH 1570, ENTC 1505.
Concurrent with: EET 3725.

EET 3730 Logic Systems Design 3 s.h.
The characteristics and applications of integrated circuit logic families and various memory devices. Emphasis on the design of digital systems with SSI, MSI, and LSI as system components.
Prereq.: "C" or better in EET 2620 and EET 2620L and EET 2605 and EET 2605L and EET 1502 and EET 1502L and MATH 1570.
Concurrent with: EET 3730L.

EET 3730L Logic Systems Design Lab 0 s.h.
Laboratory exercises dealing with applications of concepts developed in EET 3730. Three hours per week.
Concurrent with: EET 3730.

EET 3735 Microprocessor Architecture and Programming 3 s.h.
An introduction to microprocessor architecture, memory organization, and input/output addressing. Emphasis on machine/assembly language programming to teach concepts of buses, machine cycles, and internal data flow. Two hours lecture and three hours of lab per week.
Prereq.: "C" or better in CSIS 1590 or EET 1501 and EET 1501L and EET 2620 and EET 2620L and MATH 1513.

EET 3735L Microprocessor Architecture and Programming Laboratory 0 s.h.
Microprocessor Architecture and Programming Laboratory.

EET 3745 Microprocessor Systems 2 3 s.h.
Continuation of EET 2645 with emphasis on advanced programming techniques, memory mapping, I/O ports, and basic I/O interfacing.
Prereq.: "C" or better in EET 3735 and EET 3735L and EET 1502 and EET 1502L and MATH 1513.
Concurrent with: EET 3745L.

EET 3745L Microprocessor Systems 2 Lab 0 s.h.
Laboratory exercises utilizing a microcomputer to provide practical applications of concepts developed in EET 3745. Three hours per week.
Concurrent with: EET 3745.

EET 3760 Variable Speed Drives 3 s.h.
Introduction to electronic speed control of direct and alternating current motors. Power conversion and waveform modulation techniques, drive sizing, harmonics, and motor performance.
Prereq.: "C" or better in EET 3710 and EET 3710L and EET 3706 and EET 3706L, EET 3700, and MATH 2670.
Concurrent with: EET 3760L.

EET 3760L Variable Speed Drives Lab 0 s.h.
Exercises in variable speed drive applications, demonstrating the concepts developed in EET 3760.
Concurrent with: EET 3760.

EET 3780 Communication Systems 3 s.h.
Audio signals, noise, untuned and RF amplifiers, amplitude, frequency, pulse modulation, transmission lines, antennas, and multiplexing of communication channels.
Prereq.: "C" or better in the following: EET 1502, EET 1502L, EET 3706, EET 3706L, EET 3700, and MATH 2670.
Concurrent with: EET 3780L.

EET 3780L Communication Systems Lab 0 s.h.
Laboratory exercises dealing with application of concepts developed in EET 3780. Three hours per week.
Concurrent with: EET 3780.

EET 4810 Electrical System Design 3 s.h.
The design and layout of electrical systems for power, light, heat, signals, and communications in commercial, industrial, and residential buildings. Two hours lecture, three hours of lab per week.
Prereq.: EET 3710, EET 3710L.

EET 4820 Power System Protection and Control 3 s.h.
An introduction to electrical power system protection and control utilizing intelligent smart grid technologies. Topics include power system analysis, real time data acquisition and control, synchrophasor measurements, communications, and application of microprocessor-based protective relaying. Two hours lecture per week.
Prereq.: "C" or better in EET 3710 and EET 3710L and EET 3712 and EET 3712L, EET 3700 and MATH 2670.
Concurrent with: EET 4820L.

EET 4820L Power System Protection and Control Lab 0 s.h.
Establishing communications, programming, and testing of various microprocessor based power system protective relays, including time-overcurrent, bus, differential, motor, distributed generation, and transformer relays. Three hours lab per week.
Prereq.: "C" or better in EET 3710 and EET 3710L and EET 3712 and EET 3712L.
Concurrent with: EET 4820.

EET 4845 Microprocessor Systems 3 3 s.h.
Continuation of EET 3745 with emphasis on real data acquisition, A/D and D/A conversions, and industrial applications.
Prereq.: "C" or better in EET 3730 and EET 3730L and EET 3745 and EET 3745L and MATH 2670.
Concurrent with: EET 4845L.

EET 4845L Microprocessor Systems 3 Lab 0 s.h.
Laboratory exercises utilizing a microcomputer to provide practical applications of concepts developed in EET 4845. Three hours per week.
Concurrent with: EET 4845.

EET 4850 Integrated Circuit Applications 3 s.h.
Introduction to integrated circuits technology and typical application.
Prereq.: "C" or better in EET 3706 and EET 3706L and EET 1502 and EET 1502L and MATH 2670.
Concurrent with: EET 4850L.

EET 4850L Integrated Circuit Applications Lab 0 s.h.
Laboratory exercises dealing with the application of concepts developed in EET 4850. Three hours per week.
Concurrent with: EET 4850.

EET 4870 Process Control Technology 4 s.h.
Application of Laplace transform solution of differential equations to system transfer functions. Development of control system transfer functions, control system components and analysis of linear control systems.
Prereq.: "C" or better in EET 1502 and EET 1502L and EET 3706 and EET 3706L and EET 3780 and EET 3780L and MATH 2670.

EET 4880 Electrical and Mechanical Facilities Design 3 s.h.
Multidisciplinary study of building systems; HVAC, plumbing, electrical power, lighting, and communication systems. Computational labs and group projects for each topic. Two hours lecture and three hours computational lab.
Prereq.: Senior standing and permission of the CCET or EET student's program advisor.
Concurrent: CCET 4884.

EET 4890 Special Topics in EET 1-4 s.h.
Special topics/new developments in electrical engineering technology. Subject matter, special prerequisites, and credit hours to be announced in advance of each offering. May be repeated with different subject matter to a maximum of 8 s.h.
Prereq.: Senior standing in EET or consent of the instructor.

Engineering Technology

ENTC 1500 Technical Skills Development 4 s.h.
A course designed to develop the technical, analytical and problem solving skills of students planning to enter an engineering or technical course of study. Three (3) hours of lecture and three (3) hours lab per week. Grading is A, B, C, NC.
Prereq. or concurrent: MATH 1501.

ENTC 1501 Introduction to Engineering Technology 2 s.h.
Understanding what engineering technology is, exploring careers for engineering technicians, time management and adjusting to the college environments, basic Excel functions and uses, performing labs and writing lab reports, writing class reports/term papers.

ENTC 1505 Engineering Technology Concepts 4 s.h.
The role of the technician, technologist, engineer and scientist in the technology team; a study of basic mathematical, scientific, and communicative techniques as applied to the work of engineering technologists; ethical, global, and societal issues facing the engineering technology professional. Three hours lecture, three hours lab per week. Grading is A, B, C, NC. Corequistite MATH 1513.
Prereq.: grade of "B" in both ENTC 1500 and MATH 1507.

ENTC 2615 Design Project 3 s.h.
The student undertakes a project designed to utilize principle methods studied in previous courses. The subject of the project is determined jointly by the student and instructor and developed formally by the student. The course is normally taken during the final stages of the student's program.
Prereq.: Consent of instructor.

ENTC 3799 Professional Practice in Engineering Technology 1 s.h.
This course provides students with cooperative education experiences in various engineering technology disciplines. To receive credit for the course, the student is expected to work at the assignment a minimum of 400 hours, submit a report of activities, and obtain approval of the department Professional Practice Committee. Course may be repeated up to a maximum of 3 s.h. toward the BSAS. Students are considered full-time even though only 1 s.h. is given for each course. Grading: PR, CR, NC.
Prereq.: Consent of department chairperson.

ENTC 4895 Independent Engineering Technology Project 1-4 s.h.
Individual study under direction of a faculty member. Written and oral report required. May be repeated for a maximum of 4 s.h.
Prereq.: Junior standing, consent of instructor, and prior approval of the project by the IETP committee of engineering technology faculty.

Electrical Utility Technology

EUT 1500 Electrical Fundamentals 3 s.h.
Introduction to direct and alternating current circuits. Study of resistance, capacitance, inductance, Ohm's and Kirchoff's Laws applied to circuits. Three hours lecture per week.
Prereq.: ENTC 1500 and MATH 1501 or at least level 3 on the Mathematics Placement Test.
Concurrent with: EUT 1500L.

EUT 1500L Electrical Fundamentals Lab 1 s.h.
Lab component of EUT 1500. Provides hands-on instruction in the use of electrical test equipment including digital multimeters, power supplies, oscilloscopes, etc. Three hours per week.
Prereq.: ENTC 1500 and MATH 1501 or at least level 3 on the Mathematics Placement Test.
Concurrent with: EUT 1500.

EUT 1502 Power Plant Fundamentals 4 s.h.
Introduction to power plant systems including boiler, turbine, generator, condenser, pumps, and auxiliary equipment. Emphasizes use of schematics and diagrams in discussing plant systems. Includes plant safety training. Four hours lecture per week.
Prereq.: MATH 1501 or Level 3 on MPT and eligible to enroll in ENGL 1550.
Prereq. or concurrent: ENTC 1500.
Concurrent: EUT 1502L.

EUT 1502L Power Plant Fundamentals Lab 1 s.h.
Lab component to accompany EUT 1502. Provides introduction to power generating plant systems and equipment including boiler, turbine, generator, condenser, pumps, and auxiliary equipment. Emphasizes the use of schematics and diagrams in discussing plant systems. Three hours laboratory per week.
Concurrent with: EUT 1502.

EUT 1503 Power Plant Mechanical Equipment 3 s.h.
Introduction to various mechanical equipment found in power plants including pumps, fans, blowers, valves, heat exchangers and power transmission equipment. Mechanical concepts of force and torque. Basic types of bearings, seals, and lubrication. Mechanical assembly drawings and diagrams. Three hours lecture per week.
Prereq.: ENTC 1500 and EUT 1502, EUT 1502L, and MATH 1501.
Concurrent with: EUT 1503L.

EUT 1503L Power Plant Mechanical Equipment Lab 1 s.h.
Lab component to accompany EUT 1503. Provides hands-on activities related to pumps, fans, blowers, valves, heat exchangers, bearings, seals, lubrication, and power transmission equipment. Three hours lab per week.
Prereq.: ENTC 1500, EUT 1502, EUT 1502L, and MATH 1501.
Concurrent with: EUT 1503.

EUT 1504 Maintenance Fundamentals 1 4 s.h.
Introduction to blueprint reading and technical diagrams, use of hand tools and power tools, safety and health, development of troubleshooting skills, chemical hazards, and material safety data sheets. Three hours lecture, and three hours lab per week.
Prereq. or concurrent: ENTC 1500.

EUT 1505 Maintenance Fundamentals 2 4 s.h.
Introduction to piping systems, basic hydraulics and pneumatics, hydraulic and pneumatic troubleshooting, rigging and equipment installation, welding principals, oxyacetylene cutting and welding. Three hours lecture, three hours lab per week.
Prereq.: EUT 1502 and EUT 1504, concurrent or prerequisite EUT 1503.

EUT 2600 Electric Utility Distribution Systems 4 s.h.
Applications of transformers, switchgear, regulators, overhead conductors and underground cable. Power factor correction, voltage regulation, coordination and overcurrent protection of distribution circuits.
Prereq.: EUT 1500.

EUT 2601 Electrical Codes and Standards 4 s.h.
National Electrical Code and National Electrical Safety Code as applied to overhead and underground electric utility distribution systems. Pole guying, overhead conductor sag and tension, cable pulling, and clearances. Four hours lecture per week.
Prereq.: EUT 2600.

EUT 2604 Power Plant Electrical Equipment 3 s.h.
Study of three-phase power systems including motors, generators, transformers, and switchgear. NEC and NESC Code requirements, automatic and manual motor controls, variable speed drives, circuit protection. Three hours lecture per week.
Prereq.: EUT 1500 and EUT 1500L.
Concurrent with: EUT 2604L.

EUT 2604L Power Plant Electrical Equipment Lab 1 s.h.
Lab component to accompany EUT 2604. Provides hands-on activities related to three-phase power systems, motors, generators, transformers, and switchgear. Three hours lab per week.
Prereq.: EUT 1500 and EUT 1500L.
Concurrent with: EUT 2604.

EUT 2605 Intermediate Power Plant Systems 3 s.h.
Continuation of EUT 1502. Study of power plant cycles, thermodynamic properties of water and steam, and use of steam tables. Includes thermodynamic analysis of boiler system, feedwater, superheat, and reheat systems, heat transfer in pre-heaters, turbine, condensers, and pumps. Three hours lecture per week.
Prereq.: EUT 1503, and EUT 1503L.
Concurrent with: EUT 2605L.

EUT 2605L Intermediate Power Plant Systems Lab 1 s.h.
Lab component to accompany EUT 2605. Provides hands-on and computational methods to dynamic analysis of boiler system, feedwater, superheat, and reheat systems, heat transfer in pre-heaters, turbine, condenser, and pumps. Three hours per week.
Prereq.: EUT 1503, and EUT 1503L.
Concurrent with: EUT 2605.

EUT 2606 Power Plant Operator Practice 3 s.h.
Discusses the operation of large utility power plants including start-up and shut-down of all major systems, disturbance response, and safe operation of plant systems. Three hours lecture per week.
Prereq.: EUT 1503 and EUT 1503, EUT 1503L.
Concurrent and EUT 2605/EUT 2605L.

EUT 2607 Power Plant Instrumentation and Control 3 s.h.
Introduces basic principles of process instrumentation and control systems. Measurement parameters such as flow, pressure, level, temperature, and pH. Includes coverage of programmable logic controllers, and distributed control systems. Three hours lecture per week.
Prereq.: EUT 2604, EUT 2604L and EUT 2605, EUT 2605L.
Concurrent with: EUT 2607L.

EUT 2607L Power Plant Instrumentation & Control Lab 1 s.h.
Lab component to accompany EUT 2607. Provides hands-on activities related to process instrumentation and control systems. Three hours per week.
Prereq.: EUT 2604L, and EUT 2605L.
Concurrent with: EUT 2607.

EUT 2608 Advanced Power Plant Systems 3 s.h.
Continuation of EUT 2605. Examines on-line boiler control concepts, including combustion, feedwater, header pressure, oxygen content, power demand, and other processes as applied to utility boilers and process heat supply boilers. Also examines pollution control systems, gas turbines and diesel generators. Three hours lecture per week.
Prereq.: EUT 2605, EUT 2605L.
Concurrent with: EUT 2607, EUT 2607L and EUT 2608L.

EUT 2608L Advanced Power Plant Systems Lab 1 s.h.
Lab component to accompany EUT 2608. Provides hands-on activities related to on-line boiler control concepts, pollution control systems, gas turbines and diesel generators. Three hours per week.
Prereq.: EUT 2605, EUT 2605L.
Concurrent with: EUT 2607, EUT 2607L and EUT 2608.

EUT 2699 Electric Utility Co-op 2 s.h.
Compensated and evaluated work experience with local utility company. Forty contact hours per week.
Prereq.: EUT 2691, permission of program coordinator.

Mechanical Engineering Technology

MET 1515 Mechanics 1 3 s.h.
Study of forces as vector quantities; resultants of force systems; principles of mechanical equilibrium; application of principles to problems, devices and structures commonly encountered in industry. Two hours lecture, three hours lab per week.
Prereq.: "C" or better in ENTC 1505 and MATH 1513.

MET 2616 Mechanics 2 3 s.h.
Continuation of MET 1515 with further application of statics, introduction to dynamics of solids, study of various types of motion, Newton's second law, work and energy, impulse and momentum. Two hours lecture, three hours lab per week.
Prereq.: MET 1515 "C" or better.

MET 2630 Manufacturing Techniques 3 s.h.
The study of materials and processes used in manufacturing, including casting, heat treatment, hot and cold working, plastics processing and machining, Geometric Dimensioning and Tolerancing.
Prereq.: "C" or better in ENTC 1505.

MET 2630L Manufacturing Techniques Laboratory 1 s.h.
Practice and procedures of machine tool operation including lathes, drill presses, shapers, and milling machines. Two hours lab per week. "C" or better in MET 2630 or concurrent with MET 2630.

MET 3705 Thermodynamics 4 s.h.
Properties of ideal and real gases, first and second laws of thermodynamics, application to thermodynamic cycles involving power plants and cyclic machinery.
Prereq.: "C" or better in CHEM 1515 or CHEM 1505, "C" or better in EET 3725.

MET 3706 Machine Design 1 4 s.h.
Principles of stresses and deflections, shear and moment diagrams, combined stresses, fatigue, measurement of strain, and theories of failure. Application of these principles to design of machine components. Includes a capstone experience for MET AAS degrees. 4 s.h.
Prereq.: "C" or better in CCET 2604, "C" or better in DDT 1503.

MET 3707 Machine Design 2 3 s.h.
Continuation of MET 3706, progressing to the design of machine elements such as gears, belts, clutches, chains, bearings, welded and bolted joints. Two hours lecture, three hours lab per week.
Prereq.: "C" or better in MET 3706.

MET 3710 Tool Design 3 s.h.
Design and selection of cutting tools, fixtures, bending and forming dies, inspection and gauging instruments, and material feed mechanisms. Two hours lecture, three hours lab per week.
Prereq.: "C" or better in MET 3707.

MET 3711 Heat and Power Cycles 4 s.h.
A continuation of MET 3705, including the study of heat transfer, the Rankine cycle, the Otto cycle, the Diesel cycle, and the performance of pumps and heat exchangers.
Prereq.: 'C" or better in MET 3714, "C" or better in MET 3705.

MET 3714 Fluid Mechanics 4 s.h.
Principles of fluid statics and fluid dynamics and their application to incompressible flow in pipes and channels; Bernoulli's equation, laminar and turbulent flow; energy and momentum in fluid flow.
Prereq.: "C" or better in MET 1515.

MET 3714L Fluid Mechanics Laboratory 1 s.h.
Tests and applications of concepts covered in MET 3714. Three hours lab per week.
Concurrent with: MET 3714.

MET 3720 Mechanisms 3 s.h.
Graphical and analytical solution of problems involving displacement, velocity, and acceleration in machine mechanisms. Design of linkages with drafting software to provide required motions of machine members. Two hours lecture, three hours lab per week.
Prereq.: C or better in MET 2616, "C" or better in MATH 1570 or "C" or better in MATH 1571.

MET 3730 Energy and Financial Modeling 4 s.h.
The analysis and evaluation of financial factors that affect alternative energy systems explored in several common systems, such as soar, fuel cells, biodiesel, and wind, along with existing fuels such as coal, oil, natural gas, and nuclear.
Prereq.: MET 3705.

MET 3731 Grant Proposal 4 s.h.
The field of Alternative Energy Technologies requires significant writing skills to prepare the many parts of a proposal. Students will learn about funding sources for grants, prepare all portions of a grant proposal including Statement of Need, Work Plans, Budgets, Outcomes and Periodic Reports.
Prereq.: ENGL 1551 and MET 3730.

MET 3735 Hydrogen Production and Storage 4 s.h.
The methods of hydrogen production are discussed, including stem reforming, coal gasification, fermentation, and electrolysis. Storage systems are presented, along with national codes for the storage equipment, and best practices. Three hours lecture and 1-1 1/2 lab. of CHEM 1505, CHEM 1505L or CHEM 1515, CHEM 1515L.
Prereq. or concurrent MET 3705 and Prereq.

MET 3736 Design of Solar Systems 1 4 s.h.
Use of the sun as an energy source is explored in forms of electricity or heat. Topics include regions that are best suited for solar, solar energy capture methods, energy conversion to electricity, steam or hot water. Actual systems are evaluated, including electrical and mechanical design, economic calculations, and related codes. Three hours lecture and 1-1 1/2 lab. of CHEM 1505, CHEM 1505L or CHEM 1515, CHEM 1515L.
Prereq. or concurrent EET 1502/L and Prereq.

MET 3737 Design of Solar Systems 2 4 s.h.
This course builds upon MET 3736 Design of Solar Systems I and adds more detailed analysis to the capture and use of solar energy. The radiation spectrum is defined and integration methods presented. Further discussion of solar use in heat pumps and absorption systems is explored. Three hours lecture and 1-1 1/2 computational lab. Prereq. MATH 2670 and MET 3736.

MET 3739 Geothermal Processes 4 s.h.
This course provides students with basic knowledge on geothermal systems, the most-favorable areas for geothermal, principles of heat pumps and geothermal steam systems, common design principles, followed by economics, code requirements and LEED contributions. Three hours lecture and 1-1 1/2 computational lab.
Prereq.: MET 3705.

MET 3740 Design of Wind Systems 1 4 s.h.
Evaluation of wind energy as a low-impact alternative energy source. Topics include selection of an appropriate wind site, types of turbines, and capture efficiency of wind devices. The electrical and mechanical systems are reviewed in detail, along with economic calculations and discussion of related codes. Three hours lecture and 1-1 1/2 computational lab. Prereq. or.
Coreq.: with EET 1502, EET 1502L.

MET 3742 Biodiesel Processes 4 s.h.
Several methods of biodiesel production are surveyed, such as algae, palm, and soy. The chemical process of each method is explored and analyzed. Existing production systems and campus research projects are used in class demonstrations. Three hours lecture and 1-1 1/2 computational lab. Prereq. CHEM 1505, CHEM 1505L or CHEM 1515, CHEM 1515L, BIOL 2601, BIOL 2601L, and MET 3705.

MET 3743 Fuel Cell Systems 4 s.h.
Several methods of fuel cells are explored including Proton Exchange Membrane Fuel Cells (PEMFC), Solid Polymer Electrolyte Fuel Cells (SPEFC) and Solid Oxide Fuel Cells (SOFC). The principles of operation existing barriers for each system will be presented, along with the current reach and economical feasibility. Three hours lecture and 1-1 1/2 computational lab.
Prereq.: MET 3705 and CHEM 1515, CHEM 1515L or CHEM 1505, CHEM 1505L.

MET 4810 Manufacturing Systems Analysis 3 s.h.
Study of manufacturing systems including manufacturing process design, analysis, selection and sequencing; value analysis, machine tool cost and functions; computer and statistical simulation of production systems. Two hours lecture and three hours of computational lab per week.
Prereq.: "C" or better in MET 3707.

MET 4812 Numerical Control 3 s.h.
A study of the programming of numerically-controlled machine tools. Students program NC machines using manual and computer-assisted techniques.
Prereq.: "C" or better in DDT 2606, and "C" or better in MET 3707.

MET 4812L Numerical Control Lab 1 s.h.
A study of the programming of numerically-controlled machine tools. Students program NC machines using manual and computer-assisted techniques. Three hours lab per week. Coreq. or.
Prereq.: MET 4812.

MET 4820 Machine Systems 3 s.h.
Analysis and comprehensive design of complex machine systems incorporating hydraulic and pneumatic subsystems and electrical controls as a capstone experience. Two hours lecture, three hours lab per week. "C" or better or concurrent with MET 4810.
Prereq.: "C" or better in MET 3720.

MET 4850 Air Conditioning Principles and Practice 3 s.h.
The practical techniques used in the design of heating, ventilating, and air conditioning systems, including load calculations, unit selection, and duct system layout. The laboratory work includes the use of design charts and manufacturer's catalogs in a project. Two hours lecture, two hours lab per week.
Prereq.: MET 3711.

MET 4860 Robotics Technology 2 s.h.
An application-oriented course on the technology and use of industrial robots, including classification, tooling, sensors, workcell design, safety, and programming.
Prereq.: MET 3714 "C" or better.

MET 4860L Robotics Technology Laboratory 1 s.h.
Practice in the programming and application of industrial robots and associated equipment. Construction of simulated robotic workcells using actual industrial robots, programmable controllers, sensors, and grippers. Two hours lab per week.
Prereq.: MET 3714 "C" or better.
Concurrent with: MET 4860.

MET 4870 Applied Finite Element Method 3 s.h.
Principles of the finite element method and its application to the analysis of stress, strain, and heat transfer. Computer aided solutions to two- and three-dimensional problems in structural analysis, mechanical design and heat transfer. Two hours lecture, three hours lab per week. Prereq. or.
Coreq.: with MET 3707 or "C" or better in CCET 3709.

MET 4890 Special Topics in Mechanical Engineering Technology 1-4 s.h.
New developments in Mechanical Engineering Technology. Subject matter, special prerequisites, and credit hours to be announced in advance of each offering. May be repeated with different subject matter to a maximum of 8 s.h.
Prereq.: Senior standing in MET or consent of the instructor.