Menoufia University
Faculty of Electronic Engineering
Industrial Electronics and control Engineering Dept.

جامعة المنوفية
كلية الهندسة الالكترونية بمنوف
قسم هندسة الإلكترونيات الصناعية والتحكم

Program Specification

Industrial Electronics and control Engineering

A- Basic Information

1- Program title: Bachelor of Industrial Electronic and Control Engineering
2- Program type: Single
3- Department (s): Industrial Electronics and Control Engineering
4- Coordinator: Prof. Mohammed Fkirin
5- External evaluator(s): Prof. Omar Abdulaziz Alsebakhy
6- Last date of program specifications approval:

B- Professional Information

1- Program aims

The program aims to:

- Have strong foundations in mathematics, basic science and engineering concepts.
- Enable graduates to exhibit a high level of practical and theoretical skills in industrial Electronics and control Engineering with a knowledge of currently available techniques and technologies
- Understand different techniques to do analysis for various engineering problems.
- Conduct experiments and to analyze and interpret data.
- Acquire methods and procedures to design a system or process to meet required needs.
- Work within multi-disciplinary teams.
- Identify, formulate and solve engineering problems.
- Has understanding of professional and ethical responsibilities.
- Develop competent professionals able to play a leading part in many different commercial industrial and academic activities and adapt rapidly to changing technology.
- Equipped with good communication skills.
- Consider and avoid the detrimental impact of engineering solutions within social or global measures.
- Know how to use the techniques, skills and modern engineering tools necessary for engineering practice.
- Know the technology required to build advanced control system for linear and nonlinear systems.
- Have an integrated understanding of the scientific and engineering principles underlying the four major elements of the field of industrial electronics, microcontrollers, programmable logic controllers and its applications.
- Prepare students for the social, organizational and professional context in which they will be working.
- Teach students basic mechanisms for following and learning the continuous progress in the field independently.
- Further the personal and professional development of individual students.
- Continue to attract students from Egypt.

2- Intended Learning Outcomes (ILOs)

Industrial Electronics and Control Engineering Program

On successful completion of the Industrial Electronics and Control Engineering program, graduate students must have knowledge and understanding of the field of Industrial Electronics and control engineering, intellectual skills, professional and practical skills, general and transferable skills.

A- Knowledge and Understanding:

The graduates of the Industrial Electronics and Control engineering programs should be able to demonstrate the knowledge and understanding of:

a1) Concepts and theories of mathematics and sciences appropriate to industrial electronics and control engineering.
a2) Basics of information and communication technology (ICT)
a3) Characteristics of engineering materials related to industrial electronics and control engineering.
a4) Principles of design including elements design, process and/or a system related to electronics.
a5) Methodologies of solving engineering problems, data collection and interpretation
a6) Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.
a7) Business and management principles relevant to engineering.
a8) Current engineering technologies as related to industrial electronics and control engineering.
a9) Topics related to humanitarian interests and moral issues.
a10) Technical language and report writing
a11) Professional ethics and impacts of engineering solutions on society and environment
a12) Contemporary engineering topics.
a13) Elementary science underlying electronic engineering systems and information technology, fundamentals of electrical engineering and machines, logic design, circuit analysis, signal, real-time systems and reliability analysis.
a14) Basics of design and analyzing electronic engineering systems, while considering the constraints of applying inappropriate technology and the needs of commercial risk evaluation.
a15) Principles of Analyzing and design of electronic circuits and components.
a16) Principles of Analyzing and design of control systems with performance evaluation.
a17) Biomedical instrumentation;
a18) Programmable logic controllers PLC, real time systems, robotics.
a19) Fundamentals of problem identification, formulation and solution in the inter-disciplinary fields of industrial electronics and control engineering.
a20) The principles of sustainable design and development;

B- Intellectual skills:

Graduate students must be able to:

b1) Select appropriate mathematical and computer-based methods for modeling and analyzing problems.
b2) Select appropriate solutions for engineering problems based on analytical thinking.

b3) Think in a creative and innovative way in problem solving and design.
b4) Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.
b5) Assess and evaluate the characteristics and performance of components, systems and processes.
b6) Investigate the failure of components, systems, and processes.
b7) Solve engineering problems, often on the basis of limited and possibly contradicting information.
b8) Select and appraise appropriate ICT tools to a variety of engineering problems.
b9) Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.
b10) Incorporate economic, societal, environmental dimensions and risk management in design.
b11) Analyze results of numerical models and assess their limitations.
b12) Create systematic and methodic approaches when dealing with new and advancing technology.
b13) Develop innovative solutions for the practical industrial problems.
b14) Analyze the performance of digital and analog control systems.
b15) Synthesis and integrate industrial electronic systems for certain specific function using the right equipment.
b16) Identify at an appropriate level the design, production, interfacing and software needs of different parts of control systems.
b17) Create solutions to control systems especially to manufacturing, maintenance and interfacing problems in a creative way, taking account of industrial and commercial constraints.
b18) Integrate electrical, electronic and mechanical components and equipment with transducers, actuators and controllers in creatively computer controlled systems.

C-Professional and Practical Skills:

Graduate students must be able to:

c1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve engineering problems.
c2) Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.
c3) Create and/or re-design a process, component or system, and carry out specialized engineering designs.
c4) Practice the neatness and aesthetics in design and approach.
c5) Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.
c6) Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.
c7) Apply numerical modeling methods to engineering problems.
c8) Apply safe systems at work and observe the appropriate steps to manage risks.
c9) Demonstrate basic organizational and project management skills.
c10) Apply quality assurance procedures and follow codes and standards.
c11) Exchange knowledge and skills with engineering community and industry.

c12) Prepare and present technical reports.
c13) Use appropriate mathematical methods or IT tools.
c14) Practice computer programming for the design and diagnostics of digital and analog control systems.
c15) Use relevant laboratory equipment and analyze the results correctly.
c16) Troubleshoot, maintain and repair almost all types of industrial electronic systems using the standard tools.
c17) Use appropriate tools to measure system performance.
c18) Manage field problem, identification, formulation and solution;
c19) Utilize practical systems approach to design and performance evaluation;
c20) Apply the principles of sustainable design and development;
c21) Design and perform experiments, as well as analyze and interpret experimental results related to control systems.
c22) Test and examine components, equipment and systems of industrial electronic systems.
c23) Integrate electrical, electronic and mechanical components and equipment with transducers, actuators and controllers in creatively computer controlled systems.
c24) Apply modern techniques, skills and engineering tools to control systems.

D-General and Transferable skills:

Graduate students must be able to:

d1) Collaborate effectively within multidisciplinary team.
d2) Work in stressful environment and within constraints.
d3) Communicate effectively.
d4) Demonstrate efficient IT capabilities.
d5) Lead and motivate individuals.
d6) Effectively manage tasks, time, and resources.
d7) Search for information and engage in life-long self learning discipline.
d8) Acquire entrepreneurial skills.
d9) Refer to relevant literatures.

Term	Course Name	Code	Knowledge and understanding																				Intellectual skills																			
			a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17	a18	a19	a20	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15	b16	b17	b18
1																																										
2																																										
3																																										
	Electrical Engineering	AC141															√						√	√																		
4																																										
	Lab Test	AC142													√		√																									
5																																										
	Control Eng	AC241	√		√		√	√		√						√		√					√	√	√				√				√	√	√	√			√	

V

6	Elect power & machine	AC242		√		√	√	√	√	√				√	√	√	√							√	√	√	√	√	√		√		√	√	√		√			
	Elect measurements	AC243	√		√	√	√			√					√	√						√	√			√	√	√											
	Lab Test	AC225												√		√	√																							
	First Year Training	FR182		√	√	√					√			√		√											√		√										
7	Eng. Mathematics	AC341	√				√														√	√					√				√								
	Elec & Ind Measure.	AC342	√								√			√		√											√												√
	Linear Control systems	AC343	√			√	√						√				√			√	√	√	√		√							√	√	√	√			√
	Microcontrollers	AC344				√				√			√		√	√	√		√		√				√	√				√			√	√	√	√	√	√	√
	Elective-1	AC345																																							
	Experimental Lab 1	AC346				√				√							√			√		√						√	√						√		√	√	√	√
8	Nonlinear Cont. Sys.	AC347															√				√				√	√														
	Industrial Electronics	AC348	√												√	√										√									√				√
	Digital Cont-sys	AC349	√		√											√			√		√			√	√							√	√		√				
	Medical electronics	AC350			√			√		√	√							√					√	√	√														
	Elective-2	AC351													√	√		√	√	√	√	√	√		√								√					√
	Experimental Lab 2	AC346				√				√						√		√		√						√	√						√		√	√	√	√
9	PLC	AC441		√	√	√				√									√		√												√	√		√	√	√
	Power Elec. Circuits	AC442				√				√			√	√		√				√	√							√				√	√					
	Real Time Cont sys	AC443			√	√	√	√		√		√		√			√				√	√	√	√	√							√	√	√		√	√	√
	Medical Equipments	AC444									√							√					√	√	√													
	Elective-3	AC445				√	√									√			√	√	√	√		√							√		√	√				
	Experimental Lab 3	AC446	√																		√	√	√			√												
10	Ind. Auto. systems	AC448	√		√	√													√			√						√										
	Applications Ind. Elec.	AC449	√		√	√				√			√			√	√						√	√									√	√	√		√	√
	Intelligent Cont. Sys.	AC450	√				√			√		√	√				√		√	√	√	√	√	√	√							√					√	√
	Eng. Eco. Legis.	FR486					√	√	√		√		√			√								√					√	√								
	Elective 4	AC452																	√														√					√
	Experimental Lab. 4	AC446	√																		√	√	√			√												

Continue….

Term	Course Name	Code	Professional and practical skills																							General & Transferable skills								
			c1	c2	c3	c4	c5	c6	c7	c8	c9	c10	c11	c12	c13	c14	c15	c16	c17	c18	c19	c20	c21	c22	c23	c24	d1	d2	d3	d4	d5	d6	d7	d8	d9
1																																			
2																																			
3																																			
	Electrical Engineering	AC141						√																			√								
4																																			
	Lab Test	AC142	√				√			√				√			√		√								√					√			
5																																			
	Control Eng	AC241	√	√	√	√			√		√									√	√					√		√	√	√	√	√	√		√

6	Elect power & machine	AC242	√		√				√				√					√	√		√	√		√			√	√	√	√	√		√	√	√
	Elect measurements	AC243	√	√			√							√					√						√	√		√	√			√			√
	Lab Test	AC225	√				√			√				√			√			√					√			√				√			
	First Year Training	FR182	√							√	√			√											√		√	√						
7	Eng. Mathematics	AC341				√		√																								√		
	Elec & Ind Measure.	AC342					√										√	√					√	√								√		
	Linear Control systems	AC343		√	√	√	√					√			√							√		√		√				√		√		√
	Microcontrollers	AC344		√	√			√				√			√	√					√	√		√		√			√				√	√
	Elective-1	AC345																																	
	Experimental Lab 1	AC346					√	√				√			√	√	√	√					√	√	√	√					√	√	√	√
8	Nonlinear Cont. Sys.	AC347									√		√												√			√				√	√	
	Industrial Electronics	AC348											√										√	√								√		
	Digital Cont-sys	AC349	√				√		√																√	√	√	√						
	Medical electronics	AC350		√	√	√				√																	√				√		√	
	Elective-2	AC351			√				√					√	√						√				√			√	√		√			√
	Experimental Lab 2	AC346					√	√				√			√	√	√	√					√	√	√	√					√	√	√	√
9	PLC	AC441					√	√				√			√	√	√	√					√	√	√	√		√	√	√	√	√	√	√
	Power Elec. Circuits	AC442							√				√		√					√	√	√		√							√	√	√		√
	Real Time Cont sys	AC443	√	√	√		√	√	√		√	√															√	√	√	√	√	√	√		
	Medical Equipments	AC444						√					√	√													√			√			√		
	Elective-3	AC445									√	√	√																√				√	√	√
	Experimental Lab 3	AC446					√									√						√	√			√								
10	Ind. Auto. systems	AC448							√				√														√	√				√	√	√
	Applications Ind. Elec.	AC449			√		√	√				√				√		√	√			√	√	√	√	√				√		√		
	Intelligent Cont. Sys.	AC450	√	√	√	√	√	√				√		√	√	√				√	√	√			√				√			√	√	√
	Eng. Eco. Legis.	FR486								√	√	√														√				√		√		
	Elective 4	AC452			√							√													√			√						
	Experimental Lab. 4	AC446					√									√						√	√			√								

3- Academic standards

(3a) External references for standards (Benchmarks)

- Leading universities
- Beneficiaries expectations
- Professional syndicates standards
- Commercial sector indicators.
- NARS (National Academic Reference Standards)
- IEEE Standards
- ABET

4- *Curriculum Structure and Contents*

4.a- Program duration : Five Years

4.b- Program structure

4.b.i- No. of hours per week: Lectures 139 Lab./Exercise 135 total 274

4.b.ii- No. of hours: Compulsory 258 Elective 16 Optional -

4.b.iii-No. of hours of basic sciences courses: No. 61 % 21

4.b.iv- No. of hours of courses of social sciences and humanities No. 8 % 3

4.b.v- No. of hours of specialized courses: No. 58 % 20

4.b.vi- No. of hours of other courses: N0. 2 % 1

4.b.vii Practical/Field Training:

Programming & application skills 150

4.b.viii-Program Levels (in credit-hours system):

5- Program courses

5.1- Prep. Year Semester 1

a. Compulsory

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
PM001	Mathematics (1)	4	3		7
FR081	Engineering drawing and projection (1)	2	4		6
PM003	Physics (1)	3	1	2	6
PM007	Special Chemistry	3	1	1	5

CSE061	Computer Fundamentals 1	2		2	4
FR082	Specialized English Language	2			2
		16	**9**	**5**	**30**

5.2- Prep. Year Semester 2
a. Compulsory

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
PM002	**Mathematics (2)**	**4**	**2**		**6**
PM005	**Mechanics**	**3**	**2**		**5**
PM004	**Physics (2)**	**2**	**1**	**2**	**5**
FR081	**Engineering drawing and projection (2)**	**1**	**4**		**5**
CSE061	**Computer Fundamentals 2**	**1**		**2**	**3**
FR083	**History of Engineering Sciences**	**2**			**2**
PM006	**Production Technology (Production Engineering)**	**2**		**2**	**4**
		15	**9**	**6**	**30**

5.3- 1st year Semester 1
a. Compulsory

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
PM101	**Mathematics (3)**	**4**	**2**		**6**
PM103	**Physics (3)**	**3**	**1**	**1**	**5**
AC141	**Electrical Engineering**	**3**	**2**		**5**
EC121	**Electronics (1)**	**3**	**2**		**5**
EC123	**Electrical Workshop**			**2**	**2**
CSE161	**Computers Operations**	**2**	**1**	**2**	**5**
		15	**8**	**5**	**28**

5.4- 1st year Semester 2

a. Compulsory

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
PM102	Mathematics (4)	4	2		6
EC122	Electronics (2)	3	2		5
EC124	Semiconductor Devices Physics and Technology	3	1	1	5
FR181	Environmental Engineering	2	2		4
EC125	Electronic Circuits Drawing	2	3		5
AC142	Lab. Test	1		4	5
FR084	Prep Training				
		15	10	5	30

5.5- 2nd year Semester 1

a. Compulsory

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
PM201	Mathematics (5)	3	2		5
AC242	Electrical Power and Machines	3	2		5
EC221	Communication Engineering	3	2		5
AC241	Control Engineering	3	2		5
EC222	Very Large Scale of Integrated Circuit (VLSI)	3	1	2	6
EC223	Electrical and Electronic Circuits (2)	2	2		4
		17	11	2	30

5.6- 2nd year Semester 2

a. Compulsory

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
PM202	**Mathematics (6)**	**3**	**2**		**5**
CSE261	**Computer Engineering**	**3**	**2**		**5**
EC234	**Electronic circuit**	**3**	**2**		**5**
AC243	**Electrical Measurements**	**3**	**2**		**5**
AC225	**Lab. Test**	**2**		**4**	**6**
AC226	**Electronic work shop**			**2**	**2**
FR182	**1st year Training**				
		14	**8**	**6**	**28**

5.7- 3rd year Semester 1

a. Compulsory

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
AC341	Eng. Mathematics	**3**	**2**	**-**	**5**
AC342	Electronics and industrial Measurements	**3**	**2**	**-**	**5**
AC343	Linear Control systems	**3**	**2**		**5**
AC344	Micro-Controllers	**2**	**-**	**3**	**5**
AC346	Experimental .Laboratory (1)	**2**		**3**	**5**
	Total	**13**	**6**	**6**	**25**

b- Elective-

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
AC345	Elective (1)	**3**	**1**		**4**

5.8- 3rd year Semester 2

a. Compulsory

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
AC347	Nonlinear systems	**3**	**2**	**-**	**5**
AC348	Industrial Electronics	**3**	**2**		**5**
AC349	Digital Control systems	**3**	**2**	**-**	**5**
AC350	Medical Electronics	**3**	**2**		**5**
AC364	Experimental Lab (2)	**2**		**3**	**5**
	Total	**14**	**8**	**3**	**25**

b- Elective

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
AC351	Elective (2)	**3**	**1**		**4**

5.9- 4th year Semester 1

a. Compulsory

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
AC441	Programmable logic controllers	**2**	**-**	**3**	**5**
AC442	Power electronics circuits	**3**	**2**	**-**	**5**
AC443	Real time control systems	**3**	**2**	**-**	**5**
AC444	Medical equipment	**3**	**1**	**-**	**4**
AC446	Experimental Lab 3	**2**		**3**	**5**
AC467	Project	**2**			**2**
	Total	**15**	**5**	**6**	**26**

b- Elective

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
AC445	Elective (3)	**3**	**1**		**4**

5.10- 4th year Semester 2

a. Compulsory

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
AC448	Industrial automation systems	**2**	**2**	**-**	**4**
AC449	Applications of industrial Electronics	**3**	**2**		**5**
AC450	Intelligent control systems	**3**	**2**	**-**	**5**
FR386	Eng. Economy. Legislations &contracts	**2**	**-**		**2**
AC	Experimental Lab. 4	**1**		**3**	**4**
	Project	**2**	**2**		**4**
	Total	**13**	**8**	**3**	**24**

b- Elective

Code	Subject	Weekly Hours			
		Lecture	Exercise		Total
			Tutorial	Prac	
AC452	Elective (4)	**3**	**1**		**4**

6- Program admission requirements

General Secondary School Certificate with Major in Mathematics with high academic reference, at secondary school marks of > 91%, or an equivalent certificate from a foreign institute recognized by the university. The program is studied for a minimum of four years full-time.

The program is arranged normally in 8 x 14 week semesters (2 semesters per year). There are normally 28 (2 x 14) study weeks (excluding examination periods and summer session) in each year. The program is divided into 246 hours per week: 36 basic science hours per week, 162 specialized hours per week, 12 sciences and humanities hours per week, and 36 other hours per week. Currently there are no Optional courses on this program.

7- Regulations for progression and program completion

(For the students to be transferred from one academic year to the next, he/she is required to have successfully passed in all subjects. However, the student may still be transferred if he/she has failed in not more than two basic subjects from the same academic year or from previous years. In such cases, students " carrying" subjects from one year to the next should re-sit for their "failed" subjects in their proper respective semesters. Final year students who have failed in a maximum of two basic complementary ones in that year or from previous years can re-sit for their exams in those subjects in September of the same year. Should the student failed again, he/she has to re-sit for his/her exams in those subjects in their proper respective semesters thereafter as many times as necessary until he/she succeeds). Marks from the first year to the fourth year are weighted so that determination of overall marks of the degree.

The final overall marks determine the degree classification as follows:

- Less than 50% Fail
- At least 50% and less than 65% Pass
- At least 65 and less than 75 % Good
- At least 75 and less than 85 % very good
- At least 85 and more Excellent

First Year/Level/Semester

- Moved to second Semester Passing in all courses of the year or fail in not more than two compulsive subjects

Second Year Semester 1, and 2

- Passing in all courses the year but at least tow related to first and second years

Third Year Semester 1, and 2

- Passing in all courses the year but at least tow related to first, second, and/or third years

Forth Year Semester 1, and 2

Passing in all courses or fail in not more than two compulsive subjects. In this case, the student is allowed to enter a September Exam in the same year.

By laws and Regulations for Undergraduate Students "Enrollment opportunities/or "regular" and "external" students:

Academic year	Enrollment opportunities	
	Regular students	External students
First	Two opportunities	None
Second	Two opportunities	Two opportunities
Third	Two opportunities	Two opportunities
Fourth	Two opportunities	Number of subjects, he/she would Be allowed to re-sit for the exam the subjects he/she has failed in indefinitely until He/she is graduated.

Once the student exhausts the number of opportunities of a being a regular" student, he/she becomes an "external" student for a certain number of times according to the above table. Once an "external" student in a certain year succeeds in his/her exams for that year to allow him/her to be transferred to the following year, he/she automatically becomes registered as a regular student again.

8- Evaluation of program intended learning outcomes

Evaluator	**Tool**	**Sample**
1- Senior students		
2- Alumni		
3- Stakeholders (Employers)		
4-External Evaluator(s) (External Examiner(s))		
5- Other		

Annex 1

Attach course specifications