Technology Courses (TECH)

Courses

This course is part of the nationally certified Project Lead The Way (PLTW) curriculum. Students are introduced to the engineering design process and its application. Through hands-on projects, students apply engineering standards, use 2D and 3D CAD software to help design solutions, solve problems, and communicate solutions. (Spring)

Materials and properties, fundamentals of metal casting, product design considerations, woodworking, plastics processing, metal forming, welding, assembly processes, powder metallurgy, and ceramic processing. Lecture and lab. (Fall and Spring)

Theory of metal machining, cutting-tool technology, turning and related operations, drilling and related operations, milling, grinding and other abrasive processes, other machine tools, nontraditional machining and thermal cutting processes, metrology. Prerequisite(s): TECH 1008 (330:008). (Fall and Spring)

TECH 1011. Introduction to Graphic Programs — 3 hrs.
Provides lab-based experiences for learning software skills utilizing the industry standard for graphic communications. Addresses fundamentals of the Adobe Creative Suite for print and multimedia. Provides a foundation for required courses in Graphic Technologies. (Fall and Spring)

TECH 1015. Introduction to Sustainability — 3 hrs.
Students will gain a basic understanding of sustainability, with focus on possibilities for harmonizing economic, ecological, and social goals for current and future generations. They will conduct practical exercises to enhance personal sustainability. (Fall)

Fundamental concepts and procedures of producing 2D drafting and 3D solid modeling applicable to design and/or drafting in such areas as architecture, communications, electronics, manufacturing, and interior planning. Lab activities using CAD software on microcomputer systems. (Fall and Spring)

Examination of the resources commonly utilized in the construction industry--money, materials, methods, processes, personnel--and their management. (Fall and Spring)

Evolution and contemporary approaches in technology and engineering education. Examination of career opportunities. (Fall)

Assessment of historical, state-of-the-art communication technologies as tools for exchange of ideas and information. Encompasses digital imaging, printing, publications, wired/wireless communications, technical illustrations, multimedia, and Internet. (Fall and Spring)

Fundamentals of product design process, development of engineering drawings geometric constructions, multi-view projections, section views, auxiliary view (pictorials); using 2D drafting software. Use of 3D CAD techniques for design of parts/components. Prerequisite(s): pass CAD Proficiency test. (Fall and Spring)

Analysis of the techniques used in developing construction drawings and reading construction specifications. Computer applications. Prerequisite(s) or corequisite(s): TECH 1018 (330:018). (Variable)

TECH 1037 (330:037). Introduction to Circuits — 3 hrs.
Introduction to AC circuits, in-depth DC circuits; current and voltage laws, circuit analysis including series and parallel circuits, inductance, capacitance, introductory magnetism; power calculations and electrical measurements, circuit simulation, troubleshooting techniques. Prerequisite(s) or corequisite(s): MATH 1140 (800:046) or equivalent or consent of instructor. (Fall)

AC circuits including j operators, phasors, transformers, reactance, capacitance, impedance, AC resonance, frequency response, passive filters, network theorems and circuit simulation. Lecture and lab. Prerequisite(s): TECH 1037 (330:037). Prerequisite(s) or corequisite(s): MATH 1140 (800:046). (Spring)

Introduction to foundry technologies and careers; evolution, systems, research and development, and planning/control of foundry production; evaluation of all aspects of foundry operations including melting, molding, casting quality, and supervision. (Variable)

Concepts and processes used by the communications industry to place images on surfaces including conventional offset, laser techniques, inkjet technology, screen printing and specialized contemporary technologies are presented. Topics include imaging history, finishing techniques and the opportunity to experience actual print projects within a graphics lab. Includes both lecture and lab. (Fall and Spring)

Study of technology in society and the workplace, including selection, utilization, management, impact, and optimization. Focused experiences will facilitate technological literacy. (Fall and Spring)

Industrial communications techniques, tools, and management strategies associated with design and delivery of messages in organizations. (Variable)

Engineering design process, geometric dimensioning and tolerancing pertaining to ANSI Y14.5M-1994, fasteners, gears, cams, assembly modeling, and rapid prototyping. Prerequisite(s): TECH 1024 (330:024). (Fall)

Introduction to energy and mechanical power systems. Lecture and lab cover traditional and emerging electrical power technologies such as renewable energy applications. (Fall)
Technology Courses (TECH)

Single and polyphase circuits, DC machines, AC single and polyphase synchronous and induction machines, power transformers, introduction to conventional- and renewable-based power systems. Includes lecture and lab projects. Prerequisite(s): TECH 1037 (330:037); TECH 1039 (330:039); MATH 1150 (800:048) or MATH 1420 (800:060). (Fall)

TECH 2041 (330:041). Introduction to Analog Electronics — 3 hrs.
Semiconductor materials, P-N junction, characteristics of electronic devices: junction diodes, photodiodes, LED, Zener diodes, and their applications, BJT and FET transistors, small-signal amplifiers, oscillators, electronic circuit simulation and troubleshooting. Prerequisite(s): TECH 1037 (330:037); TECH 1039 (330:039); MATH 1140 (800:046). (Fall)

TECH 2042 (330:042). Introduction to Digital Electronics — 3 hrs.
Number systems and codes, digital arithmetic, Boolean algebra, elementary logic gates, combinational logic circuits, sequential logic circuits, logic circuit design and industrial applications, simulation and troubleshooting. Lecture and lab. Prerequisite(s): TECH 1037 (330:037); TECH 1039 (330:039); MATH 1140 (800:046). (Fall)

Examination of construction contract principles, construction documents, and the component parts of law affecting construction operations. Prerequisite(s): TECH 1025 (330:025). (Variable)

Flexible and fixed automation systems: transfer lines, CNC programming, robotics, and FMSs. Prerequisite(s): sophomore standing. (Fall and Spring)

TECH 2070 (330:070). Digital Pre-Media — 3 hrs.
Using industry standard applications and technology, this course introduces students to the essentials of preparing a file for different mediums including print, web, and electronic media. An in-depth look into electronic file development, digital prepress techniques, variable data implementation, interactive pdf creation, color management and epublishing. Prerequisite(s): TECH 1055 (330:055). (Fall and Spring)

Introductory course of principles and properties of materials, including metals, composites (concrete and asphalt), ceramics, wood, glass, and polymers. Corrosion concepts integrated into course to understand impact on applications of materials. Lecture and lab. Prerequisite(s): CHEM 1020 (860:020) or CHEM 1110 (860:044); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); sophomore standing. (Fall and Spring)

Evaluation of force and force resultants, and reporting of material characteristics and strength, and probable usefulness in the construction of structures. Prerequisite(s): PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130). (Fall and Spring)

OSHA standards (29 CFR Part 1926) for the construction industry. Fall protection, crane utilization, concrete and masonry, steel erection, demolition and scaffolding. Focus on the uniqueness of the construction industry and development of a comprehensive safety and health program. Prerequisite(s): sophomore standing. (Fall)

This course is part of the nationally certified Project Lead The Way (PLTW) curriculum. Students investigate principle concepts encountered in engineering and related fields. Topics include mechanisms, energy, statistics, materials, and kinematics. Students develop problem-solving skills and apply knowledge of research and design to create solutions to various challenges, document work, and communicate solutions. Prerequisite(s): PHYSICS 1400 (880:011) or PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130). (Spring)

TECH 3024/5024 (330:122g). Advanced CAD and Modeling — 3 hrs.
Design and development of three-dimensional models, productivity techniques, system customization, and translation of graphic databases using a parametric, solid modeling system. Lecture and lab. Prerequisite(s): TECH 1024 (330:024); junior standing. (Spring)

Philosophy and historical development, principles, practices, and organization of public career and technical and adult education in the nation. Prerequisite(s): junior standing. (Variable)

Exploration of the complex relationships between technology and society. Students discover how social systems affect the nature and use of technology and how the nature and use of technology affect social systems. Prerequisite(s): junior standing. (Same as CAP 3102 (CAP:102)) (Spring)

Principles of cutting tools, jigs, fixtures, progressive dies, and gaging; tool geometry, tool life, cost analysis, ergonomics, and safety in tooling design applications. Lecture and lab. Prerequisite(s): TECH 1008 (330:008); TECH 1010 (330:010); TECH 1024 (330:024); MATH 1150 (800:048) or MATH 1420 (800:060); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); TECH 2072 (330:072); junior standing. (Spring)

Application of organizational management practices within a simulated product development and enterprise environment. Activities relate to development and enterprising functions such as financing, designing, producing, and marketing a product. Prerequisite(s): TECH 1008 (330:008); TECH 1017 (330:017) or TECH 1022 (330:022) or TECH 1024 (330:024); or consent of instructor; junior standing. (Fall)

Basic DC/AC electrical circuits, electrical machines, analog/digital electronics fundamentals, electronic devices/systems, actuators, sensors, AD/DA converters and their applications. Prerequisite(s): MATH 1140 (800:046) or equivalent. (Variable)

Study of major technology-oriented programming software including spreadsheet applications, technical report writing, database management, and presentation graphics. Applications are introduced as solutions to specific technology problems through programming exercises. Prerequisite(s): sophomore standing. (Variable)
Development of programs and courses for technology and engineering education and related fields, including content decision-making, delivery strategies, and program evaluation. Prerequisite(s): TECH 1019 (330:019); junior standing. (Fall)

Applications and analysis of technology systems. Also includes equipment operation, maintenance, and safety. Prerequisite(s): TECH 1008 (330:008); TECH 1010 (330:010); TECH 1024 (330:024); junior standing. (Spring)

TECH 3122/5122 (330:122g). Commercial and Heavy/Highway Construction — 3 hrs.
Examination of systems and operational procedures used to construct commercial, heavy and highway projects. Analysis/design of airports and highways. Earthmoving, dewatering, and construction economics. Prerequisite(s): ACCT 2120 (120:030); MGMT 2080 (150:080); TECH 1025 (330:025); junior standing. Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 3000/4000-level construction management courses or student will be dropped. (Spring)

TECH 3126/5126 (330:126g). Land, Route, and Construction Surveying — 3 hrs.
Principles of aerial, boundary, land and route surveying including leveling, area and earthwork volume calculation, photogrammetry, traverse computations, building, culvert, pipeline, municipal street, and highway construction. Design and layout of highway curves. Prerequisite(s): TECH 1018 (330:018); TECH 1025 (330:025); MATH 1420 (800:060); junior standing. Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 3000/4000-level construction management courses or student will be dropped. (Variable)

Application of fluid flow and heat transfer concepts to material processing including conduction, convection, radiation, Bernoulli’s principles, and turbulent flow. Thermoodynamic principles are reviewed and applied to heat power cycle systems. Thermal and fluid computational dynamics are covered and applied to physical simulation models. Prerequisite(s): TECH 1024 (330:024); MATH 1150 (800:048) or MATH 1420 (800:060); CHEM 1020 (860:020) or CHEM 1110 (860:044); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130). (Odd Springs)

Basic principles of electricity and materials. Methods of electrical system designs in building construction. Prerequisite(s): TECH 2045 (330:045). Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 3000/4000-level construction management courses or student will be dropped. (Fall)

TECH 3129/5129 (330:129g). Linear Control Systems — 3 hrs.
Learning open and closed loop control theory, applications to analogies for modeling and design procedures. Introducing sensors, actuators, PID control, analog controllers, and elementary concepts of dynamic performance and stability. Lecture and lab. Prerequisite(s): TECH 3152 (330:152); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); junior standing. (Spring)

Project management concepts, needs identification, composition and role of project teams, project communication, related project management techniques, practical implementation, and project management software. Prerequisite(s): junior standing. (Fall)

Advanced principles of metallurgy, properties, microstructural analysis, and heat treatment of metals and alloys used in manufacturing. Transformation kinetics are included. Lecture and lab. Prerequisite(s): CHEM 1020 (860:020) or CHEM 1110 (860:044); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); or consent of instructor; junior standing. (Fall)

Study of molding practices used in contemporary metal casting. Prerequisite(s): TECH 2072 (330:072); CHEM 1020 (860:020) or CHEM 1110 (860:044); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); junior standing or consent of instructor. (Odd Falls)

Applied manufacturing design process: design teams define, plan and document design project. Concept generation and evaluation, engineering and product performance specifications, costing, production process, and product support. Prerequisite(s): TECH 1024 (330:024); TECH 2024 (330:023); TECH 3024/5024 (330:122g); junior standing. (Spring)

Application of quality concepts to manufacturing environment using statistics, sampling techniques, probability, and control charts. Calculation and interpretation of process capability, design of experiments, and continuous improvement. Prerequisite(s): MATH 1140 (800:046) or MATH 1150 (800:048) or MATH 1420 (800:060) or STAT 1772 (800:072). (Fall and Spring)

Analysis and management of Manufacturing functions. Topics include: forecasting, project management, operations cost analysis, plant layout, process planning, quality control, total quality management, statistical process control, inventory management, materials requirement. Prerequisite(s): MATH 1140 (800:046) or MATH 1150 (800:048) or MATH 1420 (800:060) or STAT 1772 (800:072). (Fall and Spring)

Development of interactive Web sites with content management tools. Emphasis on creating Website for accessibility and usability, digital content management, and site layout and maintenance. Lecture on current graphics’ industry issues and hands-on Web publishing activities. Prerequisite(s): TECH 1022 (330:022). (Variable)

Advanced programming for CNC machines, machining parameters, machining centers, turning centers, CAM application programs to create part geometry, tool paths, machining parameters, and post process NC code. Prerequisite(s): TECH 1008 (330:008); TECH 1010 (330:010); TECH 1024 (330:024); TECH 2060 (330:060). (Odd Springs)

Principles of design for machine elements, failure analysis, static and dynamic loads. Machine elements include power transmission
elements such as fasteners, gears, belts, chains, shafts, keys, couplings, clutches, brakes, springs, bearings. Prerequisite(s): MATH 1150 (800:048) or MATH 1420 (800:060); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); TECH 2080 (330:080). (Fall)

**TECH 3149 (330:149). Construction Estimating — 3 hrs.**

Construction cost analysis techniques for estimating materials, labor, equipment, and subcontracting costs in commercial building construction. Prerequisite(s): TECH 1025 (330:025); TECH 2045 (330:045). Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 3000/4000-level construction management courses or student will be dropped. Corequisite(s): TECH 4124/5124 (330:124g). (Spring)

**TECH 3150/5150 (330:150g). Graphic Communications Imaging — 3 hrs.**

Explorations of conventional graphic arts imaging technologies and processes including screen printing processes, dye sublimation, and other conventional imaging technologies. Emphasis on technical information and hands-on experiences. Prerequisite(s): TECH 1055 (330:055); junior standing. (Spring)

**TECH 3152 (330:152). Advanced Analog Electronics — 3 hrs.**

Amplifier and oscillator circuits using discrete electronic devices, principle of feedback, ICs - SSI, MSI and LSI, operational amplifiers, electronic circuits using OP-AMPS, measurement and simulation techniques, regulated power supplies, industrial applications of ICs, troubleshooting techniques. Lecture and lab. Prerequisite(s): TECH 1037 (330:037); TECH 1039 (330:039); TECH 2041 (330:041). Prerequisite(s) or corequisite(s): MATH 1150 (800:048) or MATH 1420 (800:060); sophomore standing. (Spring)

**TECH 3156 (330:156). Advanced Digital Electronics — 3 hrs.**

Arithmetic circuits, sequential logic circuit analysis and synthesis, counters and registers, shift registers, memory devices, digital and analog interfaces, ADC, DAC, and Multiplexing. Lecture and lab. Prerequisite(s): TECH 1037 (330:037); TECH 1039 (330:039); TECH 2042 (330:042) or CS 1410 (810:041); sophomore standing. (Spring)

**TECH 3157/5157 (330:157g). Microcontroller Applications — 3 hrs.**

Microcontroller technology applied to real-time industrial problems; survey of industrial computer hardware, networking, and software. Lecture and lab. Prerequisite(s): TECH 3152 (330:152); TECH 3156 (330:156); CS 1130 (810:030) or CS 1160 (810:036); junior standing. (Fall)

**TECH 3160/5160 (330:160g). Computer-Aided Instrumentation and Interfacing — 3 hrs.**

Computer-aided instrumentation and interfacing; real-time industrial data acquisition hardware and software; sensors, signal conditioning; design and debugging of data acquisition systems using software tools. Lecture and lab. Prerequisite(s): TECH 3152 (330:152); TECH 3156 (330:156); TECH 3157/5157 (330:157g); junior standing. Corequisite(s): TECH 3129/5129 (330:129g). (Spring)

**TECH 3163/5163 (330:163g). Advanced Digital Pre-Media — 3 hrs.**

An advanced look into using industry standard applications and technology, this course course introduces students to the essentials of preparing a file for different mediums including print, web, and electronic media. An in-depth look into electronic file development, digital prepress techniques, variable data implementation, interactive pdf creation, color management and epublishing. Prerequisite(s): TECH 1055 (330:055); TECH 2070 (330:070); junior standing. (Spring)

**TECH 3164/5164 (330:164g). Programmable Logic Controllers (PLCs) — 3 hrs.**

Introduction to PLCs, Basic Modes of Operation Ladder Logic Diagrams, industrial applications, sequencers, bit-wise operations, arithmetic operations, and conditional branching. Lab activities and projects. Prerequisite(s): TECH 2038 (330:038); TECH 1039 (330:039); TECH 2041 (330:041); TECH 2042 (330:042); CS 1130 (810:030) or CS 1160 (810:036); junior standing. (Spring)

**TECH 3166/5166 (330:166g). Advanced Electrical Power Systems — 3 hrs.**

Analysis, modeling, simulation, and operation of electrical utility, commercial, and industrial power systems. Voltage-drop calculations, voltage regulation, system protection, faults, and harmonics. Power quality in industrial power systems. Lecture and lab. Prerequisite(s): TECH 2038 (330:038); MATH 1150 (800:048) or MATH 1420 (800:060); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); junior standing. (Spring)

**TECH 3168/5168 (330:168g). Technology Training Strategies — 3 hrs.**

Developing training programs in technological environments, including analysis and utilization of program planning models for business and industry, and specific strategies for customizing training for various groups within an organization, including synchronous and asynchronous delivery methods. Prerequisite(s): junior standing. (Variable)

**TECH 3169 (330:169). Digital Imaging I — 3 hrs.**

Photography fundamentals for digital imaging. Emphasis on developing calibration, creating profiles for digital cameras, imaging technologies, and output devices. Lecture and hands-on capturing and manipulating digital images for cross applications and content management. Prerequisite(s): TECH 1022 (330:022). (Fall)

**TECH 3177/5177 (330:177g). Advanced Manufacturing Processes — 3 hrs.**

Fundamentals of production lines, rapid prototyping, semiconductor manufacturing, IC fabrication and packaging, introduction to nanotechnology, nanofabrication processes, process planning, group technology, concurrent engineering, design for manufacturability. Prerequisite(s): CHEM 1020 (860:020) or CHEM 1110 (860:044); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); MATH 1150 (800:048) or MATH 1420 (800:060); TECH 1008 (330:008); TECH 1010 (330:010); TECH 1024 (330:024); TECH 2060 (330:060); TECH 2072 (330:072); junior standing. (Odd Falls)

**TECH 3180 (330:180). Lean and Sustainable Manufacturing — 3 hrs.**

Introduction to lean manufacturing systems and concepts - basic philosophy of reducing waste in areas such as production, processing, inventory, transportation, waiting time, and scrap generation - to improve quality, reduce cost and production time, and sustainability in manufacturing and product design. Prerequisite(s): TECH 3143; MATH 1150 (800:048) or MATH 1420 (800:060) or STAT 1772 (880:072); junior standing or consent of instructor. (Spring)

**TECH 3181/5181 (330:181g). Instructional Design for Career and Technical Education — 2 hrs.**

Project management concepts, needs identification, composition and role of project teams, project communication, related project management techniques, practical implementation, and project management software. Prerequisite(s): junior standing. (Variable)
TECH 3182/5182 (330:182g). Coordination of Techniques in Career and Technical Programs — 2 hrs.
Planning, organization, development, and teaching of cooperative or multi-occupational programs in career and technical education. Prerequisite(s): junior standing. (Variable)

Application of technical knowledge to solve industrial problems within the functional area of manufacturing engineering. Preparation for examination through the manufacturing Engineering Certification Institute. Prerequisite(s): junior standing or consent of instructor. (Variable)

TECH 3188/5188 (330:188g). Nanotechnology Fabrication — 3 hrs.
Developmental analysis of nanotechnological fabrication developments with a focus on nanoparticles, nanoscale devices, production techniques, and their interdisciplinary applications in various industrial fields such as material science, manufacturing, physical sciences, and electronic technology. Prerequisite(s): CHEM 4210/5210 (860:148g) or PHYSICS 4210/5210 (880:148g); junior standing. (Variable)

Methods of teaching in technology and engineering education and related fields, including group and individualized instructional strategies. Includes 25 hours of field experience. Need minimum grade of C prior to student teaching. Prerequisite(s): TECH 1019 (330:019); junior standing. Prerequisite(s) or corequisite(s): TEACHING 3128. (Spring)

Basic principles of instruction, instructional organization, methods of presentation, lesson planning, and applications of audio-visual media. Prerequisite(s): junior standing. (Variable)

Non-destructive evaluation of materials using such techniques as x-ray, gamma ray, liquid penetrant tests, magnetic particle, eddy currents, SEM, etc. Prerequisite(s): TECH 2072 (330:072) or TECH 3132/5132 (330:132); junior standing. (Variable)

Basic concepts and techniques for evaluating students and programs in career and technical education. Prerequisite(s): TECH 3181/5181 (330:181g) or consent of department; junior standing. (Variable)

Examination of the directives mandated for General Industry (29 CFR Part 1910) by the Occupational Safety and Health Administration (OSHA). Emphasis on developing and implementing a comprehensive safety and health program. Prerequisite(s): sophomore standing. (Fall and Spring)

TECH 4000/5000. Wind Energy Engineering — 3 hrs.
Fundamentals and history of wind power. Operation, control, applications, types of wind turbines. Stand alone, grid connectivity, transmission, economic and management issues regarding the adoption of wind as an energy source. Technical, political and economic implications. Prerequisite(s): junior standing. (Variable)

Senior group research project pertaining to a topic in construction. Includes an oral and written presentation of the findings, conclusions, and recommendations. Prerequisite(s): TECH 4154/5154 (330:154g). Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 3000/4000-level construction management courses or student will be dropped. (Spring)

TECH 4103/5103 (330:103g). Electronic Communications — 3 hrs.
Basic communication concepts including propagation, modulation, demodulation, receivers, transmitters, antennas, transmission lines, digital coding, pulse modulation and other digital/data communication techniques. Introduction to fiber-optic and satellite communications. Lecture and lab. Prerequisite(s): TECH 3152 (330:152); TECH 3156 (330:156); MATH 1150 (800:048) or MATH 1420 (800:060); junior standing. (Fall)

Introduction to discrete-time signals and systems, digital sampling theory, discrete Fourier transform, Z transform, and FIR/IIR filter design. Projects and labs based on MATLAB and DSP development kit (TMS320C5510) will be performed. Lecture and lab. Prerequisite(s): TECH 3156 (330:156) or CS 1410 (810:041); CS 1160 (810:036) or CS 1130 (810:030); junior standing. (Fall)

This course deals with the best practices used in industry to design and manufacture successful products. Product cycle in manufacturing, product quality, Machining capability, Assembly capability, Part design for producibility, Design for manufacturing and assembly, Concurrent Engineering, Part design analysis, Tolerance stacking, Process design and development, Operation selection, Manufacturing process selection, Tooling selection, Tolerance charting, Process parameter selection, Cost estimation, Economics of process planning. Prerequisite(s): junior standing. Corequisite(s): TECH 4112 (330:112). (Fall)

TECH 4112 (330:112). Industrial Projects I — 1 hr.
Cross-disciplinary teams work to research and develop a project with industrial partners. Conception phase includes problem identification, product development and testing, cost analysis, and/or process planning. First semester culminates in project proposal. Must register for TECH 4113 (330:197) in spring semester. Prerequisite(s): senior standing. Corequisite(s): TECH 4110/5110; 12 semester hours completed in major concentration or consent of instructor. (Fall)

Cross-disciplinary teams work to research and develop a project with industrial partners. Implementation phase includes research, testing, fabrication, and product/process documentation. Second semester culminates in project completion and seminar presentation. Prerequisite(s): TECH 4112 (330:112). (Spring)

Basic principles, methods, and equipment pertaining to building mechanical systems (heating, cooling, ventilation, and plumbing) related to human health and comfort. Prerequisite(s): junior standing. Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 3000/4000-level construction management courses or student will be dropped. (Variable)
Technology Courses (TECH)

Advanced course in the principles of metal melting practices with an
emphasis on microstructural evolution and thermodynamic reactions.
Topics include basic melting practices for ferrous and non-ferrous
metals. Processing considerations are covered in relation to
developed microstructure and refractory reactions. Prerequisite(s): TECH 2072
(330:072); MATH 1150 (800:048) or MATH 1420 (800:060); CHEM
1020 (860:020) or CHEM 1110 (860:044); PHYSICS 1511 (880:054)
or PHYSICS 1701 (880:130); junior standing or consent of instructor. (Even Falls)

Advanced course in the principles of foundry tooling design including
selection of pattern materials, rapid prototype development techniques,
gating and riser design, and basic core box production techniques.
Prerequisite(s): TECH 2072 (330:072); MATH 1150 (800:048) or
MATH 1420 (800:060); CHEM 1020 (860:020) or CHEM 1110
(860:044); PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130);
junior standing or consent of instructor. (Even Springs)

TECH 4153/5153 (330:153g). Construction Project Planning,
Scheduling and Controlling — 3 hrs.
Further development of estimating expertise in previous courses with
emphasis on planning, scheduling, and controlling of construction
projects based on the use of CPM and Precedence Programming.
Assessment of computer-aided scheduling and control systems.
Prerequisite(s): TECH 4154/5154 (330:154g); junior standing.
Prerequisite for Construction Management majors: student must have
a minimum UNI GPA of 2.20 to take 3000/4000-level construction
management courses or student will be dropped. (Spring)

TECH 4154/5154 (330:154g). Computerized Construction
Estimating — 3 hrs.
Utilization of contemporary and emerging building estimating
software and advanced estimating techniques. Prerequisite(s): TECH
3149 (330:149); junior standing. Prerequisite for Construction
Management majors: student must have a minimum UNI GPA of 2.20
to take 3000/4000-level construction management courses or student
will be dropped. (Fall)

TECH 4155/5155 (330:155g). Finite Element Analysis — 3 hrs.
Fundamental concepts of the finite element method for linear stress
and deformation analysis of mechanical components. Development of
truss, beam, frame, plane stress, and plane strain elements. Practical
modeling techniques and use of general-purpose codes for solving
practical stress analysis problems. Prerequisite(s): TECH 2080
(330:080); MATH 1150 (800:048) or MATH 1420 (800:060);
PHYSICS 1511 (880:054) or PHYSICS 1701 (880:130); junior
standing. (Fall)

TECH 4158/5158 (330:158g). Graphic Communications Technical
Visualization — 3 hrs.
Development of technical presentations by utilizing digital graphics
and technologies for new approaches to visualization; lecture and
skills development for creating 2D simulations and animations, data
based graphics and charts, and creation of technical presentations.
Prerequisite(s): TECH 1022 (330:022); junior standing. (Fall and Spring)

TECH 4161/5161 (330:161g). Digital Graphic Communications —
3 hrs.
Emphasis on contemporary and future issues in the graphic
communications industry. Study of the creation and conversion
of graphics for cross-media applications for print and the Internet.
Creative problem solving and portfolio development. Prerequisite(s):
junior standing. (Fall and Spring)

TECH 4162. Automation - Pneumatics and Hydraulics — 3 hrs.
Basic application of hydraulics and pneumatics towards industrial
automation. It includes hydraulic pumps, cylinders, valves, motors,
fluid logic control and electrical devices used in fluid control.
Pneumatic circuits and applications. Prerequisite(s): MATH 1150
(800:048) or MATH 1420 (800:060); PHYSICS 1511 (880:054) or
PHYSICS 1701 (880:130); TECH 2060 (330:060). (Even Falls)

TECH 4165/5165 (330:165g). Wireless Communication Networks
— 3 hrs.
Topics include wireless transmission fundamentals, protocols and
TCP/IP suites, cellular wireless networks, Mobile IP, wireless
LAN technologies, IEEE 802.11 and IEEE 802.15 standards, and
security issues in wireless networks. Lecture and lab. Prerequisite(s):
junior standing. Prerequisite(s) or corequisite(s): TECH 4103/5103
(330:103g) or CS 3470/5470 (810:147g). (Spring)

Theory and industrial applications of solid-state electronic devices
for control and conversion of electrical power. Fundamentals of
power computations. Analysis/design of power converter circuits and
components: single and 3-phase rectifiers, DC-DC, AC/AC converters,
and inverters. Prerequisite(s): TECH 2038 (330:038); TECH 3152
(330:152); junior standing. (Fall)

Management concepts in construction: business methods, finance,
decision making, labor relations, marketing, quality control, marketing
and computer applications. Analysis of office and field problems.
Prerequisite(s): TECH 4154/5154 (330:154g); junior standing.
Prerequisite for Construction Management majors: student must have
a minimum UNI GPA of 2.20 to take 3000/4000-level construction
management courses or student will be dropped. (Spring)

TECH 4174 (330:174). Senior Design I — 1 hr.
Individual and/or team analytical research or design project.
Collaboration with local industry, government agencies, or research
institutions is encouraged. Must register for TECH 4176 (330:176) in
spring semester. Prerequisite(s): senior in EET major. (Fall)

TECH 4175/5175 (330:175g). Structural Analysis in Construction
— 3 hrs.
Structural analysis of wood, concrete, steel, and composite, finite
element analysis of structural members. Emphasis on topics such as
the design of form work and scaffolding. Prerequisite(s): TECH 2080
(330:080); junior standing. Prerequisite for Construction Management
majors: student must have a minimum UNI GPA of 2.20 to take
3000/4000-level construction management courses or student will be
dropped. (Fall)

Development and completion of project identified in TECH 4174
(330:174). Prerequisite(s): TECH 4174 (330:174). (Spring)

TECH 4178/5178 (330:178g). Contemporary Instruction in
Technology Education — 3 hrs.
Inquiry into recent applications in instructional strategies and content,
including research, development, and management of modular
technology instructional systems. Prerequisite(s): TECH 1019
(330:019) or consent of instructor; junior standing. (Spring)
TECH 4184/5184. Digital Imaging II — 3 hrs.
Students will explore digital imaging formats in a lab-based, hands-on environment. Topics include color calibration and printing large format images, as well as workflow and production issues, color pre-press and digital formats appropriate to multiple media. Prerequisite(s): TECH 4154/5154 (330:154g); junior standing. (Spring)

Analysis and evaluation of construction improvements, overview of current innovations in construction such as sustainability/LEED/BIM. Prerequisite(s): junior standing. Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 3000/4000-level construction management courses or student will be dropped. Prerequisite(s) or corequisite(s): TECH 4154/5154 (330:154g). (Fall)

Investigation of industrial supervision and management; includes directed field study in industry. Prerequisite(s): MGMT 3153 (150:153) or TECH 3131/5131 (330:131g) or TECH 3143 or consent of instructor; junior standing. (Fall and Spring)

Exploration of workflow systems for cost and pricing associated with the graphic imaging industry and web-to-print publishing. Prerequisite(s): TECH 1055 (330:055); TECH 4194/5194 (330:194g); junior standing. (Spring)

TECH 4194/5194 (330:194g). Graphic Communications Estimating and Management I — 3 hrs.
Study of traditional and modern management principles. Exploration of software for cost and pricing associated with the printing industry and web-to-print publishing. Development of marketing strategies for variable data printing and ancillary services. Prerequisite(s): TECH 1055 (330:055); junior standing. (Fall)

Design of safe and effective facilities for technology and engineering education and related fields, facility management, and development of a safety program. Prerequisite(s): TECH 3120 (330:120) or TECH 3190/5190 (330:190g); junior standing. (Fall)

TECH 4198 (330:198). Independent Study. (Variable)

Introduction to the theory and applications of analog and digital electronics utilizing the Digital Electronics curriculum from the nationally certified Project Lead The Way (PLTW) curriculum. Especially intended for science and technology K-12 education majors to become certified PLTW teachers of this course. Prerequisite(s): PHYSICS 1511 (880:054) or PHYSICS 1400 (880:011) or PHYSICS 1701 (880:130); junior standing. (Same as PHYSICS 4290/5290) (Spring)

Principles of economic factors in engineering project evaluation, planning and implementation. Engineering decision analysis, money-time relationships, measures of investment, break-even method, cost-benefit ratio, risk management. Engineering projects analyzed/
that apply to manufacturing, service, and technological organizations. Prerequisite(s): program approval and advisor endorsement, or approval of instructor. (Even Springs)

**TECH 6262 (330:262). Sustainable/Green Building Construction — 3 hrs.**
Technologies and processes used in green building construction including low impact site development, material selection, energy efficiency in heating/air conditioning and lighting. Water conservation and reclamation. Prerequisite(s): TECH 4153/5153 (330:153g).
(Variable)

**TECH 6265 (330:265). Risk Analysis and Management in Construction — 3 hrs.**
Cost concepts, comparison of alternative investments, economic analysis of projects in public sector, break-even and sensitivity analysis, risks and uncertainty in project investments, and decision models. Prerequisite(s): TECH 3125/5125 (330:125g); TECH 4185/5185 (330:185g). (Variable)

**TECH 6273 (330:273). Machining Process Planning — 3 hrs.**
Survey of various methods of metal removal, mechanics of orthogonal cutting, thermal aspects of metal cutting, cutting fluids, tool wear, tool life, machinability, machining economics, abrasive machining processes, high speed machining, ultra-precision machining and hard turning. Prerequisite(s): consent of instructor. (Variable)

**TECH 6275 (330:275). Advanced Lean Manufacturing — 3 hrs.**
Development of skills and techniques in applying lean manufacturing to service and industrial settings. Topics include lean enterprise, product development, supplies network, JIT tools, Theory of Constraint, and value stream mapping. Prerequisite(s): TECH 3180 (330:180) or consent of instructor. (Odd Falls)

**TECH 6282 (330:282). Technology Seminar — 1 hr.**
Selected advanced topics in technology and engineering technology as needed. (Variable)

**TECH 6283 (330:283). Research Prospectus Seminar — 1 hr.**
Supervised writing and research leading to the development and presentation of a prospectus for graduate research. Prerequisite(s): TECH 6292 (330:292); advisor approval. (Variable)

**TECH 6284 (330:284). Industrial Technology — 2 hrs.**
Offered in separate areas as shown in Schedule of Classes. Credit may be earned in more than one area but not repeated in a single area. Requires written consent of instructor. (Variable)

**TECH 6288 (330:288). Master Internship/Project — 3 hrs.**
Masters' students may choose to do an internship or a research project, but not both. An internship is a supervised practicum in an industrial organization, public service agency, or education setting. A research project is a major industrial assignment ending with a measured deliverable with a substantial written report required. Approval by department graduate advisor is required for registration. Students should not take this course during their first semester. Prerequisite(s): limited to master's degree candidates; program approval, advisor and department head endorsement. (Fall, Spring, Summer)

**TECH 6289. Seminar in Engineering and Technology — 1 hr.**
Seminar in Engineering and Technology

**TECH 6290 (330:290). Training and Development in Industrial Technology — 3 hrs.**
Systematic application of training to enhance industrial productivity and development of the various techniques and skills to assess training needs, develop and evaluate training programs, and manage the training process in an industrial environment. (Variable)

**TECH 6291 (330:291). Technical Program Development — 3 hrs.**
Development of skills and techniques in the method of identifying, analyzing, selecting, and organizing instructional content. Consideration for installation, operation and evaluation of a curriculum plan in industrial technology areas. Prerequisite(s): TECH 6290 (330:290) or consent of instructor. (Variable)

**TECH 6292 (330:292). Research Methods in Technology — 3 hrs.**
Introduction to research and scholarly investigation. Critical Analysis of Research, Research Problem Purpose, Characteristics of Good Research Questions, Hypothesis Variables, The Value of a Literature Review, Purpose, Need, Validity, Reliability, Quantitative Research Methodologies, Experimental Research, Correlational Research, Causal - Comparative Research, Samples, Survey research, Qualitative Research methodologies, Historical, Ethnographic Research. Individual exploration of possible thesis topics, Research proposal, Presentation methods. (MS students should not take this during their first semester. DT students should take only after completing 30 hours of course work). (Spring)

**TECH 6294 (330:294). Technological Evolution and Innovation — 3 hrs.**
Overview of technology - its chronological development and evolution. Interrelationships among disciplines and influence of contemporary technology on industry, culture, education, and society. (Even Springs)

**TECH 6295 (330:295). Advanced Management and Supervision Technology — 3 hrs.**
Development of knowledge, skills, and advanced application experiences of management technologies utilized in industrial supervision and management. Prerequisite(s): admission to Graduate Program. (Even Springs)

**TECH 6296. Research Design in Technology — 3 hrs.**
Emphasis on the relationships between theory, planning, research design, instrumentation assessment and administration, data collection and analysis, and the interpretation of findings. Includes critical review of previous research and preparation of proposed manuscripts. Prerequisite(s): graduate status or consent of instructor. (Variable)

**TECH 6299 (330:299). Research (Master’s Thesis).**
Prerequisite(s): consent of department. (Fall and Spring)

**TECH 6300. Advanced Technical Project Management for Engineering and Technology — 3 hrs.**
Technical project management and system management ensure technical progress toward objectives, proper deployment and conversation about human and financial resources, and achievement of cost and schedule targets. The course focuses on technical, industrial systems development, scheduling technical project planning and control; structuring performance measures and metrics; technical teams and technical project management. Prerequisite(s): graduate status or consent of instructor. (Summer)

**TECH 7300 (330:300). DIT Post Comprehensive Registration.**
(Fall and Spring)

**TECH 7375 (330:375). Historical and Contemporary Issues in Technology — 3 hrs.**
Historical, contemporary and future developments and Technological innovations of manufacturing, production, communication, and power systems and their impact on people, society and the environment. Prerequisite(s): admission to Doctor of Technology program or consent of instructor. (Fall)
A study with emphasis on production, communication, and power systems; and their interrelationship with people, society, and the environment. Prerequisite(s): TECH 7375 (330:375). (Variable)

Case studies on the impact of technological and innovation evolution on societal trends and changes in its culture, with emphases on discussions of the influence of such contemporary changes in disciplines such as education, industry and research. Prerequisite(s): admission to Doctor of Technology program or consent of instructor. (Spring)

Survey of the issues, values, principles, and ethics of a technological society. Emphasis on the leadership principles, behaviors, and normative ethics of the technologist to practice the ethical decision-making process within a technological or institutional organization. Prerequisite(s): admission to graduate program or consent of instructor. (Fall)

Offered in education and industry to provide practical experience in teaching, supervision, administration, or management. May be taken once in educational environment and once in industrial environment. Prerequisite(s): consent of advisor; advancement to candidacy; completion of at least 21 semester hours in required core. (Fall and Spring)

Prerequisites: successful completion of 40 credit hours in approved program of study, internship, and approval of dissertation proposal. (Fall and Spring)