## ENGR 100
**Engineering Physics**
The overall objective of the course is to prepare secondary school students to be successful in a typical university freshmen-level introduction to engineering curriculum. Students will use hands-on project work, presentations, and discussion to gain a broad perspective of a number of individual engineering disciplines. Students will understand and apply the various aspects of the engineering design process, understand and apply creative and analytical problem solving methods to various situations and improve their ability to use technical-based communication. The format of projects will be written, oral, or graphical.

**Lecture:** 3  
**Lab:** 0  
**Credits:** 3

## ENGR 111
**Introduction to Engineering and Design**
This course introduces the student to the basic concepts and practices common to engineering. The engineering design process is presented through examples and hands-on projects. Along with fundamental engineering principles, communication skills, computer applications, and professional ethics will be included. Upon successful completion, the student will have been provided a foundation for further study in engineering.

**Lecture:** 2  
**Lab:** 0  
**Credits:** 2

## ENGR 112
**Introduction to Robotics**
Introductory experience to the field of robotics. Included in this experience will be the engineering design process, a university-level programming language, and open-ended problem solving strategies. Students, working in small hands-on teams, will be presented with several authentic design challenges. To meet these challenges, students will design, build, and program an appropriate LEGO? EV3 robot with National Instruments LabVIEW software. Teams will document and present their design solutions. Additional topics may include motor control, gear ratios, torque, friction, sensors, timing, program loops, logic gates, decision-making, and timing sequences. The course incorporates Next Generation Science Standards (NGSS).

**Lecture:** 2  
**Lab:** 0  
**Credits:** 2

## ENGR 200
**Entrepreneurship NOW! -- Introduction to the Entrepreneurial Mind Set**
This course introduces students to the basic skill set that changes a student’s perspective from one of passive reception and learning to active participation and purposeful exploration to create value. This is a hands-on course where students learn to climb Mount Everest as a team, learn and practice the five disciplines for creating value, spark creativity and invention, learn the IIT-way to design, prototype, prototype and prototype, elevator pitching, and practice what they have learned by competing in a mini-innovation chase. The winners receive free courses at IIT to continue their journey to perfect the entrepreneurial mind set.

**Lecture:** 0  
**Lab:** 4  
**Credits:** 2

## ENGR 411
**Fabrication Practices for Engineers**
The course will provide an overview of standard shop practices, machining theory, measurement, mechanical drawing, dimensioning requirements, tolerances, material selection, fastener selection, and shop safety. This course will provide basic instruction on the proper use and complimentary capabilities of standard machine tools. Hand tools, drill press, lathe, mill, band saw, CNC machines, laser cutters and 3D printers will be used by students. Students will fabricate a variety of parts that will demonstrate the capabilities of individual machine tools.

**Lecture:** 0  
**Lab:** 5  
**Credits:** 2

## ENGR 496
**Practical Engineering Training**
This course is a mentored, immersive practical engineering training. Students learn under the direction of professional engineers and practicing engineers by working on real engineering projects. The student will perform hands-on engineering, including learning and developing/applying engineering principles and concepts to complete the project assigned to the student. The student will apply engineering ethics and safety during their practical engineering training. Students will communicate the results of their work in written and oral communications. Students will receive assignments of varying complexity consistent with their undergraduate standing.

**Lecture:** 0  
**Lab:** 9  
**Credits:** 3

## ENGR 497
**Special Topics: Introduction to Research**
This course introduces students to research methods, techniques for measurement and data analysis, lab safety, and contemporary issues related to research in a university setting. Students will be introduced to research proposal development, scientific literature reviews, measurement techniques, statistical data analysis, design of experiments, good laboratory practice, and proper presentation techniques. Ethics and intellectual property topics related to research will also be covered. During this course, students will be involved in hands-on experimentation in order to practice their measurement and data analysis skills as well as test their hypotheses. Experiments will focus on the engineering themes of energy, water, health, and security.

**Lecture:** 0  
**Lab:** 3  
**Credits:** 3

## ENGR 498
**Undergraduate Research Immersion: Team**
This course provides a faculty-mentored immersive research experience as a part of a student team. Research topics are determined by faculty mentor’s area of research.

**Lecture:** 0  
**Lab:** 6  
**Credits:** 3

## ENGR 499
**Undergraduate Research Immersion: Individual**
This course provides a faculty-mentored immersive research experience. Research topics are determined by faculty mentor’s area of research.

**Lecture:** 0  
**Lab:** 6  
**Credits:** 3
ENGR 502
Medical Device Regulations and Commercialization
This course helps prepare students for commercializing medical devices within a highly-regulated environment. Concepts include protecting intellectual property, the structure and scope of the Federal Drug Administration (FDA), developing, testing, producing and marketing medical devices under FDA regulations, total product lifecycle, and quality management.
Lecture: 3 Lab: 0 Credits: 3

ENGR 510
Strategic Engineering Management
This course will review technology-based enterprises and the driving forces that impact corporate strategy. Students will learn how to apply engineering knowledge to determine technology/product direction and make/buy/partnering decisions. Relationships between research and development, operations, finance, marketing, and other functions within engineering-based organizations that drive strategic decisions will be examined. Strategy development and competitive analysis will be included. Case studies from the industry relevant to the student’s engineering track will be reviewed.
Lecture: 3 Lab: 0 Credits: 3

ENGR 520
Best Practices in Engineering Project Management
Many engineering projects suffer due to weak business cases, schedule slippages, and cost overruns. This course presents commonly used tools and techniques and best practices to build an effective business case, develop a realistic schedule and budget, and successfully execute and complete a project. Students are introduced to a generic project management life cycle model, review basic project management principles, tools, and techniques, and learn engineering-tailored best practices used by high performing, project-centric organizations. Students have an opportunity to apply selected tools in the form of short classroom exercises.
Lecture: 3 Lab: 0 Credits: 3

ENGR 521
Risk Management in Engineering Projects
In project management, a risk is considered an uncertain event that may have a positive or a negative impact on project objectives. Managing identified threats individually through customized strategies is key to project success. Similarly, opportunities must be leveraged for better project outcomes. Implementation of an effective risk management process is imperative for today’s complex projects. This course presents a five-step process to manage project threats as well as opportunities. On every project, students will be able to identify and analyze risks and develop response strategies for each identified risk and take proper response action to manage the risks. Industry best practices and quantitative tools and simulations are used to analyze risk.
Lecture: 3 Lab: 0 Credits: 3

ENGR 531
Urban Systems Engineering Design
ENGR 531 is a project-based course where students will explore integrated designs of urban systems. Each project will apply the students? engineering disciplines (such as structures, transportation, building science, construction engineering and management, environmental engineering) in a comprehensive analysis that considers the economic, human, and environmental issues associated with the project.
Lecture: 3 Lab: 0 Credits: 3

ENGR 532
Urban Systems Engineering Seminar
ENGR 532 is an active seminar course that emphasizes current topics in urban systems engineering. Invited speakers will include researchers and representatives from current practice, such as municipal and regional planners and consultants. Appropriate readings will be assigned in advance of each speaker to guide students in preparation for active discussion with each speaker. Each student will also write a term paper on an urban systems engineering topic of their choice, connecting material from the assigned reading, the speakers, and additional references selected by the student.
Lecture: 3 Lab: 0 Credits: 3

ENGR 534
Product Design and Innovation
This course covers all aspects of planning new products or services that are commercially viable and add to a company’s suite of offerings. It includes such topics as user research, market analysis, need/problem identification, creative thinking, ideation, concepiting, competitive benchmarking, human factors, prototyping, evaluation, and testing. The course includes creative, analytical, and technical skills in a balanced approach using such teaching methods as case studies, individual exercises, and group projects.
Lecture: 3 Lab: 0 Credits: 3

ENGR 539
Robotic Motion Planning
Configuration space. Path planning techniques including potential field functions, roadmaps, cell decomposition, and sampling-based algorithms. Kalman filtering. Probabilistic localization techniques using Bayesian methods. Trajectory planning.
Lecture: 3 Lab: 0 Credits: 3

ENGR 572
Construction Cost Accounting and Control
Lecture: 3 Lab: 0 Credits: 3
ENGR 587
Introduction to Digital Manufacturing
This course is about the digital revolution taking place in the world of manufacturing and how students, workers, managers, and business owners can benefit from the sweeping technological changes taking place. It is about the change from paper-based processes to digital-based processes all through the design/ manufacturing/deliver enterprise, and across the global supply chain. It touches on digital design, digital manufacturing engineering, digital production, digital quality assurance, and digital contracting, from large companies to small. There is also a significant focus on cyber security and the new types of threats that manufacturers face in the new digital world. Other topics covered include intelligent machines, connectivity, the digital thread, big data, and the Industrial Internet of Things (IIoT).
Lecture: 3 Lab: 0 Credits: 3

ENGR 588
Additive Manufacturing
This course examines the fundamentals of a variety of additive manufacturing processes as well as design for additive manufacturing, materials available, and properties and limitations of materials and designs. It also examines the economics of additive manufacturing as compared to traditional subtractive manufacturing and other traditional techniques. Additive techniques discussed include 3D printing, selective laser sintering, stereo lithography, multi-jet modeling, laminated object manufacturing, and others. Advantages and limitations of all current additive technologies are examined as well as criteria for process selection. Processes for metals, polymers, and ceramics are covered. Other topics include software tools and connections between design and production, direct tooling, and direct manufacturing. Current research trends are discussed.
Lecture: 3 Lab: 0 Credits: 3

ENGR 575
Systems Analysis in Engineering
Management and system concepts, linear programming, graphical methods, Simplex, two-phase Simplex, the transportation problem, the assignment problem, integer programming, and sensitivity analysis. System modeling by activity networks; maximal-low flow, longest-path and shortest-path analyses, flow graphs, decision-tree analysis, stochastic-network modeling, queuing systems, and analysis of inventory systems. Case studies from the construction industry.
Lecture: 3 Lab: 0 Credits: 3

ENGR 576
Nanotechnology
This course covers the general methods used for micro- and nanofabrication and assembly, including photolithography techniques, physical and chemical deposition methods, masking, etching, and bulk micromachining as well as self-assembly techniques. It also covers nanotubes, nanowires, nanoparticles, and the devices that use them, including both electronic and mechanical-electronic systems, as well as nano-structural materials and composites. Focus is on commercially available current processes as well as emerging technologies and evolving research areas. Sensing and instrumentation as well as nano-positioning and actuation are covered briefly.
Lecture: 3 Lab: 0 Credits: 3
ENGR 596  
**Practical Engineering Training**  
This course is a mentored, immersive practical engineering training. Students learn under the direction of professional engineers and practicing engineers by working on real engineering projects. The student will perform hands-on engineering, including learning and developing/applying engineering principles and concepts to complete the project assigned to the student. The student will apply engineering ethics and safety during their practical engineering training. Students will communicate the results of their work in written and oral communications. Students will receive assignments of varying complexity consistent with their graduate standing.  
*Lecture: 0 Lab: 9 Credits: 3*

ENGR 598  
**Graduate Research Immersion: Team Project**  
This course provides a faculty-mentored immersive team-based research experience. Research topics are determined by the faculty mentor’s area of research. In addition to the mentored research, students participate in seminars, prepare a written report of their research findings, and present their research findings at a poster expo.  
*Lecture: 3 Lab: 0 Credits: 3*

ENGR 599  
**Graduate Research Immersion: Individual**  
This course provides a faculty-mentored immersive research experience. Research topics are determined by the faculty mentor’s area of research. In addition to the mentored research, students participate in seminars, prepare a written report of their research findings, and present their research findings at a poster expo.  
*Lecture: 3 Lab: 0 Credits: 3*