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Course Information

Information in this block comes from "Student Information System". If you need update for this block you can contact with your faculty administrative staff.

Term

202201

Code

ME 308

Title

Industrial Control

Faculty

Faculty of Eng. & Natural Sci.

Subject

Mechatronics(ME)

SU Credit

3.0

ECTS Credit

6.0

Level Of Course

UG

Prerequisites

Content

This is an course that covers industrial control systems. The specific topics include: control systems architectures; transducers and actuators; communications in industrial control systems - industrial LANs; sequential control - programmable logic controllers; direct digital control and supervisory control; structures of SCADA systems; case studies.

Distribution of Lectures

1+2

Syllabus Information

Language of Instruction ECTS

English

Recommended or required reading ECTS

- [ ] Textbook
- [ ] Cases
- [x] Readings
- [x] Optional Readings
- [ ] Course Web

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Readings

Pdf documents related to Siemens S7 300 PLCs, Beckhoff industrial PCs.

Optional Readings

Title: Automated Manufacturing Systems
Author: S. Brian Morriss
Year: 1994
Publisher: Mc Graw Hill

Title: Automation Systems for Control and Data Acquisition
Author: Lawrence T. Amy
Year: 1992
Publisher: ISA (Instrument Society of America)
Series: Resources for Measurement and Control Series

Title: Practical Process Control
Author: A. M. Seal
Year: 1998
Publisher: Arnold

Hans Berger, Munich, Automating with SIMATIC, Publicis MCD Verlag, Munich
Lawrence T. Amy, Automation Systems for Control and Data Acquisition, ISA

Assessment methods and criteria ECTS

- [x] Final
- [x] Midterm
- [x] Quiz
- [x] Assignment
- [ ] Case Study
- [ ] Term-Paper
- [x] Participation
- [x] Individual Project
- [ ] Group Project
- [x] Written report
- [ ] Presentation
- [ ] Team member evaluation
- [x] Homework
- [ ] Other

	Percentage (%)	Number of assessment methods

	Percentage (%)	Number of assessment methods
Final	25	
Midterm	20	1
Exam	3	3
Assignment	16	4
Participation	5	
Individual Project	16	4
Written report	5	1
Homework	10	5

Learning Outcomes ECTS

LO-1

List main types of industrial automation systems and industrial actuation and sensor systems

LO-2

Identify the individual design steps in an industrial automation project.

LO-3

Design automation systems with industrial control components.

LO-4

Compare different industrial control strategies.

LO-5

Draw wiring diagrams.

LO-6

Program Programmable Logic Controllers (PLC) and Industrial Robots

LO-7

Develop Graphical User Interfaces

LO-8

Work with industrial communication networks

LO-9

Wire and instrument basic industrial sensors and actuators.

LO-10

Develop skills to adapt industrial control components to their automation design.

LO-11

Develop problem solving and planning skills and work effectively as part of a team

Course Policies ECTS

This is a physical-only course.
Attendance to a minimum of 70% of lectures is required to be admitted to the final exam.
More than 70% attandence earns participation points.
Pop quizes ("Exam" in the sysllabus means quiz).
Weekly laboratory work (week 2-week 13)

Course Outline ECTS

Week 1:
Introduction
PLC (Programmable Logic Controller)
Resources
Hard wired logic

Week 2:
PLC
Ladder Logic Program (LAD)

Week 3:
PLC
Statement List Program (STL)
Linear Programming
Partitioned Programming

Week 4:
PLC - Structured Programming

Week 5:
Wiring Diagrams

Week 6:
Wiring diagrams

Week 7:
Industrial PCs
Industrial Networks
Structural text programming

Week 8:
Structural text programming
Midterm

Week 9:
Graphical User Interfaces

Week 10:
Robotics

Week 11:
Robotics

Week 12:
Sensors

Week 13:
Actuators

Planned learning activities ECTS

- [x] Interactive
- [ ] Learner centered
- [x] Communicative
- [x] Discussion based learning
- [x] Project based learning
- [x] Task based learning
- [ ] Jigsaw learning
- [ ] Guided discovery
- [x] Simulation
- [ ] Case Study
- [ ] Other

Mode of delivery ECTS

- [x] Formal lecture
- [x] Interactive lecture
- [ ] Workshop
- [ ] Swapshop
- [ ] Seminar
- [ ] On-line task/distance
- [x] Field work/field study/on-the-job
- [ ] Recitation
- [ ] Studio work/practice
- [ ] One-to-one tutorial
- [ ] Group tutorial
- [x] Laboratory
- [x] Other

Work placement(s) ECTS

- ( ) Yes
- (•) No

Objective ECTS

To provide the students with the foundations of modern industrial control in the machine automation context.

Instructor(s)

1 Primary

Name

Kemalettin Erbatur

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9585

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Office Hours

Reach me after lecture hours or via e-mail for an appointment.

Program Outcomes

The program outcomes related to this course listed below. Please select appropriate scale value that shows strength of the relation between the course and the program outcome.

(1:Not at all ... 5:A lot)

Common Outcomes For All Programs

1 Understand the world, their country, their society, as well as themselves and have awareness of ethical problems, social rights, values and responsibility to the self and to others. / Dünyayı, ülkeyi, toplumu ve kendilerini anlamak; etik sorunlara, toplumsal haklara ve gerek kendisine gerek başkalarına karşı sorumluluklara dair bilinçlenmek.

1 2 **3** 4 5

2 Understand different disciplines from natural and social sciences to mathematics and art, and develop interdisciplinary approaches in thinking and practice. / Doğa ve toplum bilimlerinden matematiğe ve sanata kadar farklı disiplinleri anlayarak düşünce ve uygulamada disiplinlerarası yaklaşımlar geliştirmek.

1 2 **3** 4 5

3 Think critically, follow innovations and developments in science and technology, demonstrate personal and organizational entrepreneurship and engage in life-long learning in various subjects; have the ability to continue to educate him/herself. / Eleştirel düşünmek, bilim ve teknolojideki yenilik ve gelişmeleri takip etmek, kişisel ve kurumsal girişimcilik sergilemek ve çeşitli konularda hayat boyu öğrenim çabasında olmak; kendini sürekli yenileme becerisine sahip olmak.

1 2 3 **4** 5

4 Communicate effectively in Turkish and English by oral, written, graphical and technological means. / Türkçe ve İngilizce sözlü, yazılı, grafik ve teknolojik imkanlarla etkili iletişim kurabilmek.

1 2 3 **4** 5

5 Take individual and team responsibility, function effectively and respectively as an individual and a member or a leader of a team; and have the skills to work effectively in multi-disciplinary teams. /

Bireysel sorumluluk ve takım sorumluluğu almak; birey olarak ya da takımın üyesi veya lideri olarak verimli ve saygılı bir şekilde çalışmak; çok disiplinli takımlarda etkin biçimde çalışabilme becerisine sahip olmak.

1	2	3	4	5
				✓

Common Outcomes For Faculty of Eng. & Natural Sci. Programs

1 Possess sufficient knowledge of mathematics, science and program-specific engineering topics; use theoretical and applied knowledge of these areas in complex engineering problems. / Matematik, fen bilimleri ve ilgili mühendislik disiplinine özgü konularda yeterli bilgi birikimine; bu alanlardaki kuramsal ve uygulamalı bilgileri, karmaşık mühendislik problemlerinde kullanabilme becerisine sahip olmak.

1	2	3	4	5
			✓	

2 Identify, define, formulate and solve complex engineering problems; choose and apply suitable analysis and modeling methods for this purpose. / Karmaşık mühendislik problemlerini saptama, tanımlama, formüle etme ve çözme becerisine; ve bu amaçla uygun analiz ve modelleme yöntemlerini seçme ve uygulama becerisine sahip olmak.

1	2	3	4	5
		✓		

3 Develop, choose and use modern techniques and tools that are needed for analysis and solution of complex problems faced in engineering applications; possess knowledge of standards used in engineering applications; use information technologies effectively. / Mühendislik uygulamalarında karşılaşılan karmaşık problemlerin analizi ve çözümü için gerekli olan modern teknik ve araçları geliştirme, seçme ve kullanma becerisine; mühendislik uygulamalarında kullanılan standartlar hakkında bilgiye; bilişim teknolojilerini etkin bir şekilde kullanma becerisine sahip olmak.

1	2	3	4	5
			✓	

4 Have the ability to design a complex system, process, instrument or a product under realistic constraints and conditions, with the goal of fulfilling specified needs; apply modern design techniques for this purpose. / Karmaşık bir sistemi, süreci, cihazı veya ürünü gerçekçi kısıtlar ve koşullar altında, belirli gereksinimleri karşılayacak şekilde tasarlama becerisine; bu amaçla modern tasarım yöntemlerini uygulama becerisine sahip olmak.

1	2	3	4	5
				✓

5 Design and conduct experiments, collect data, analyze and interpret the results to investigate complex engineering problems or program-specific research areas. / Karmaşık mühendislik problemlerinin veya disipline özgü araştırma konularının incelenmesi için deney tasarlama, deney yapma, veri toplama, sonuçları analiz etme ve yorumlama becerisine sahip olmak.

1	2	3	4	5
			✓	

6 Possess knowledge of business practices such as project management, risk management and change management; awareness on innovation; knowledge of sustainable development. / Proje yönetimi, risk yönetimi ve değişiklik yönetimi gibi, iş hayatındaki uygulamalar hakkında bilgi; girişimcilik, yenilikçilik hakkında farkındalık sahibi olmak; sürdürülebilir kalkınma hakkında bilgi sahibi olmak.

1	2	3	4	5
		✓		

7 Possess knowledge of impact of engineering solutions in a global, economic, environmental, health and societal context; knowledge of contemporary issues; awareness on legal outcomes of engineering solutions; knowledge of behavior according to ethical principles, understanding of professional and ethical responsibility. / Mühendislik uygulamalarının evrensel ve toplumsal boyutlarda sağlık, çevre ve güvenlik üzerindeki etkileri ve çağın mühendislik alanına yansıyan

sorunları hakkında bilgi sahibi olmak; mühendislik çözümlerinin hukuksal sonuçları konusunda farkındalık sahibi olmak; etik ilkelerine uygun davranma ve mesleki ve etik sorumluluk hakkında bilgi sahibi olmak;

1	2	3	4	5

8 Have the ability to write effective reports and comprehend written reports, prepare design and production reports, make effective presentations, and give and receive clear and intelligible instructions. / Etkin rapor yazma ve yazılı raporları anlama, tasarım ve üretim raporları hazırlayabilme, etkin sunum yapabilme, açık ve anlaşılır talimat verme ve alma becerisine sahip olmak.

1	2	3	4	5

Mechatronics Engineering Program Outcomes (Core Electives)

1 Familiarity with concepts in statistics and optimization, knowledge in basic differential and integral calculus, linear algebra, differential equations, complex variables, multi-variable calculus, as well as physics and computer science, and ability to use this knowledge in modeling, design and analysis of complex dynamical systems containing hardware and software components. / İstatistik ve optimizasyon konularına aşina olmak, temel diferansiyel ve integral hesaplamalar, lineer cebir, türevsel denklemler, kompleks değişkenli ve çok değişkenli hesaplamalar içeren matematik, matematiğe dayalı fizik ve bilgisayar bilimleri alanlarında bilgi sahibi olmak ve bu bilgiyi kullanarak dinamik sistemlerle etkileşebilen, donanım ve yazılım bileşenleri içeren karmaşık sistemlerin modellemesini, analizini ve tasarımını yapabilmek.

1	2	3	4	5

2 Ability to work in design, implementation and integration of engineering applications, such as electronic, mechanical, electromechanical, control and computer systems that contain software and hardware components, including sensors, actuators and controllers. / Algılayıcı, eyleyici ve kontrol birimleri içeren, donanım ve yazılım öğelerine sahip elektronik, mekanik, elektromekanik, kontrol veya bilgisayar sistemleri gibi mühendislik uygulamalarının tasarımı, gerçeklenmesi ve entegrasyonu alanlarında çalışabilme becerisine sahip olmak.

1	2	3	4	5

Industrial Engineering Program Outcomes (Area Electives)

1 Formulate and analyze problems in complex manufacturing and service systems by comprehending and applying the basic tools of industrial engineering such as modeling and optimization, stochastics, statistics. / Karmaşık üretim ve servis sistemlerinde oluşacak problemleri endüstri mühendisliğinin modelleme ve eniyileme, rassal modeller ve istatistik gibi temel araçlarını kullanarak formüle ve analiz etmek.

1	2	3	4	5

2 Design and develop appropriate analytical solution strategies for problems in integrated production and service systems involving human capital, materials, information, equipment, and energy. / İçinde insan kaynağı, malzeme, bilgi, teçhizat ve enerji bileşenlerini içeren tümleşik üretim ve servis sistemlerinde karşılaşılan problemler için uygun analitik çözüm stratejileri tasarlamak ve geliştirmek.

1	2	3	4	5

3 Implement solution strategies on a computer platform for decision-support purposes by employing effective computational and experimental tools. / Karar destek amacıyla oluşturulan

çözüm stratejilerini etkin hesaplamalı ve deneysel araçlar kullanarak bilgisayar ortamında uygulamak.

1 2 3 4 5

Materials Science and Nano Engineering Program Outcomes (Area Electives)

1 Applying fundamental and advanced knowledge of natural sciences as well as engineering principles to develop and design new materials and establish the relation between internal structure and physical properties using experimental, computational and theoretical tools. / Temel ve ileri bilim ve mühendislik prensiplerini yeni malzeme geliştirme ve tasarlamaya uygulama, ve malzemenin yapısı ve fiziksel özellikleri arasında deneysel, hesaba dayalı ve teorik metotlarla bağlantı kurabilme.

1 2 3 4 5

2 Merging the existing knowledge on physical properties, design limits and fabrication methods in materials selection for a particular application or to resolve material performance related problems. / Belirli uygulamalar veya malzeme performansıyla ilgili problemlerin çözümü için malzeme seçiminde fiziksel özellikler, tasarım limitleri ve üretim metotları üzerine varolan bilgi birikimini birleştirme.

1 2 3 4 5

3 Predicting and understanding the behavior of a material under use in a specific environment knowing the internal structure or vice versa. / Herhangi bir malzemenin iç yapısını bilerek, bu malzemenin farklı ortamlardaki davranışlarını tahmin etme ve anlama, ve bunun tam tersini de yapabilme.

1 2 3 4 5

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