(TECH 1008)
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. (Offered Fall and Spring)

(TECH 1010)
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. (Offered Fall and Spring)

(TECH 1017)
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. (Variable)

(TECH 1018)
Examination of the resources commonly utilized in the construction industry--money, materials, methods, processes, personnel--and their management. (Offered Fall and Spring)

330:019. Introduction to Technology Education and Training -- 3 hrs.
(TECH 1019)
Evolution and contemporary approaches in technology education and training. Examination of career opportunities. (Offered Fall)

(TECH 2020)
Industrial communications techniques, tools, and management strategies associated with design and delivery of messages in organizations. (Offered Fall and Spring)

(TECH 1022)
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. (Offered Fall and Spring)

330:023. Technical Drawing and Design II -- 3 hrs.
(TECH 2024)
Engineering design process, geometric dimensioning and tolerancing pertaining to ANSI Y14.5M-1994, fasteners, gears, cams, assembly modeling, and rapid prototyping. Prerequisite(s): 330:024 (TECH 1024) (Offered Fall)
(TECH 1024)
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): [330:017] (TECH 1017) or equivalent. (Offered Spring)

(TECH 1025)
Analysis of the techniques utilized in the designing and developing of specifications and working drawings for commercial construction. Prerequisite(s) or corequisite(s): [330:018] (TECH 1018). (Variable)

(TECH 2036)
Introduction to energy and mechanical power systems. Lecture and lab cover traditional and emerging electrical power technologies such as renewable energy applications. (Offered Fall)

330:037. Introduction to Circuits -- 3 hrs.
(TECH 1037)
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): [800:046] (MATH 1140) or equivalent or consent of instructor. (Offered Fall)

330:038. Introduction to Electrical Power and Machinery -- 3 hrs.
(TECH 2038)
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): [330:037] (TECH 1037); [330:039] (TECH 1039) or consent of instructor. (Offered Fall)

(TECH 1039)
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) or corequisite(s): [330:037] (TECH 1037); [800:048] (MATH 1150) or [800:060] (MATH 1420); or consent of instructor. (Offered Spring)

(TECH 1040)
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)

330:041. Introduction to Analog Electronics -- 3 hrs.
(TECH 2041)
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) or corequisite(s): [330:037] (TECH 1037); [330:039] (TECH 1039). (Offered Fall)
330:042. Introduction to Digital Electronics -- 3 hrs.
(TECH 2042)
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): [330:037](TECH 1037); [330:039](TECH 1039). (Offered Fall)

(TECH 2043)
Manufacturing functions related to forecasting, project planning, operations cost analysis, plant layout, process planning and control, supply chain management, lean manufacturing, and quality control. Prerequisite(s): sophomore standing. (Formerly 330:143g) (Offered Fall and Spring)

(TECH 2045)
Examination of construction contract principles, construction documents, and the component parts of law affecting construction operations. Prerequisite(s): [330:025](TECH 1025). (Variable)

(TECH 1055)
Overview of concepts and practices for printing processes and technologies for print reproduction. Topics covering industrial printing practices, finishing and binding techniques, with an emphasis on individual and collaborative projects. Includes lecture and lab. (Offered Fall)

(TECH 2060)
Flexible and fixed automation systems: transfer lines, CNC programming, robotics, and FMSs. Prerequisite(s): sophomore standing. (Offered Fall and Spring)

(TECH 1065)
Study of technology in society and the workplace, including selection, utilization, management, impact, and optimization. Focused experiences will facilitate technological literacy. (Offered Fall and Spring)

(TECH 2070)
Desktop composition, publishing technologies for developing prepress in a digital environment. Computer design/layout of publications including typography, color management, system configurations and applications. Collaborative projects in publications. (Offered Fall)

(TECH 2072)
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): [860:020](CHEM 1020) or [860:044](CHEM 1110); [880:054](PHYSICS 1511) or [880:130](PHYSICS 1701); sophomore standing. (Offered Fall and Spring)
330:080. Statics and Strength of Materials -- 3 hrs. (TECH 2080)
Evaluation of force and force resultants, and reporting of material characteristics and strength, and probable usefulness in the construction of structures. Prerequisite(s): [860:020] (CHEM 1020) or [860:044] (CHEM 1110); [880:054] (PHYSICS 1511) or [880:130] (PHYSICS 1701). Prerequisite(s) or corequisite(s): [330:072] (TECH 2072); sophomore standing. (Formerly 330:170) (Offered Fall and Spring)

330:096. Construction Safety -- 3 hrs. (TECH 2096)
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. (Offered Fall)

330:100. Undergraduate Research in Construction Management -- 3 hrs. (TECH 4100)
Senior group research project pertaining to a topic in construction. Includes an oral and written presentation of the findings, conclusions, and recommendations. Prerequisite(s): [330:154] (TECH 4154/TECH 5154). Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/3000/4000-level construction management courses or student will be dropped. (Offered Spring)

330:101(g). History and Philosophy of Career and Technical Education -- 2 hrs. (TECH 3101/TECH 5101)
Philosophy and historical development, principles, practices, and organization of public career and technical and adult education in the nation. Prerequisite(s): junior standing (Variable)

330:102. Living in Our Techno-Social World -- 3 hrs. (TECH 3102)
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:102 (CAP 3102)) (Offered Spring)

330:103(g). Electronic Communications -- 3 hrs. (TECH 4103/TECH 5103)
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): [330:152] (TECH 2152); [330:156] (TECH 2156); [800:048] (MATH 1150) or [800:060] (MATH 1420); junior standing. (Offered Fall)

330:104(g). Applied Digital Signal Processing -- 3 hrs. (TECH 4104/TECH 5104)
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): [330:156] (TECH 2156) or [810:041] (CS 1410); [810:036] (CS 1160); junior standing. (Offered Spring)
330:112. Industrial Projects I -- 1 hr.  
(TECH 4112)  
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 [330:197](TECH 4197) (TECH 4197) in spring semester. Prerequisite(s): senior standing; 12 semester hours completed in major concentration or consent of instructor. (Offered Fall)

(TECH 3113)  
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): [330:008](TECH 1008); [330:010](TECH 1010); [330:023](TECH 2024); [330:024](TECH 1024); [330:060](TECH 2060); [800:048](MATH 1150) or [800:060](MATH 1420); [880:054](PHYSICS 1511) or [880:130](PHYSICS 1701); junior standing or consent of instructor. (Offered Spring)

(TECH 3114)  
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): [330:008](TECH 1008); [330:009](TECH 1017) or [330:017](TECH 1017) or [330:022](TECH 1022) or [330:024](TECH 1024); or consent of instructor; junior standing. (Offered Fall)

(TECH 1115)  
Basic DC/AC electrical circuits, electrical machines, analog/digital electronics fundamentals, electronic devices/systems, actuators, sensors, AD/DA converters and their applications. Prerequisite(s): [800:046](MATH 1140) or equivalent. (Variable)

(TECH 2119)  
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)

(TECH 3120)  
Development of programs and courses for technology education and related fields, including content decision-making, delivery strategies, and program evaluation. Prerequisite(s): [330:019](TECH 1019); junior standing. (Offered Fall)

(TECH 3121/TECH 5121)  
Applications and analysis of technology systems. Also includes equipment operation, maintenance, and safety. Prerequisite(s): [330:008](TECH 1008); [330:010](TECH 1010); [330:024](TECH 1024); junior standing. (Offered Spring)
330:122(g). Advanced CAD and Modeling -- 3 hrs.
(TECH 3122/TECH 5122)
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): [330:023] (TECH 2024); [330:024] (TECH 1024); junior standing. (Variable)

(TECH 3124)
Basic principles, methods, and equipment pertaining to building mechanical systems (heating, cooling, ventilation, and plumbing) related to human health and comfort. Prerequisite(s): [330:045] (TECH 2045). Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/3000/4000-level construction management courses or student will be dropped. (Offered Spring)

330:125(g). Commercial and Heavy/Highway Construction -- 3 hrs.
(TECH 3125/TECH 5125)
Examination of systems and operational procedures used to construct commercial, heavy and highway projects. Study of soil mechanics, analysis/design of rigid and flexible pavements for airports and highways. Earthmoving, dewatering, and construction economics. Prerequisite(s): [120:030] (ACCT 2120); [150:080] (MGMT 2080); [330:025] (TECH 1025); junior standing. Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/3000/4000-level construction management courses or student will be dropped. (Offered Spring)

330:126(g). Land, Route, and Construction Surveying -- 3 hrs.
(TECH 3126/TECH 5126)
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): [330:018] (TECH 1018); [330:025] (TECH 1025); [800:060] (MATH 1420); junior standing. Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/3000/4000-level construction management courses or student will be dropped. (Variable)

(TECH 3127)
Application of fluid flow, heat transfer, and diffusion mass transport concepts to material processing including presentation of conduction, convection, radiation, Bernoulli's principles, turbulent flow, and Fick's first and second law of diffusion. Prerequisite(s): [330:008] (TECH 1008); [330:010] (TECH 1010); [330:023] (TECH 2024); [330:024] (TECH 1024); [330:043] (TECH 2043); [330:060] (TECH 2060); [330:072] (TECH 2072); [330:080] (TECH 2080); [800:048] (MATH 1150) or [800:060] (MATH 1420); [860:020] (CHEM 1020) or [860:044] (CHEM 1110); [880:054] (PHYSICS 1511) or [880:130] (PHYSICS 1701); junior standing or consent of instructor. (Offered Spring 2011)

(TECH 3128)
Basic principles of electricity and materials. Methods of electrical system designs in building construction. Prerequisite(s): [330:045] (TECH 2045). Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/3000/4000-level construction management courses or student will be dropped. (Offered Fall)
330:129(g). Linear Control Systems -- 3 hrs.  
(TECH 3129/TECH 5129)  
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): [330:152](TECH 2152); [880:054](PHYSICS 1511) or [880:130](PHYSICS 1701); junior standing. (Offered Fall 2010)

(TECH 3131/TECH 5131)  
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 3132)  
Advanced principles of metallurgy, properties, microstructural analysis, heat treatment, testing, and inspection of metals and alloys used in manufacturing. Lecture and lab. Prerequisite(s): [330:008](TECH 1008); [330:010](TECH 1010); [330:072](TECH 2072); [800:048](MATH 1150) or [800:060](MATH 1420); [860:020](CHEM 1020) or [860:044](CHEM 1110); [880:054](PHYSICS 1511) or [880:130](PHYSICS 1701); junior standing or consent of instructor. (Offered Fall 2011)

(TECH 3134)  
Study of molding practices used in contemporary metal casting. Prerequisite(s): [330:008](TECH 1008); [330:010](TECH 1010); [330:023](TECH 2024); [330:024](TECH 1024); [330:043](TECH 2043); [330:060](TECH 2060); [330:072](TECH 2072); [330:080](TECH 2080); [800:048](MATH 1150) or [800:060](MATH 1420); [860:020](CHEM 1020) or [860:044](CHEM 1110); [880:054](PHYSICS 1511) or [880:130](PHYSICS 1701); junior standing or consent of instructor. (Offered Fall 2011)

(TECH 3135/TECH 5135)  
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): [330:023](TECH 2024); [330:024](TECH 1024); [330:122](TECH 3122/TECH 5122); [800:048](MATH 1150) or [800:060](MATH 1420); [860:020](CHEM 1020) or [860:044](CHEM 1110); [880:054](PHYSICS 1511) or [880:130](PHYSICS 1701); junior standing. (Offered Spring 2011)

(TECH 4136)  
Advanced course in the principles of metal melting systems including selection of furnace types, charge materials, refractory lining applications, energy recovery, and environmental considerations. Prerequisite(s): [330:008](TECH 1008); [330:010](TECH 1010); [330:023](TECH 2024); [330:024](TECH 1024); [330:043](TECH 2043); [330:060](TECH 2060); [330:072](TECH 2072); [330:080](TECH 2080); [800:048](MATH 1150) or [800:060](MATH 1420); [860:020](CHEM 1020) or [860:044](CHEM 1110); [880:054](PHYSICS 1511) or [880:130](PHYSICS 1701); junior standing or consent of instructor. (Offered Fall 2010)
(TECH 4137)
Advanced course in the principles of foundry tooling design, including selection of pattern materials, rapid prototype development techniques, advanced polymer materials, and design of permanent mold tooling, as well as basic core box production techniques. Prerequisite(s): 330:008 (TECH 1008), 330:010 (TECH 1010), 330:023 (TECH 2024), 330:024 (TECH 1024), 330:043 (TECH 2043), 330:060 (TECH 2060), 330:072 (TECH 2072), 330:080 (TECH 2080), 800:048 (MATH 1150) or 800:060 (MATH 1420), 860:020 (CHEM 1020) or 860:044 (CHEM 1110), 880:054 (PHYSICS 1511) or 880:130 (PHYSICS 1701); junior standing or consent of instructor. (Offered Fall and Spring 2012)

(TECH 2142)
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): 800:046 (MATH 1140) or 800:048 (MATH 1150) or 800:060 (MATH 1420) or 800:072 (STAT 1772); sophomore standing. (Offered Fall and Spring)

(TECH 1144)
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): 330:022 (TECH 1022). (Offered Fall)

330:145. Production Planning and Control -- 3 hrs.
(TECH 3145)
Design, analysis, and management of production systems. Topics include: work measurement, methods improvement, demand flow, cost of manufacturing, materials requirement planning (MRP), job/machine scheduling, line balancing, facilities planning, process planning. Prerequisite(s): 330:008 (TECH 1008), 330:010 (TECH 1010), 330:023 (TECH 2024), 330:024 (TECH 1024), 330:043 (TECH 2043), 330:060 (TECH 2060), 330:072 (TECH 2072), 330:080 (TECH 2080), 800:048 (MATH 1150) or 800:060 (MATH 1420), 860:020 (CHEM 1020) or 860:044 (CHEM 1110), 880:054 (PHYSICS 1511) or 880:130 (PHYSICS 1701); junior standing or consent of instructor. (Variable)

(TECH 3147)
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): 330:008 (TECH 1008), 330:010 (TECH 1010), 330:023 (TECH 2024), 330:024 (TECH 1024), 330:043 (TECH 2043), 330:060 (TECH 2060), 330:072 (TECH 2072), 330:080 (TECH 2080), 800:048 (MATH 1150) or 800:060 (MATH 1420), 860:020 (CHEM 1020) or 860:044 (CHEM 1110), 880:054 (PHYSICS 1511) or 880:130 (PHYSICS 1701); junior standing or consent of instructor. (Variable)

(TECH 3148)
Principles of design for machine elements, failure analysis, clutches, brakes, dynamic loads, and balancing. Prerequisite(s): 330:008 (TECH 1008), 330:010 (TECH 1010), 330:023 (TECH 2024), 330:024 (TECH 1024), 330:043 (TECH 2043), 330:060 (TECH 2060), 330:072 (TECH 2072), 330:080 (TECH 2080), 800:048 (MATH 1150) or 800:060 (MATH 1420), 860:020 (CHEM 1020) or 860:044 (CHEM 1110), 880:054 (PHYSICS 1511) or 880:130 (PHYSICS 1701); junior standing or consent of instructor. (Offered Fall)

(TECH 3149)

Construction cost analysis techniques for estimating materials, labor, equipment, and subcontracting costs in commercial building construction. Prerequisite(s):

- 330:018 (TECH 1018)
- 330:025 (TECH 1025)
- 330:045 (TECH 2045)

Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/3000/4000-level construction management courses or student will be dropped. Corequisite(s):

- 330:124 (TECH 3124). (Offered Spring)

330:150(g). Graphic Communications Imaging -- 3 hrs.

(TECH 3150/TECH 5150)

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):

- 330:055 (TECH 1055); junior standing. (Offered Spring)


(TECH 2152)

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):

- 330:037 (TECH 1037)
- 330:039 (TECH 1039)
- 330:041 (TECH 2041)
- 800:048 (MATH 1150) or 800:060 (MATH 1420); sophomore standing. (Offered Spring)


(TECH 4153/TECH 5153)

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):

- 330:154 (TECH 4154/TECH 5154); junior standing.

Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/3000/4000-level construction management courses or student will be dropped. (Offered Spring)


(TECH 4154/TECH 5154)

Utilization of contemporary and emerging building estimating software and advanced estimating techniques. Prerequisite(s):

- 330:149 (TECH 3149); junior standing. Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/3000/4000-level construction management courses or student will be dropped. (Offered Fall)

330:155(g). Finite Element Analysis -- 3 hrs.

(TECH 4155/TECH 5155)

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):

- 330:008 (TECH 1008)
- 330:010 (TECH 1010)
- 330:023 (TECH 2024)
- 330:024 (TECH 1024)
- 330:043 (TECH 2043)
- 330:060 (TECH 2060)
- 330:072 (TECH 2072)
- 330:080 (TECH 2080)
- 800:048 (MATH 1150) or 800:060 (MATH 1420)
- 860:020 (CHEM 1020) or 860:044 (CHEM 1110)
- 880:054 (PHYSICS 1511) or 880:130 (PHYSICS 1701); junior standing or consent of instructor. (Variable)
(TECH 2156)
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): [330:037](TECH 1037); [330:039](TECH 1039); [330:042](TECH 2042) or [810:041](CS 1410); sophomore standing. (Offered Spring)

330:157(g). Microcomputer Applications -- 3 hrs.
(TECH 3157/TECH 5157)
Microcomputer technology applied to real-time industrial problems; survey of industrial computer hardware, networking, and software. Lecture and lab. Prerequisite(s): [330:152](TECH 2152); [330:156](TECH 2156); [810:030](CS 1130) or [810:036](CS 1160); junior standing. (Offered Fall)

330:158(g). Graphic Communications Technical Visualization -- 3 hrs.
(TECH 4158/TECH 5158)
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): [330:022](TECH 1022); junior standing. (Offered Spring)

(TECH 3160/TECH 5160)
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): [330:152](TECH 2152); [330:156](TECH 2156); [330:157](TECH 3157/TECH 5157); junior standing. (Offered Spring)

330:161(g). Digital Graphic Communications -- 3 hrs.
(TECH 4161/TECH 5161)
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. (Offered Fall)

(TECH 3163/TECH 5163)
Development, layout, and content management of single and complex color publications in a digital workflow environment. Lecture and hands-on collaborative group work and individual projects for prepress, packaging, and variable data print projects. Prerequisite(s): [330:055](TECH 1055); [330:070](TECH 2070); junior standing. (Offered Spring)

330:164(g). Programmable Logic Controllers (PLCs) -- 3 hrs.
(TECH 3164/TECH 5164)
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): [330:038](TECH 2038); [330:039](TECH 1039); [330:041](TECH 2041); [330:042](TECH 2042); [810:030](CS 1130) or [810:036](CS 1160); junior standing. (Offered Spring)
330:165(g). Wireless Communication Networks -- 3 hrs.  
(TECH 4165/TECH 5165)  
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): 330:103 (TECH 4103/TECH 5103) or 810:147 (CS 3470/CS 5470); junior standing. (Variable)

(TECH 3166/TECH 5166)  
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): 330:038 (TECH 2038); 800:048 (MATH 1150) or 800:060 (MATH 1420); 880:054 (PHYSICS 1511) or 880:130 (PHYSICS 1701); junior standing. (Variable)

330:167(g). Power Electronics Applications -- 3 hrs.  
(TECH 4167/TECH 5167)  
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): 330:038 (TECH 2038); 330:152 (TECH 2152); junior standing. (Offered Fall)

(TECH 3168/TECH 5168)  
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 1169)  
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): 330:022 (TECH 1022). (Offered Spring)

(TECH 4173/TECH 5173)  
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): 330:154 (TECH 4154/TECH 5154); junior standing. Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/300/4000-level construction management courses or student will be dropped. (Offered Spring)

330:174. Senior Design I -- 1 hr.  
(TECH 4174)  
Individual and/or team analytical research or design project. Collaboration with local industry, government agencies, or research institutions is encouraged. Must register for 330:176 (TECH 4176) (TECH 4176) in spring semester. Prerequisite(s): senior in EET major. (Offered Fall)
330:175(g). Structural Analysis in Construction -- 3 hrs.  
(TECH 4175/TECH 5175)  
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): 330:080 (TECH 2080); junior standing. Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/300/4000-level construction management courses or student will be dropped. (Offered Fall)

330:176. Senior Design II -- 3 hrs.  
(TECH 4176)  
Development and completion of project identified in 330:174 (TECH 4174) (TECH 4174). Prerequisite(s): 330:174 (TECH 4174). (Offered Spring)

330:177(g). Advanced Manufacturing Processes -- 3 hrs.  
(TECH 3177/TECH 5177)  
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): 330:008 (TECH 1008); 330:010 (TECH 1010); 330:023 (TECH 2024); 330:024 (TECH 1024); 330:043 (TECH 2043); 330:060 (TECH 2060); 330:072 (TECH 2072); 330:080 (TECH 2080); 800:048 (MATH 1150) or 800:060 (MATH 1420); 860:020 (CHEM 1020) or 860:044 (CHEM 1110); 880:054 (PHYSICS 1511) or 880:130 (PHYSICS 1701); junior standing. (Variable)

(TECH 4178/TECH 5178)  
Inquiry into recent applications in instructional strategies and content, including research, development, and management of modular technology instructional systems. Prerequisite(s): 330:190 (TECH 3190/TECH 5190) or consent of instructor; junior standing. (Offered Spring)

330:180. Lean Manufacturing -- 3 hrs.  
(TECH 4080)  
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. Prerequisite(s): 330:008 (TECH 1008); 330:010 (TECH 1010); 330:023 (TECH 2024); 330:024 (TECH 1024); 330:043 (TECH 2043); 330:060 (TECH 2060); 330:072 (TECH 2072); 330:080 (TECH 2080); 800:048 (MATH 1150) or 800:060 (MATH 1420); 860:020 (CHEM 1020) or 860:044 (CHEM 1110); 880:054 (PHYSICS 1511) or 880:130 (PHYSICS 1701); junior standing or consent of instructor. (Offered Spring)

330:181(g). Instructional Design for Career and Technical Education -- 2 hrs.  
(TECH 3131/TECH 5131)  
Basic methods of identifying, analyzing, selecting, and organizing instructional content for career and technical programs. Prerequisite(s): junior standing. (Variable)

330:182(g). Coordination of Techniques in Career and Technical Programs -- 2 hrs.  
(TECH 3182/TECH 5182)  
Planning, organization, development, and teaching of cooperative or multi-occupational programs in career and technical education. Prerequisite(s): junior standing. (Variable)
(TECH 3183)
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)

330:185(g). Methods Improvement and Quality Control Assurance in Construction -- 3 hrs.
(TECH 4185/TECH 5185)
Analysis and evaluation of methods improvement techniques and management of quality assurance and quality control. Prerequisite(s): junior standing. Prerequisite for Construction Management majors: student must have a minimum UNI GPA of 2.20 to take 100/3000/4000-level construction management courses or student will be dropped. Prerequisite(s) or corequisite(s): 330:154 (TECH 4154/TECH 5154). (Offered Fall)

(TECH 4187/TECH 5187)
Investigation of industrial supervision and management; includes directed field study in industry. Prerequisite(s): 150:153 (MGMT 3153) or 330:043 (TECH 2043) or 330:131 (TECH 3131/TECH 5131); junior standing. (Offered Fall and Spring)

330:188(g). Nanotechnology Fabrication -- 3 hrs.
(TECH 3188/TECH 5188)
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): 860:148 (CHEM 4210/CHEM 5210) or 880:148 (PHYSICS 4210/PHYSICS 5210); junior standing. (Variable)

330:190(g). Technology Education Teaching Methods -- 3 hrs.
(TECH 3190/TECH 5190)
Methods of teaching in technology 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): 330:019 (TECH 1019); 12 semester hours in industrial technology; junior standing. Prerequisite(s) or corequisite(s): for Education majors: 200:128 (EDPSYCH 3128); 200:148 (EDPSYCH 3148). (Offered Spring)

330:191(g). Implementing Career and Technical Programs -- 2 hrs.
(TECH 3191/TECH 5191)
Basic principles of instruction, instructional organization, methods of presentation, lesson planning, and applications of audio-visual media. Prerequisite(s): junior standing. (Variable)

(TECH 3192/TECH 5192)
Non-destructive evaluation of materials using such techniques as x-ray, gamma ray, liquid penetrant tests, magnetic particle, eddy currents, SEM, etc. Prerequisite(s): 330:072 (TECH 2072) or 330:132 (TECH 3132); junior standing. (Variable)

(TECH 3193/TECH 5193)
Basic concepts and techniques for evaluating students and programs in career and technical education. Prerequisite(s): 330:181 (TECH 3131/TECH 5131) or consent of department; junior standing. (Variable)
330:194(g). Graphic Communications Estimating and Management -- 3 hrs.  
(TECH 4194/TECH 5194)  
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): 330:055 (TECH 1055); junior standing. (Offered Spring)

330:195(g). Technology Education Program Management -- 3 hrs.  
(TECH 4195/TECH 5195)  
Design of safe and effective facilities for technology education and related fields, facility management, and development of a safety program. Prerequisite(s): 330:120 (TECH 3120) or 330:190 (TECH 3190/TECH 5190); junior standing. (Offered Fall)

(TECH 2196)  
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. (Offered Fall and Spring)

330:197. Industrial Projects II -- 2 hrs.  
(TECH 4197)  
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): 330:112 (TECH 4112). (Offered Spring)

(TECH 4198)  
(Variable)

(TECH 6200)  
Survey of the major topic areas of industrial technology and the professional issues in the field with the development of a Personal Career Development Plan (PCDP) in respect to those concepts, issues, and concerns. Prerequisite(s): consent of department or instructor. (Variable)

(TECH 6225)  
Study of analysis, design, and issues integrating logistics and supply operations in technological organizations. Includes sourcing and supply systems, process/product development activities, supply chain practices and quality considerations. Prerequisite(s): admission to Industrial Technology graduate program or consent of instructor. (Variable)

(TECH 6231)  
Application of thermodynamic principles and energy changes associated with processing of metals, ceramics and polymers. Concepts such as mass and energy balances, fundamental laws of thermodynamics, Gibb's free energy, and activity of binary liquid and solid solutions. Prerequisite(s): consent of instructor. (Offered Fall and Spring)
(TECH 6234)
In-depth emphasis of engineering materials focusing on the properties influencing processing and applications of metals, ceramics, composites, and polymers. Also includes discussion on high temperature materials and innovative new materials. Prerequisite(s): admission to Industrial Technology graduate program and consent of instructor. (Variable)

(TECH 6235)
Material transformation topics such as solidification science, micro- and macro- segregation principles, fluid flow of Newtonian and non-Newtonian liquids, and advanced solid state transformations are covered and directly correlated to material modeling techniques. Prerequisite(s): admission to Industrial Technology graduate program and consent of instructor. (Variable)

(TECH 6242)
Complex digital systems design at the logic gate level. Basic structure, sub programs, packages and libraries of VHDL; combinational/sequential logic design with VHDL; VHDL simulation and synthesis, FPGA implementation. Projects and labs using Xilinx Spartan-3 FPGA development kit. Prerequisite(s): admission to Industrial Technology graduate program or consent of instructor. (Variable)

(TECH 6244)
Design and implementation of microcontroller-based embedded computing systems to solve real-world problems. Methodologies, hardware platforms, software design and analysis, embedded OS, real-time scheduling, mixed signal processing, hardware accelerators, low power optimization. Prerequisite(s): admission to Industrial Technology graduate program or consent of instructor. (Variable)

(TECH 6248)
Advanced topics of power electronics, AC circuit modeling/simulation of power converters, transfer functions, feedback controller design, V and I mode control of DC-DC converters, inductor and transformer design, resonant converters, soft switching, inverters, HVDC transmission. Prerequisite(s): admission to Industrial Technology Graduate Program or consent of instructor. (Variable)

330:250. Technology of Productivity Improvement -- 3 hrs.
(TECH 6250)
Exploration of productivity as an operational concept; analysis of productivity in industrial settings to seek improvement through technical and managerial expertise. Prerequisite(s): admission to Industrial Technology graduate program or consent of instructor. (Variable)

(TECH 6258)
Managerial, technological, behavioral, and statistical concepts applied to total quality management. Quality management philosophies, continuous improvement, productivity, and issues affecting quality that apply to manufacturing, service, and technological organizations. Prerequisite(s): program approval and advisor endorsement, or approval of instructor. (Variable)
(TECH 6262)
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): [330:153] (TECH 4153/TECH 5153). (Variable)

(TECH 6265)
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): [330:125] (TECH 3125/TECH 5125); [330:185] (TECH 4185/TECH 5185). (Variable)

(TECH 6273)
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)
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): [330:180] (TECH 4080) or consent of instructor. (Variable)

330:282. Industrial Technology Seminar -- 1 hr.
(TECH 6282)
Selected problems relating to production, communication, and power systems. May be repeated for maximum of 4 hours. (Variable)

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

(TECH 6284)
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)
Supervised practicum in an industrial organization, public service agency, or education setting. A proposal must be approved by department advisor and setting supervisor prior to registration. Prerequisite(s): limited to master's degree candidates; program approval and advisor endorsement. (Variable)
(TECH 6290)
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)
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): 330:290 (TECH 6290) or consent of instructor. (Variable)

(TECH 6292)
Principles of methods and evaluation of research in industrial technology. Individual exploration of possible projects or thesis topics. (Variable)

(TECH 6294)
Overview of technology - its chronological development and evolution. Interrelationships among disciplines and influence of contemporary technology on industry, culture, education, and society. (Variable)

(TECH 6295)
Development of knowledge, skills, and advanced application experiences of management technologies utilized in industrial supervision and management. Prerequisite(s): 150:153 (MGMT 3153) or [330:043] (TECH 2043); 330:187 (TECH 4187/TECH 5187); or consent of instructor. (Variable)

(TECH 6296)
Emphasis on the relationships between theory, planning, research design, instrumentation assessment and administration, data collection and analysis, and the interpretation of findings. Includes critical reviews of previous research and preparation of proposal manuscripts. Prerequisite(s): 250:180 (MEASRES 4180/MEASRES 5180); 330:292 (TECH 6292) or consent of instructor. (Variable)

(TECH 6299)
(Ofered Fall and Spring)

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

(TECH 7375)
Development of production, communication, and power systems and their influence on society and the environment. Prerequisite(s): consent of instructor. (Variable)
(TECH 7376)
A study with emphasis on production, communication, and power systems; and their interrelationship with people, society, and the environment. Prerequisite(s): 330:375 (TECH 7375). (Variable)

(TECH 7377)
Current readings on technology and society; emphasis on analysis and discussion of the issues. Prerequisite(s): 330:376 (TECH 7376). (Variable)

(TECH 7378)
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. (Variable)

(TECH 7388)
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. (Offered Fall and Spring)

(TECH 7399)
Prerequisites: successful completion of 40 credit hours in approved program of study, internship, and approval of dissertation proposal. (Offered Fall and Spring)