Industrial Engineering Graduate Studies Program

General Information

Industrial engineers use data to analyze, design and optimize — improving decision making and shaping systems comprised of humans, machines, and processes. An Industrial Engineering degree is relevant to all industries and sectors of the economy including business consulting, energy, finance, health, manufacturing, robotics, and transportation.

The overall objective of our programs is to conduct fundamental research in industrial engineering and operations research in accordance with scientific and technological developments, and to provide the students with a strong analytical basis for innovative applications and advanced theoretical work. The primary research is focused on modeling and optimization, stochastic systems and statistics, with a wide range of applications in manufacturing, system engineering, ergonomic, production, scheduling, logistics, finance, health care, energy and sustainability.

In addition to their academic research, faculty members of the department are actively involved in applied research projects supported by industry and government organizations. Thanks to this accumulation, the department has the opportunity to provide education in a wide range, to take part in joint research projects, and to continue all kinds of national and international academic activities.

The aim of the Industrial Engineering Master's Program is to train graduate engineers, who are at the forefront of researcher identity, who develop existing systems and design new systems in the face of complex problems that arise in enterprises in the manufacturing and service sectors with the effect of globalization. The Industrial Engineering Master's Program offers students a curriculum aimed at applying the principles of efficiency, productivity, compatibility, quality, and continuous improvement in the life cycles of systems, products and services. In addition to the ability of students to analyze with existing quantitative and qualitative methods, it is aimed to form and develop their research capacity.

The aim of the Industrial Engineering Department Doctorate Program is to provide students with high-quality education opportunities by transferring high-level knowledge and experience in industrial engineering, which is a rapidly changing field, and in this context, to prepare students to be the leaders of the future in the industrial engineering profession, business life and academic life. In addition, it is to enable students to specialize by developing their views on industrial problems and responsibilities. Another aim is to contribute to the industrial and economic development of Turkey by conducting high-quality theoretical and applied research in the fields covered by industrial engineering.

Students who will study for a post-graduate in Industrial Engineering;

- Be able to do different studies on the design of production / production lines and production / manufacturing processes
- Be able to perform optimization studies in various fields with mathematical methods

- Be able to plan by evaluating the mental, cognitive and physical conditions of people in the working areas within the framework of ergonomics, taking into account the human factor,
- Be able to follow the quality processes in detail,
- Gain the ability to identify and solve scientific problems,
- Have the knowledge and equipment to keep up with the rapid changes in the industry,
- Be able to analyze the data and material flow and workforce distribution within that system and redesign the system with optimization methods in order to increase the performance of a system,
- Be able to solve the problems they encounter with their advanced communication and leadership skills,
- Be able to take authority and responsibility in group work, and take initiative when necessary
- Be able to grasp the scientific research process easily, have an advanced level of awareness about the latest research topics,
- Be able to gain special knowledge and equipment from subfields of Industrial Engineering,
- Be able to prepare projects that will be beneficial to our country's competitive power in the international arena,
- Publishing his contributions to science and industry in the form of thesis, article and book,

Information on Graduate Research Areas of the Department of Industrial Engineering

Optimization & Decision Theory

As all industrial engineers know, our profession is; for the analysis, planning, organization, execution, inspection and development of these integrated systems in the production and service sector consisting of human, machine, material and similar elements;(?) is a branch of engineering that focuses on preventing and solving problems by developing systems, models and methods.

The aim of area is to carry out effective and efficient studies in production and management systems.

While performing these duties and responsibilities, industrial engineers use social sciences, computer sciences, basic sciences, management sciences, modern communication skills as well as physical, behavioral mathematics, statistics / probability. Industrial Engineers; examine, plan, organize these systems in order to create systems that are simpler, more humane, less tiring, more reliable, less costly, better quality, less stocked, less faulty, more economical, more profitable, more efficient capacity utilization They must carry out, supervise, develop and ensure their implementation. The most effective use of inputs and increasing the performance of the processes, increasing the output amounts and quality relative to the Industrial Engineers are the main duties and responsibilities.

The decision is the most important one of the popular topics of interest to management sciences and psychology, as a general expression of choices that people make at all times.

Random Systems & Simulation

Simulation is a method that includes logical and mathematical relationships in order to understand the structure and behavior of the real system, and provides the opportunity to experiment with computers or other tools outside the system.

Features of Simulation

- Observes and defines system behavior.
- Establishes theories and hypotheses that are valid for observed behaviors.

- Predicts system behavior.
- Provides the ability to control the system.
- Simulation is used in the design and analysis of complex systems
- Simulation is used to achieve one or more of the following purposes.
- Evaluation: Showing how well the proposed system works according to the determined criteria.
- Comparison: Comparison of proposed system designs or policies
- Prediction: Estimating the performance of the system under recommended conditions
- Sensitivity Analysis: Determining which factors affect the performance of the System
- Optimization: Determining a combination of factor levels that give the best performance value
- Bottleneck Analysis: Simulation is used to identify bottlenecks in a system.

It may be necessary to use simulation to solve some problems. Simulation is useful in the following situations:

- The lack of an exact mathematical model of the problem.
- The mathematical model cannot be solved by analytical approach.
- Analytical solution is possible, but this solution is mathematically very complex.
- Analytical solution increases costs.
- The system is still in the design phase
- System behavior analysis

Production Systems

It is possible to define a system as a meaningful whole that consists of certain parts (sub-units, subsystems), with certain relations between the parts and the relation of the parts with the external environment. Any structure, event or action consisting of unified and integrated parts is treated as a system.

In today's conditions, system approach thinking is widely used in every field. The concept in question also provided a wide viewpoint to production management. While each of the enterprises is considered as a system, the production systems, which are a sub-system of the enterprise, are considered as a framework consisting of activities that can create value for the society.

Production systems; "It is the process of converting the inputs provided from inside and outside the system into a physical output by finding the most suitable component in order for businesses to achieve their determined goals". According to this definition, production systems have three basic elements. These; can be counted as inputs, transformation process and outputs.

Inputs: In order to take part in a production action, there are items called inputs that must be taken from outside to the action center. We can classify the inputs that need to flow into the transformation process in terms of space, time, quantity and quality in two ways. These; uncontrollable inputs and controllable inputs.

- Uncontrollable inputs, although they affect the production system, are those that cannot be affected by the production system. These are other systems that are outside the production system. Legal system, social system, economic system, natural system and psychological system constitute uncontrollable inputs and are named as environmental factors. Although a change in the production system does not make a change in environmental factors, the opposite situation may affect the production system positively or negatively and even make it necessary to redesign.

- Controllable inputs are those whose quantities, forms, locations, qualities, proportions and flows can be changed by the production system. These consist of raw material, capital, worker and technology.

Transformation Process: In terms of production systems, the decision areas of the transformation process, which is a subsystem of the production system, determination of production type, determination of capacity, selection of the place of establishment, scheduling of production, determination of material flow paths, determination of machinery and equipment, layout arrangement, processing and maintenance - Determining the actions related to the repair.

Outputs: The goods and services produced constitute the outputs of the system. When inputs turn into goods and services in the production process, quality and cost information accumulates on the said goods and services. The quantity and characteristics of the quality and cost pair are determined by the stages of the previous production system.

Data Mining

It is the process of accumulating a large amount of information and scanning the useful information. Estimating future customer behavior and identifying models within customer information.

The rapid development of technology enabled us to record many transactions electronically, to save these records and to access them whenever they wanted. Companies want to use the data in the electronic environment for analysis while making future decisions. The data, which stands in stacks in the computer environment, is meaningful thanks to data mining.

Unless data is processed, it is worthless. Stacked data is processed and converted into information. Basically, data is divided into predefined classes according to their attributes. Data mining processes the recorded data in order to gain meaning and transforms it into information. We can use this data that is turned into information in our sales processes.

Economy & Finance Engineering

The risks we face have also changed due to the globalization and the rapidly developing technologies and the increasing international trade and relations. Currency movements in the money markets have become one of the most important risks facing the institutions. Risk Management has emerged as a very important discipline. Each organization has to calculate the risks it faces in the most effective way according to its business approach and objectives.

Financial Engineering simulates the operation of the financial instruments necessary for the realization of the risk management in the money market, the correct pricing and modeling of mathematical modeling. interest-free risk management efforts have also gained great importance in order to reduce the systemic risks it has created.

Ergonomics

Ergonomics; taking into account the physiological and psychological characteristics of human beings, is a branch of science that examines the harmony of human with machine and environment.

With ergonomics studies;

- Balancing workload and working power in the best way,
- It protects the health of the employee,
- Interaction of human - machine - environment systems, which ensures production efficiency,
- Application of the fields of anatomy, physiology and experimental psychology,

- Briefly; It covers all of the works to optimize the working and living conditions of the designs intended for human use.

Thanks to ergonomic improvements, the working environment is free of the dangers and accidents; it is transformed into an environment that enhances human motivation. In addition, due to the ergonomic disruptions of the work is prevented and the efficiency is increased and the cycle time decreases. Ergonomic arrangements do not only cover the production environment; office ergonomics, hospital ergonomics, city ergonomics also provide great benefits.

The studies that can be done within this scope can be examined under 8 main topics:

- Physical Evaluation of the Workplace
- Anthropometric Review
- Manual Lifting Work (NIOSH)
- Ergonomic Workplace Organization
- Personal Protectors / Machine Protectors
- Risk Analysis and Hazard Sources
- Posture Analysis
- Physical Loads for Mental Loads and Blue Collar in Office Work

System Engineering

The system is a structure that brings together different elements and produces results that they cannot produce when they are separate. These elements; parts, people, software, hardware, facilities, techniques and technologies, documents, policies etc. elements.

System Engineering enables the design, production, maintenance and termination of complex systems or subsystems that constitute these systems, especially considering economic fluctuations and time, cost, quality, productivity and ethical constraints.

In today's world, complex systems are often;

- Technical,
- Biological,
- Sociological,
- Environmental,
- Industrial,
- Political,
- Financial and Economic

as a result of at least a few of the systems. Especially economic fluctuations affect all systems in terms of cost, time, quality, efficiency and ethics.

Systems Engineering programs address, analyze or design the whole using all the basic concepts, tools and methods required for the analysis of functionally complex systems.

With the System Engineering approach, the whole system is taken as a whole rather than focusing separately on the parts that make up the system, and problems or problems can be detected and resolved faster by an interdisciplinary approach.

The System Engineering approach defines the functional and conceptual structure as a whole and elaborates the whole function as much as the end user. It also monitors and manages processes from design to finishing (scrapping or destroying).

The master program accepts applications from candidates who have graduated from the following majors:

- Industrial Engineering
- Department of Business
- Management Engineering
- Mechanical Engineering
- Computer Engineering
- Electrical and Electronic engineering
- Geomatic Engineering
- Department of Mathematics
- Department of Statistics
- Department of Urban and Regional Planning

The doctorate program accepts applications from candidates who have graduated from the following master programs:

- Industrial Engineering
- Management Engineering
- Mechanical Engineering
- Computer Engineering
- Electrical and Electronic Engineering
- Department of Mathematics Engineering
- Mechatronics Engineering

The language of instruction in all three programs is English. All students who wish to carry out their graduate studies at the department have to certify their proficiency in English. Master (MSc) program duration is 2 years and a student must complete it within a maximum period of 3 years. The first year is considered for course taking and the last one year for Thesis studies. If it is needed, one more year can be added to the duration. Doctorate (PhD) program duration is 4 years and a student must complete it within a maximum period of 6 years. One year is considered for course taking and three years for Dissertation studies. If it is needed, more two years can be added to the duration.

Admission Requirements

Official admission requirements are announced before each admission period on the website of the Graduate School of Natural and Applied Sciences. The requirements listed here are for information only:

Minimum Requirements for Master program;

- Required BSc GPA 2.5
- Required ALES Score for MSc program 70
- Certificate in English Proficiency YDS 60 (Candidates who do not have scores of accepted English language exam results must take the University's Foreign Language Proficiency Exam to be exempt of the English preparation class.)
- Application Letter
- CV

Minimum Requirements for Doctorate program;

- Required MSc GPA 3.0
- Required ALES Score for doctorate program 75
- Certificate in English Proficiency for doctorate program YDS 70 (Candidates who do not have scores of accepted English language exam results must take the University's Foreign Language Proficiency Exam to be exempt of the English preparation class.)
- Application Letter
- CV

Candidates should follow call for graduate programs to be announced on aybu.edu.tr/fbe to apply to the programs. Students are accepted once a year generally for Fall Term, rarely twice a year for both Fall and Spring Term.

Course Enrollment

The master's program consists of at least seven courses, seminars and thesis work, with a total of 21 credits (52.5 ECTS). The graduate student must enroll in the thesis study every semester starting from the beginning of the semester following the appointment of the thesis supervisor, and the non-credit thesis course called the specialty area, which is recommended to be opened for each student by the thesis advisor and opened with the decision of the Institute Board. The principles regarding these courses are determined by the Institute Board and implemented by the Institute Administrative Board.

Graduate students can take courses from the undergraduate program, provided they have not taken it before. Graduate courses can also be selected from courses offered in other higher education institutions with the recommendation of the advisor and the head of the relevant institute department / department and the approval of the Institute Board of Directors. The credits of the courses taken in this way cannot

exceed 50% of the total credits. Undergraduate courses cannot be counted towards course load and graduate credits.

Before a student enrolls in the Institute as a full-time student, some of the graduate courses that he / she has taken as a private student or from domestic and foreign Higher Education Institutions and have been successful in the last three years, the proposal of the supervisor, the approval of the head of the department / department and the approval of the Institute Management Upon the decision of the Board, it can be transferred to the current program. However, the credit of the courses to be taken in this way cannot exceed 50% of the total credit that the student must take in the program he/she is enrolled in.

Students should decide together their supervisors on the courses which will be taken and do their enrollment by logging in at obs.aybu.edu.tr within the periods specified in the academic calendar.

Assessment and Grading

At least one midterm exam is applied each semester. In addition to the midterms, projects and assignments whose dates are specified in the period given at the beginning of each semester are given. At the end of each semester, the student has to take the final exam. Criteria (such as midterm, project, homework and final) and end-of-term scores are clearly indicated in the course content distributed at the beginning of the semester and / or published on the website. Final examinations according to student regulations and academic background are held on the date and place and time determined and announced by the university. The final grade of the student is given according to the results of midterm, project, homework and final exam by the lecturer.

Academic Staff

Prof. Dr. Mete GÜNDOĞAN

Prof. Dr. Ergun ERASLAN

Prof. Dr. Servet SOYGÜDER

Assoc. Prof. Dr. Babek ERDEBİLLİ

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Asst. Prof. Dr. Gerçek BUDAK

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Res. Asst. Melda Kevser AKGÜN

Res. Asst. Nurullah GÜLEÇ

Res. Asst. Yağmur ARIÖZ

Res. Asst. Emine Nur NACAR

Course List

IE 508	Advanced Linear Programming
IE 502	System Engineering II
IE 506	Engineering Economy &Investment Analysis
IE 518	Research Methods & Ethics in Industrial Engineering
IE 504	Human Factors in System Design
IE 516	Multi Attribute Decision Analysis
IE 510	Supply Chain Management
IE 503	Industrial Systems Engineering
IE 509	Research Methods & Ethics in Industrial Engineering
IE 507	Linear Programming
IE 513	Operations Management
IE 516	Multi Attribute Decision Analysis
IE 505	Human Factors Engineering
IE 511	Quality Assurance & Management
IE 501	Production Planning, Scheduling & Inventory Control