<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
<th>Prereq:</th>
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<tbody>
<tr>
<td>INDT 310</td>
<td>Introduction to Industrial Technology</td>
<td>3</td>
<td>This course presents an overview of the careers that comprise the field of industrial technology and the courses and curriculum for the degree. Topical areas include: the concept of technology, overview of materials and manufacturing, safety science, network technology, electricity and electronics, automation and robotics, energy technologies, and nuclear technology. Recommended preparation: completed general education requirements.</td>
<td>MATH 160 or MATH 170</td>
</tr>
<tr>
<td>INDT 311</td>
<td>Problems in Industrial Technology</td>
<td>1</td>
<td>Students will develop a project applying technology to a National Academy of Engineering Challenge Problem. Recommended preparation: completed general education requirements.</td>
<td>INDT 310</td>
</tr>
<tr>
<td>INDT 332</td>
<td>Introduction to Analog and Digital Electronics</td>
<td>4</td>
<td>Introduction to the fundamental laws of electrical engineering, circuit analysis – D.C. and A.C. circuits-R-L and C elements – series and parallel circuits; D.C. and A.C. machines, Transformers, and Electrical measurements. Digital electronics: number system and codes; logic gates; Boolean algebra; ALU; introduction to CMOS.</td>
<td>INDT 310 or Permission</td>
</tr>
<tr>
<td>INDT 333</td>
<td>Industrial Electronics and Control Systems</td>
<td>3</td>
<td>Introduction to Control Systems: Fundamentals of programmable logic controllers. Logic concepts, Processing unit, input/output systems, peripheral devices, programming techniques, applications and interfacing. Recommended preparation: completed general education requirements.</td>
<td>INDT 332 or Permission</td>
</tr>
<tr>
<td>INDT 350</td>
<td>Introduction to Materials Science</td>
<td>3</td>
<td>Introduction to the fundamentals and applications of materials engineering. Atomic, molecular, and crystalline structures and properties of materials with their relevance to engineering. Topics will include: diffusion, defects, phase diagrams, heat treatment, mechanical behavior, and will cover the different materials classes, i.e., metals, ceramics, polymers, composites, and semiconductors.</td>
<td>INDT 310 or Permission</td>
</tr>
<tr>
<td>INDT 353</td>
<td>Manufacturing Systems</td>
<td>3</td>
<td>Introduction to manufacturing processes, mechanical and physical properties of materials, and solidification processes. Metal forming, materials removal processes, property enhancing, Joining and Assembly processes, and surface processing operations. Manufacturing systems, automation, and integrated manufacturing systems. Recommended preparation: completed general education requirements.</td>
<td>INDT 350 or Permission</td>
</tr>
<tr>
<td>INDT 362</td>
<td>Behavior Based Safety</td>
<td>3</td>
<td>Principles of paradigm shifts required for total safety, human barriers to safety, the basic principles of behavior-based psychology and behavioral safety analysis and behavior-based interventions.</td>
<td>PSYC 101</td>
</tr>
<tr>
<td>INDT 364</td>
<td>Hazardous Materials</td>
<td>3</td>
<td>Handling, transportation, and storage of hazardous materials; how to protect and suppress fires that occur in hazardous materials. Recommended preparation: completed general education requirements and INDT 310</td>
<td>CHEM 112/112L; and MATH 160 or MATH 170</td>
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<tr>
<td>INDT 400</td>
<td>Seminar</td>
<td>Credit arranged</td>
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<tr>
<td>INDT 404</td>
<td>Special Topics</td>
<td>Credit arranged</td>
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<tr>
<td>INDT 405</td>
<td>Professional Development</td>
<td>Credit arranged</td>
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<tr>
<td>INDT 408</td>
<td>Fire Safety Hazard Analysis</td>
<td>3</td>
<td>Collect and apply fire incident data and analysis. Conduct fire analysis. Conduct fire loss investigation. Identify the components that, alone or in combination, form emergency and standby power systems. Understand the dynamics of heating systems. Identify basic components and hazards associated with ‘hot work’ and manufacturing processes dealing with proper storage and handling procedures. Identify the fire hazards of grinding processes. Understand proper design, installation, and maintenance of electrical systems and appliances. Identify common types of refrigeration and associated hazards and their corrective actions. Identify the unique hazard of semiconductor manufacturing.</td>
<td>Permission</td>
</tr>
<tr>
<td>INDT 409</td>
<td>Fire Suppression Design and Detection</td>
<td>3</td>
<td>Identify the operational characteristics of modern fire alarm systems. Identify the proper applications of automatic fire detectors. Evaluate fire alarm systems, testing and maintenance. Identify the requirements and the benefits of fire alarm systems relating to other systems. Identify and understand the properties, proper use and limitations of non-water systems, halogen and carbon dioxide agents. Identify and understand the water supply system requirements as well as the design criteria for hydraulics for fire protection. Identify the properties and limitations of both dry and wet chemical extinguishing agents. Identify the properties and limitations of various foam extinguishing agents. Identify the properties and proper agents and application techniques for combustible metal fires.</td>
<td>Permission</td>
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INDT 310: Introduction to Industrial Technology

This course presents an overview of the careers that comprise the field of industrial technology and the courses and curriculum for the degree. Topical areas include: the concept of technology, overview of materials and manufacturing, safety science, network technology, electricity and electronics, automation and robotics, energy technologies, and nuclear technology. Recommended preparation: completed general education requirements.

Prereq: MATH 160 or MATH 170

INDT 311: Problems in Industrial Technology

Students will develop a project applying technology to a National Academy of Engineering Challenge Problem. Recommended preparation: completed general education requirements.

Prereq: INDT 310

INDT 332: Introduction to Analog and Digital Electronics

This course presents an overview of the careers that comprise the field of industrial technology and the courses and curriculum for the degree. Topical areas include: the concept of technology, overview of materials and manufacturing, safety science, network technology, electricity and electronics, automation and robotics, energy technologies, and nuclear technology. Recommended preparation: completed general education requirements.

Prereq: INDT 310

INDT 333: Industrial Electronics and Control Systems

This course presents an overview of the careers that comprise the field of industrial technology and the courses and curriculum for the degree. Topical areas include: the concept of technology, overview of materials and manufacturing, safety science, network technology, electricity and electronics, automation and robotics, energy technologies, and nuclear technology. Recommended preparation: completed general education requirements.

Prereq: INDT 332 or Permission

INDT 350: Introduction to Materials Science

This course presents an overview of the careers that comprise the field of industrial technology and the courses and curriculum for the degree. Topical areas include: the concept of technology, overview of materials and manufacturing, safety science, network technology, electricity and electronics, automation and robotics, energy technologies, and nuclear technology. Recommended preparation: completed general education requirements.

Prereq: INDT 310 or Permission

INDT 353: Manufacturing Systems

This course presents an overview of the careers that comprise the field of industrial technology and the courses and curriculum for the degree. Topical areas include: the concept of technology, overview of materials and manufacturing, safety science, network technology, electricity and electronics, automation and robotics, energy technologies, and nuclear technology. Recommended preparation: completed general education requirements.

Prereq: INDT 350 or Permission

INDT 362: Behavior Based Safety

Principles of paradigm shifts required for total safety, human barriers to safety, the basic principles of behavior-based psychology and behavioral safety analysis and behavior-based interventions.

Prereq: PSYC 101

INDT 364: Hazardous Materials

Handling, transportation, and storage of hazardous materials; how to protect and suppress fires that occur in hazardous materials. Recommended preparation: completed general education requirements and INDT 310

Prereq: CHEM 112/112L; and MATH 160 or MATH 170

INDT 400: Seminar

Credit arranged

INDT 404: Special Topics

Credit arranged

INDT 405: Professional Development

Credit arranged

INDT 408: Fire Safety Hazard Analysis

Collect and apply fire incident data and analysis. Conduct fire analysis. Conduct fire loss investigation. Identify the components that, alone or in combination, form emergency and standby power systems. Understand the dynamics of heating systems. Identify basic components and hazards associated with ‘hot work’ and manufacturing processes dealing with proper storage and handling procedures. Identify the fire hazards of grinding processes. Understand proper design, installation, and maintenance of electrical systems and appliances. Identify common types of refrigeration and associated hazards and their corrective actions. Identify the unique hazard of semiconductor manufacturing.

Prereq: Permission

INDT 409: Fire Suppression Design and Detection

Identify the operational characteristics of modern fire alarm systems. Identify the proper applications of automatic fire detectors. Evaluate fire alarm systems, testing and maintenance. Identify the requirements and the benefits of fire alarm systems relating to other systems. Identify and understand the properties, proper use and limitations of non-water systems, halogen and carbon dioxide agents. Identify and understand the water supply system requirements as well as the design criteria for hydraulics for fire protection. Identify the properties and limitations of both dry and wet chemical extinguishing agents. Identify the properties and limitations of various foam extinguishing agents. Identify the properties and proper agents and application techniques for combustible metal fires.

Prereq: Permission
INDT 410 Loss Control
3 credits
Initiate and coordinate hazard abatement solutions with building managers, plant personnel in providing the corrective actions for life safety and fire protection deficiencies. Use calculations to identify friction loss. Use calculations in determining fire resistive coatings used in buildings. Identify the hazards of explosion prevention and protection. Understand the precautionary need for various types of air-moving equipment. Identify building construction elements for fire protection. Understand the elements of confinement of fire in buildings. Identify and describe the structural damage factors to be evaluated after a fire. Identify fire hazards of construction, alteration and demolition of buildings.
Prereq: Permission

INDT 411 Fire and Life Safety Management
3 credits
Conduct complex inspection surveys of commercial and residential properties to evaluate physical characteristics of a property and business. Oversee acquisition, installation, operation, maintenance and disposition of building systems. Understand public protection class and municipal and private water systems. Possess knowledge of property fire insurance, building construction and/or field experience in performing fire/property surveys involving detailed analysis. Observe, examine, inspect, gather data and describe all aspects of a property/building and business. Possess knowledge of fire services, environmental hazards, and building construction.

INDT 412 Engineering for Fire and Life Safety
3 credits
Identify fire protection in special occupancies. Identify fire protection in warehouse and storage operations. Identify fire protection of electronic equipment. Understand and apply related NFPA standards and company requirements and standards. Evaluate code, law, and regulation compliance of a facility's operations. Identify safety control systems (PLC controllers, hardwired interlock systems) as it applies to: NFPA 70E, 79, 85 and 86 ANSI/ISA 84.00.01-2003 (IEC 61511) Safety Integrity Levels 1, 2 or 3. Identify principles of human behavior and fire. Identify the chemistry and physics of fire. Identify dynamics of fire growth. Identify challenges to safety in the built environment. Apply fundamentals of safe building design. Identify the local and regional codes and standards for the built environment.

INDT 413 Community Planning and Design for Fire Protection and Management
3 credits
Perform pre-incident planning for industrial and commercial facilities. Identify and understand the operations of fire loss prevention and emergency organizations. Evaluate operations of public emergency operations, fire training and communication systems. Identify the use and function of fire emergency services protective clothing and protective equipment. Identify concepts of egress design. Use calculation methods for egress prediction. Develop and manage emergency preparedness procedures and assure all emergency systems and procedures are tested as planned. Identify the elements of the National Incident Management System (NIMS) in relation to emergencies.
Prereq: Permission

INDT 414 Industrial Sustainability Analysis
3 credits
Cross-listed with TM 419
This course covers two practical topics, which are Sustainability Assessment (Topic 1) and Advanced Manufacturing (Topic 2). Topic 1 establishes the concept of sustainability, and sustainable design and manufacturing. Under this section, we introduce the intersection of sustainability and manufacturing through sustainable development, sustainability principles, and sustainable engineering. Topic 2 provides an overview of what Advanced Manufacturing (AM) is, what approaches are used, what the possible applications are, and what the limitations of the technology are. We focus on AM processes, principles, sustainability performance of AM, and sustainability assessment of AM at the macro and micro level. Students will complete one project including techno-economic and socio-environmental studies in the broad area of food-energy-water processes and systems.

INDT 415 Impact of Technology on Society
3 credits
In-depth examination of the impact technology has had and will continue to have on society. Recommended preparation: completed general education requirements.
Prereq: INDT 310 or Permission

INDT 416 Government Contract Law
3 credits
Contract formation, and contract administration pertaining to government contracts. Recommended preparation: completed general education requirements and INDT 310.

INDT 417 Quality Assurance Organization and Management
3 credits
Industrial management principles applied to effective economic control of quality assurance activities. Recommended preparation: completed general education requirements.
Prereq: INDT 310; and STAT 251 or STAT 301
INDT 466 Human Performance Field Investigation
3 credits
Provides education in the area of participating in an investigation of an incident that has a significant human contribution. Principles of the old view of human error – the problems it holds, the traps it represents, and the temptations that can make one fall into them. The new view of human error in which human error is the starting point for an investigation. Reconstruct the human contribution to system failure and "reverse engineer" the evolving mindset of personnel who were caught up in an event. Investigate the biases and difficulties in understanding past behavior associated with system failure. Recommended preparation: completed general education requirements.
Prereq: INDT 464

INDT 470 Homeland Security
3 credits
This course will provide students with a basic understanding of terrorism involving Weapons of Mass Destruction (WMD) (e.g. biological, nuclear, incendiary, chemical, radiological, and explosive devices). The history of WMD/Terrorism and how it relates to modern day devices and concepts will be discussed. The students will gain an understanding of international terrorism and homegrown terrorists. Recommended preparation: completed general education requirements.

INDT 472 National Incident Management Systems
3 credits
This course is designed to increase the participants’ knowledge and understanding of the inherent flexibility of the Incident Command System to manage major or complex incidents. Utilizing lectures and small group activities, participants will acquire an in-depth knowledge of the National Incident Management System (NIMS), terminology, players, and management philosophy. Participants will also acquire the ability to organize and manage major or complex incidents. The material covered during the course includes command and general staff duties and responsibilities, unified command, major incident management and area command structures. Recommended preparation: completed general education requirements.

INDT 473 Fundamentals of Unmanned Aerial Systems
3 credits
The course introduces students to unmanned aerial systems (UAS) and provides an overview of UAS types, applications, and operation considerations. The general principles of aerodynamics, propulsion, navigation and stability control applied to UAS are studied. The course provides an in-depth coverage of the main components integrated in both civilian and military UAS, such as payloads, ground control systems, communication data links, and launch/recovery systems.
Prereq: General Technical Background

INDT 474 Mechatronics Systems
3 credits
Mechatronics is a multi-disciplinary engineering discipline representing a synergistic combination of mechanical, electrical, control, and computer engineering, integrated through a design process. The course provides a cross-disciplinary study of mechatronics systems at a theoretical and practical level. The emphasis is on a balanced approach to: (1) theoretical and analytical understanding of the fundamentals of mechatronics system design, and (2) practical implementation of learned concepts. Software and hardware simulation and interfacing is studied and reinforced through a set of assignments, lab exercises, and a project, based on the Lego Mindstorms EV3 kit.
Prereq: INDT 333 or Permission
INDT 484 Industrial Technology Capstone I  
3 credits
*Gen Ed: Senior Experience*
This course is the first of two capstone courses. The students will select and develop a project that applies technology to a problem. Students are encouraged to incorporate service learning into the project and work in teams. One hour of lecture and two 3-hour labs per week. Recommended preparation: Senior standing.
**Prereq:** INDT 442 and INDT 444

INDT 485 Industrial Technology Capstone II  
3 credits
This course is second of the two capstone courses. The students will develop their project that applies technology to a problem. Students are encouraged to incorporate service learning into the project and to work in teams. One hour of lecture and two 3-hour labs per week. Recommended preparation: Senior standing.
**Prereq:** INDT 442 and INDT 444

INDT 499 (s) Directed Study  
Credit arranged