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Multidisciplinary Courses to be Opened in Fall 2021-2022

Each course can be accessed from the slider below

IE322 Industrial Engineering Practices in Energy Sector

About the Course

IE 322 Industrial Engineering Practices in Energy Sector is a multidisciplinary project-based course to be taught by an energy industry professional instructor in Fall 2021-2022 Semester. Main activities of the course will be focused on to understand and analyze the management, planning, economical evaluation and decision making of energy investments, considering current and future energy supply, demand, amount of sources and sustainability. Full proposal will be performed in multidisciplinary teams. Physical implementation of the project will not be required. The project topics will be based on the theme of "Evaluation of primary and renewable energy sources based power plants". Topics within the theme can be suggested by the teams or chosen among the instructor. There will be a midterm exam, grading will be carried out both midterm and proposals on individual and team basis. The course will be fully online, attendance will be required online to both lectures and practical sessions.

Course Highlights

- Presenting key indicators that are used to describe the energy system and its social and environmental impact
- Improving energy efficiency and promoting sustainable energy systems
- Learning policies to manage energy resources constrained by finite natural resources and global climate change
- Analyzing alternative and renewable energy sources in energy production and utilization
- Helping the students learn the advantages and drawbacks of different energy resources
- Improving project management capabilities on energy management issues
- Learning coordination of different disciplines in power plant projects
- Working with interdisciplinary practices in the energy sector
- Learning the responsibilities of engineering disciplines in a power plant
- Making decision and evaluation of different type of energy investments
- Developing a long-term energy strategy with a multidisciplinary synergy
- Planning on an engineering perspective
- Improving analytic skills for the assessments

Main topics to be covered will be,

- Energy resource capacity in Turkey and World
- Impact of energy in the past, present and future World
- Social and environmental impacts of different energy sources
- Impacts of fossil fuels and greenhouse effect
- Investigation of renewable and sustainable energy options
- Application of engineering principles underlying the supply, demand, amount and sustainability of alternative energy sources
- Assessment of sustainable building technologies
- Green energy solutions and carbon trade
- Types of primary power plants and technologies (fossil, nuclear and renewable energy resources)
- Methods and tools of economical evaluation of power plants
- Decision making on different type of power plant investments
- Future energy needs, energy storage methods and alternatives
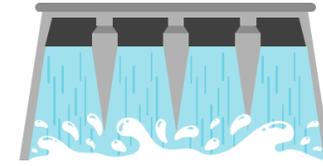
Course Instructor:

Hasan Burak Basar (hbbasar@vatecco.com)

For more information, self-enroll to the course Moodle page, examine it, and join the lecture.

IE443 Occupational Health and Safety

About the Course

IE 443 Occupational Health and Safety course is a multidisciplinary done by single instructor for multidisciplinary students including project based work.

This course provides information about Occupational Health and Safety Legislations, basic principles of occupational health and safety, educate individuals who will generate analytical solutions and perform these solutions at site to protect employees' health and working conditions and provide advices on this issue.

Content of the course is giving information about occupational health and safety, to introduce principles and legislations, to explain occupational health and safety requirements to be applied in the workplace, to provide information about occupational accidents, risk assessment and occupational audits, to provide a proactive approach to occupational health and safety.

Grading of course will be based on a midterm and a project work done by multidisciplinary students instead of a second midterm and final exam.

Main topics to be covered will be

➢ Basic Principles of Occupational Health and Safety,

➢ Occupational Health and Safety Legislation, Risk Factors (Physical, Chemical, Biological, Ergonomic, Electrical, Psychosocial),

➢ Ergonomics,

➢ Work accident and occupational disease management,

➢ Health and Safety Education Management,

➢ Risk Assessment Management, Emergency Management,

➢ Accident Investigation, Inspection and Safety System,

➢ Occupational Health and Safety Audit Management,

➢ ISO 45001 Management System

Course Highlights

➢ The ability of multidisciplinary students to work in collaboration on occupational health and safety,

➢ Learning about occupational health and safety legislation,

➢ To get general information about occupational health and safety,

➢ Improve project management skills with a multidisciplinary synergy.
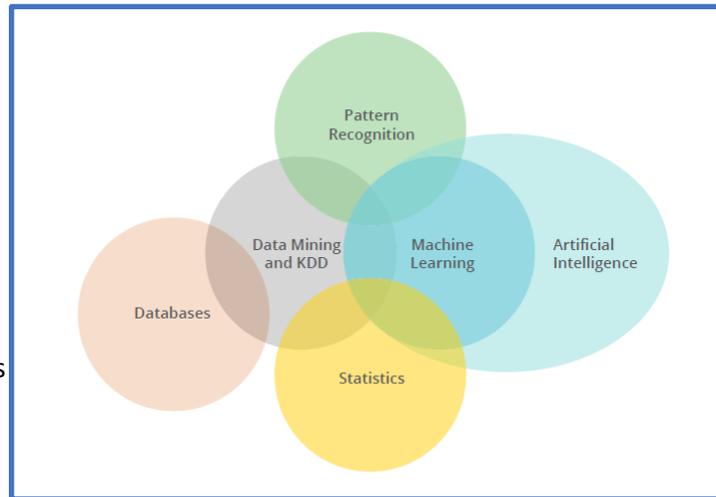
Course Instructor

Ahmet Can Çalık (ahmet.calik@atilim.edu.tr)

EE449 Pattern Classification and Sensor Applications for Engineers

About the Course

This course will be about:

➢ Pattern classification (recognition), which is one of the sub-divisions of Machine Learning and Artificial Intelligence.

➢ Sensors, which are the essential part of many circuits and systems.

The topics to be covered in this course are:

➢ What is a pattern?

➢ Pattern classification applications.

➢ Theory and methods of pattern classification (supervised and unsupervised learning).

➢ Feature extraction and selection.

➢ MATLAB Classification Learner Tool.

➢ Analysis and performance of classifiers.

➢ Sensors, general information about sensor types.

➢ Sensor working principles.

➢ Arduino sensor programming.

➢ Sensors vs. Actuators vs. Transducers.

➢ Interdisciplinary project design.

➢ Interdisciplinary project implementation.

➢ Project presentation.

Course Highlights

➢ Know about sensors.
➢ Know about sensor types and operating principles
➢ Build a circuit using Arduino cards.
➢ Learn about pattern recognition approaches.
➢ Design a classifier system.
➢ Analyze the performance of classifiers.
➢ Design and implement a multi-disciplinary project including sensors.
➢ Learn to use **MATLAB Classification Learner** application tool.

Course Instructor:

Dr. İbrahim Baran Uslu (baran.uslu@atilim.edu.tr)

ENE430 Energy Systems in Buildings

About the course

The objective of the course is to give broad engineering treatment of power generation and loss in buildings. In this context heating, ventilation and air conditioning in buildings, the calculation of heat loss and insulation surfaces, water, fuel and electricity consumption in buildings will be covered in lectures.

Main topics will be;

➢ Building Structures

➢ Air conditioning for comfort in buildings

➢ Heat loss on outer surfaces of buildings

➢ Insulation

➢ Heating ventilation and air conditioning systems

➢ Illumination in buildings

➢ Infrastructure services management in buildings

➢ Central heating in buildings

➢ National and international standards and regulations on energy efficiency in buildings
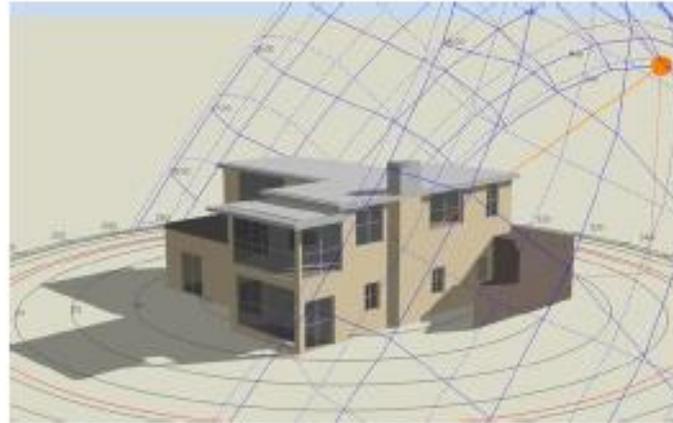
*The oldest house B.C 5481(Dobric,Bulgaria)

*An example of a modern house,
Palau de les Arts Reina Sofia (Valencia,Spain)

Course Highlights

➢ Understand the importance of the building structure and the building structure on energy efficiency

➢ Learning source of the heat loss in buildings and insulation

➢ To analyse of water, fuel and electricity consumption in buildings

➢ To be informed about national and international standards on energy efficiency in buildings

Course Instructor

Assist. Prof. Dr. Cihan TURHAN
(cihan.turhan@atilim.edu.tr)

MATE458 Materials for Catalysis and Fuel Cells

About the course

This course combines reaction engineering concepts with practical materials engineering, catalysis, and fuel cell knowledge. Kinetics and mechanisms of catalytic reactions, activity, and selectivity concepts will be summarized for students coming from different backgrounds. Deactivation of catalysts, synthesis, and characterization methods for catalytic materials will also be covered in the scope of this course. The relationship between the catalyst structure and the activity will be highlighted. A special emphasis will be given on material properties of the catalysts, their relationship with catalytic activity, and how to examine the material properties by using different characterization techniques. Electro-catalysis, photo-catalysis, fuel cells, and materials used for these applications will also be covered. Materials used in chemical reactors and material selection and development strategies will also be discussed. Types of fuel cells, their operation modes and principles, properties of fuel cell components and materials used for different fuel cell components will also be covered. Especially, solid oxide fuel cells and materials used in their applications will be emphasized. The course has an interdisciplinary approach introducing students to new technologies in relation to real life industrial applications. Interdisciplinary projects will also be conducted with multidisciplinary teams composed of students from different departments. Each group will prepare a report for a given project and make a presentation at the end of the semester.

Course Content

➤ Fundamentals of catalysis and catalytic reactors

➤ Catalyst synthesis methods

➤ Properties of catalytic materials and basics characterization methods

➤ Catalyst structure activity relationship

➤ Fundamentals of electro-catalysis and photo-catalysis

➤ Different types of fuel cells, and materials used for these applications

➤ Existing technology applications; future trends and emerging technologies

➤ Term projects in multidisciplinary teams

This course is designed for students from different backgrounds and <u>no prior knowledge on the course content is required</u>. For more information, please visit the course Moodle page and join the first class.

Multidisciplinary term project topic examples

➤ Solid oxide fuel cells for homes

➤ PEM fuel cells for automobiles

➤ Photocatalytic wastewater treatment

➤ Photocatalytic hydrogen generation reactors

➤ Electrocatalytic carbon dioxide reduction

➤ Steam reforming reactors for hydrogen production

➤ Batteries for Electric Cars

➤ Microbial fuel cells

Open for departments
➤ Metallurgical and Materials Engineering
➤ Chemical Engineering
➤ Energy Systems Engineering
➤ Mechanical Engineering
➤ Automotive Engineering
➤ Manufacturing Engineering
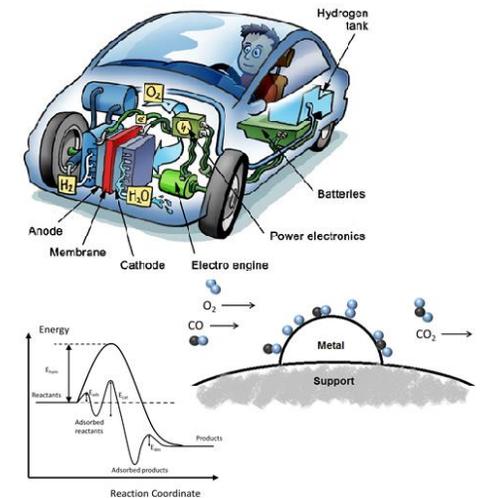
Instructor:
Dr. Doruk Doğu
Office: C-113
e-mail: doruk.dogu@atilim.edu.tr

ME482 Introduction to CAD/CAM

About the Course

ME482 Introduction to CAD/CAM course is a multidisciplinary project-based course. This course will introduce students to computer-aided design (CAD) and computer-aided machining (CAM). The major purpose of this course is designing a simple product project by using CAD and manufacture it by using CAM. To reach this purpose all the necessary information will be given with NX CAD/CAM/CAE software. Also CAD/CAM concepts and design and manufacturing methods that design and manufacturing engineers use daily will be emphasized in the course.

Grading will be based on midterm, final and multidisciplinary project.
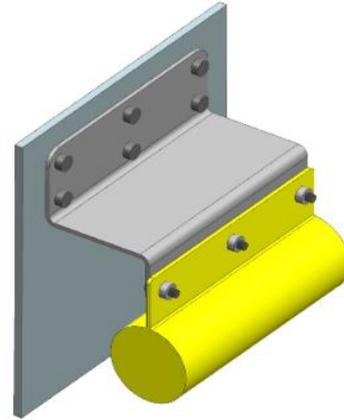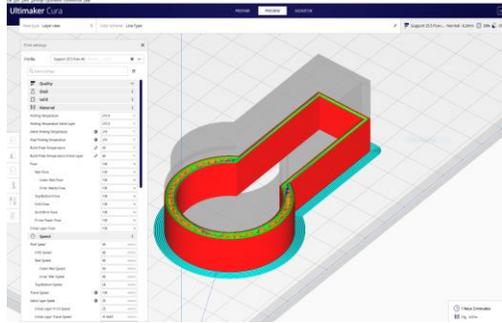
Course Highlights

➢ Joy of designing and manufacturing exciting projects with the multidisciplinary groups using top notch software and hardware.

➢ Solving challenging design and manufacturing problems.

➢ Solid understanding of CAD/CAM.

Course Instructor

Candaş Urunga (candas.urunga@atilim.edu.tr)

Course Content

- Introduction to CAD
  - Principles of Engineering Design
  - CAD Basics
  - Advanced Modeling
  - Surface Modeling
  - Assembly Modeling
  - Design the Product Using CAD
- Introduction to CAM
  - CAM Basics
  - Machined Part Manufacturing Methods
    - Tool Path Design
    - Optimizing Toolpaths
    - Warping, Tool Breakage and Vibration Prevention
    - Quality of Machined Surfaces
  - CNC Part Programming
    - Operation, Cutting Tool and Method Selection
    - Tool Path Generation
    - Post-processing and G-Code Basics
  - Additive Manufacturing Methods
    - Tool Path Design and Generation (with Ultimaker Cura)
  - Manufacture the Product Using CAM and Assemble