



FUTURE
UNIVERSITY IN EGYPT

جامعة المستقبل



Future University in Egypt
Faculty of Engineering and Technology
Mechanical Engineering Department
B.SC. In Mechatronics Engineering
Program and Course Specifications
Part 1 – Departmental Requirements
2017 / 2018

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Program Specifications



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Program Specifications

A. Basic Information

- | | |
|--|--|
| 1. Program title: | B. SC. in Mechatronics Engineering |
| 2. Program type: | Single <input checked="" type="checkbox"/> Double <input type="checkbox"/> Multiple <input type="checkbox"/> |
| 3. Faculty: | Engineering & Technology |
| 4. Department: | Mechanical Engineering |
| 5. Coordinator: | Prof Mohamed Rafat Okelah. |
| 6. Internal evaluator(s): | A. Prof Mohamed Fathy Badran |
| 7. External evaluator(s): | Prof Abdel_Aziz Morgan |
| 8. Bylaws approval Date: | September 2006 (Ministerial decree No.2299) |
| 8. Last date of program specification approval: | November 2017 |

B- Professional Information

1 Faculty Vision

Achieving excellence in Engineering education scientific and applied research and community serving nationally and internationally

2 Faculty Mission

The Faculty of Engineering and Technology at Future University in Egypt provides a promising academic and cultural environment that enables the graduation of outstanding engineers who are capable of competing nationally and regionally and well acquainted with the job market professionally and ethically. It also motivates conducting innovative scientific research and contributes to community serving and development.

3 The Program Aims

The main aims of the "Mechatronics Engineering" program at the "Faculty of Engineering and Technology" in "Future University in Egypt" are: To equip graduates with the proper and fair scientific knowledge and train them to be able to

- PA - 1. Apply knowledge of mathematics, science and engineering concepts to the solution of engineering and Mechatronics problems.
- PA - 2. Design a system, component, or process in the area of multidisciplinary specialization of Mechatronics engineering to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- PA - 3. Design and conduct experiments as well as analyze and interpret data.
- PA - 4. Identify, formulate and solve engineering problems especially in the area of integrated mechanics, electronics, computers, and software systems.
- PA - 5. Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.
- PA - 6. Work effectively on multidisciplinary teams.
- PA - 7. Communicate effectively.
- PA - 8. Have a broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- PA - 9. Have a knowledge of contemporary engineering issues especially in the area of Mechatronics.
- PA - 10. Apply professional and ethical responsibilities; and display contextual understanding
- PA - 11. Recognize the need for, and can engage in life-long learning.
- PA - 12. Apply knowledge of engineering sciences to electro-mechanical systems.
- PA - 13. Solve problems in the areas of integrated mechanics, electronics, computers and software systems.
- PA - 14. Analyze and investigate the inter-disciplinary characteristics of mechanical, electrical, and hydraulic systems.
- PA - 15. Have a wide choices leading to specialization in mechanics, electronics, design, or computer software and its applications.
- PA - 16. Acquire entrepreneurial skills

To achieve these aims, the program is designed to target the following Intended Learning Outcomes (ILOs).

4 Program Intended learning outcomes (ILOs)

a- Knowledge and understanding:

Graduates of the Mechatronics program should be able to demonstrate the knowledge and understanding of:

A01	Concepts and theories of mathematics including differential and integral calculus, complex variable analysis, P.D. equations, algebra, analytical geometry, vector analysis, probability & statistics, and numerical analysis.
A02	Concepts and theories of basic science including physics, mechanics and chemistry.
A03	Techniques of engineering graphical representations including computer aided drafting.
A04	Topics related to humanitarian interests, moral issues, respect for diversity and general knowledge from other disciplines.
A05	Basics of information and communication technology (ICT).
A06	Basics of English technical language.
A07	Fundamentals of technical report writing considering one of the standard format.
A08	Characteristics of engineering materials including material structure and properties.
A09	Principles of design including elements design, process and/or a system related to Mechatronics.
A10	Methodologies of solving engineering problems, data collection and interpretation
A11	Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.
A12	Business and management principles relevant to engineering.
A13	Current engineering technologies as related to Mechatronics including modern techniques in sensors, actuators, control units and their interfaces.
A14	Professional ethics and impacts of engineering solutions on society and environment
A15	The contemporary engineering topics.
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design, vibration analysis, fluid power control, and energy systems.
A17	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.
A18	Fundamentals of microprocessor architecture and microprocessor based control units and their software and interfaces.
A19	Fundamentals of electrical, electronic, and digital instrumentation and transducers.
A20	Principles, theories, and techniques of classical and modern control systems.
A21	Fundamentals of problem identification, formulation and solution in the inter-disciplinary fields of Mechatronics
A22	The principles of sustainable design and development

b- Intellectual skills

The graduates of the Mechatronics engineering program at FUE should be able to:

B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems.
B02	Develop and implement computer programs for engineering applications including programming of microprocessor based units.
B03	Select appropriate solutions for engineering problems based on analytical thinking.
B04	Think in a creative and innovative way in problem solving and design.
B05	Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.
B06	Assess and evaluate the characteristics and performance of components, systems and processes related to Mechatronics including mechanical systems, sensors, interfacing, controllers, and actuators.
B07	Investigate the failure of components, systems, and processes.
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.
B09	Select and appraise appropriate ICT tools to a variety of engineering problems.
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.
B11	Incorporate economic, societal, environmental dimensions and risk management in design.
B12	Analyze results of numerical models and assess their limitations.
B13	Create systematic and methodic approaches when dealing with new and advanced technology.
B14	Analyze and design Mechanical systems considering modern techniques including modern CAD tools.
B15	Analyze and design electrical and electronics including logic circuits, and microprocessor based systems.
B16	Develop and apply the necessary software for controlling and interfacing of mechatronics systems.
B17	Apply different theories and techniques to solve problems of classical and modern control systems.
B18	Identify at an appropriate level the design, production, interfacing and software needs of different parts of Mechatronics systems.
B19	Create solutions to mechatronics systems especially to manufacturing, maintenance and interfacing problems in a creative way, taking account of industrial and commercial constraints.

c- Professional and practical skills

The graduates of the Mechatronics engineering program at FUE should be able to:

C01	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.
C02	Construct engineering graphics to visualize various engineering applications including computer aided drafting.
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs.
C06	Practice the neatness and aesthetics in design of Mechatronics systems and approach.
C07	Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.
C08	Apply numerical modeling methods to solve and analyze engineering problems.
C09	Apply safe systems at work and observe the appropriate steps to manage risks.
C10	Use the basic organizational and project management skills.
C11	Apply quality assurance procedures and follow codes and standards.
C12	Exchange knowledge and skills with engineering community and industry.
C13	Prepare and present technical reports.
C14	Compete, in-depth, in at least one engineering discipline, namely: mechanics, electronics or interfacing and software;
C15	Utilize practical systems approach for design and performance evaluation;
C16	Apply the principles of sustainable design and development;

d- General and transferable skills

The graduates of the Mechatronics engineering program at FUE should 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

5 Academic standards

The department council adopted in the official meetings on: 18/7/2016 & 16/11/2016 to develop the Mechatronics engineering program Intended Learning Outcomes (ILO's) in the light of: The National Academic Reference Standards (NARS) for Bachelor degree of engineering (Mechatronics Program) published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE -August 2009) **as the main academic standards reference.**

- See Table [1] for a relationship matrix of "Program Aims Vs Faculty Mission".
- See Table [2] for a relationship matrix of "Program Aims Vs the Program ILOs".
- See Table [3] for a relationship matrix of "Program ILOs Vs the NARS's ILOs".
- See Table [4] for a relationship matrix of "Program Aims Vs NARS's Student's Attributes".
- See Table [5] for a relationship matrix of Program ILOs Vs the Program Courses.

6 Benchmark

The department council approved in its official meetings on 18/7/2016 & 16/11/2016 the adoption of the accreditation standards of the Accreditation Board for Engineering and Technology (ABET) as a benchmark.

The **faculty council approved** these adoptions (Academic standards & Benchmark) in the official meeting No. 6 for the academic year 2016/2017 on: 27/3/2017. As usual, the minutes of this meeting has been sent to the **university administration**.

7 Curriculum Structure and Contents

7.1 Programme duration:

Five Years, 10 semesters, 175 Ch.H.

7.2 Programme structure

Contact Hours Distribution		%
Lectures	133h	53%
Tutorial/lab	118h	47%
Total	251h	100%

Program Courses Types		%
Compulsory	161 Cr.H.	92%
Elective	14 Cr.H.	8%

Subject Area		%	NARS Criteria %
Humanities and Social Sciences	15	8.6	9-12 %
Mathematics and Basic Sciences	40.5	23.1	20-26 %
Basic Engineering Sciences	41.3	23.6	20-23 %
Applied Engineering and Design	43	24.6	20-22 %
Computer Applications and ICT*	17.1	9.8	9-11 %
Design Projects and Practice	18.1	10.3	8-10 %
Discretionary (Institution Character Identifying)	0	0	
Total	175	100	

7.3 Program Courses

7.3.1 UNIVERSITY REQUIREMENTS (12 credit hours)

Compulsory Courses List (8 credit hours)			Elective Courses List (4 credit hours)		
Code	Course Title	Cr. H	Code	Course Title	Cr. H
CMP 101	Introduction to Computers	2	BSA H01	Administration of Small Projects	2
HUM 103	Human Rights	2	HUM H03	Environmental Science	2
ENG 101	English Language 1	2	HUM H05	History of Science	2
ENG 102	English Language 2	2	HUM H06	Psychology	2
Total		8	HUM H07	Sociology	2
			HUM H08	Scientific Thinking	2
			HUM H09	Specific Computer Applications	2

7.3.2 FACULTY REQUIREMENTS (32 credit hours)

Code	Course Title	Cr. H
CHM 151	Chemistry 1	2
CMP 132	Computer Programming	2
GEN 313	Report Writing and Presentation Skills	2
GEN 441	Law for Professional Engineers	2
GRA 141	Graphics 1	2
GRA 142	Graphics 2	2
MAN 121	Production Technology	2
MEC 121	Mechanics 1 (Statics)	2
MEC 122	Mechanics 2 (Dynamics of Particles)	2
MTH 111	Differentiation with Applications and Algebra (Math 1)	3
MTH 112	Integration with Applications and Analytical Geometry (Math 2)	3
PHY 131	Properties of Matter and Thermodynamics (Physics 1)	4
PHY 132	Electricity and Magnetism (Physics 2)	4
Total		32

7.3.3 DEPARTMENT REQUIREMENTS

Core Courses List (73 credit hours)

Code	Course Title	Cr. H
CMP 470	Control Systems	3
CMP 475	Digital Control Systems	3
ELE 216	Basic Electronic Circuits	3
EPR 266	Electrical Circuits	4
EPR 340	Electrical Machines	3
MAN 221	Production Engineering 1	2
MAN 231	Properties of Materials	3
MAN 232	Stress Analysis	3
MAN 241	Mechanical Engineering Drawing	2
MAN 311	Mechanical Mechanisms	3
MAN 321	Fundamentals of Manufacturing Processes	2
MAN 331	Structural Mechanics	3
MAN 341	Mechanical Design 1	3
MAN 381	Engineering Economics	2
MAN 441	Mechanical Design 2	3
MAN 380	Modeling and Simulation	2
MAN 481	Quality Control	2
MAN 592	Project Management	2
MEC 221	Dynamics of Rigid Bodies	3
MPR 251	Engineering Thermodynamics	4
MPR 252	Fluid Mechanics	4
MPR 321	Measurements and Measuring Instruments	2
MTH 211	Functions of Several Variables and ODE (Math 3)	3
MTH 212	Transformation and Numerical Analysis (Math 4)	3
MTH 311	Complex Variables and Special Functions (Math 5)	3
MTH 312	Probability and Statistics (Math 6)	3
Total		73

7.3.4 SPECIALIZATION REQUIREMENTS

Mechatronics Engineering (58 credit hours)

Compulsory Courses List (48 credit hours)		
Code	Course Title	Cr. H
CMP 456	Design of Real-Time Embedded Systems	2
ELE 366	Digital Systems	3
ELE 410	Introduction to Microprocessors	3
EPR 442	Actuators and Power Electronics	3
MAN 350	Industrial Automation (CAD/CAM)	2
MAN 515	Electromechanical Design	3
MKT 411	Mechatronics	3
MKT 412	Mechatronics System Design	3
MKT 440	Programmable Logic Controllers	2
MKT 471	Robot Mechanics	3
MKT 472	Robot Control	3
MKT 500	Graduation Project I	2
MKT 501	Graduation Project II	4
MPR 355	Thermal Power Systems	3
MPR 459	Fluid Systems Control	3
MPR 456	Heat Transfer	3
MPR 555	Energy Conversion systems	3
Total		48

Elective Courses List (10 credit hours)		
Code	Course Title	Cr. H
MAN 547	Reverse Engineering in Mechanical Design	2
MAN 570	Mechanisms Computer Aided Design	2
MKT 505	Sensors and Signal Conditioning	2
MKT 506	Micro Processor- Based Instrumentation	2
MKT 507	Introduction to Micro- Electro Mechanical Systems (MEMS)	2
MKT 510	Vibration Principles and Monitoring	2
MKT 590	Smart Systems	2
MKT 599	Special Topics in Mechatronics	2
MPR 466	Heating, Ventilation and Air Conditioning	2
MPR 561	Plant Engineering and Maintenance	2
MPR 563	Pollution Control	2

7.4: Graduation Project

The Graduation Project represents the capstone achievement of the Mechatronics engineering student's undergraduate experience. It is an application oriented and requires the use of engineering principles to the solution of a real-world problem. The graduation project is carried out in two phases. In phase 1, a team of students (2-4) is attached to one or more faculty members as advisor(s). A topic related to Mechatronics engineering is to be selected in accordance to interest of both the student and the advisor. This topic is preferred to be linked with a real problem in industry. During this phase, the following tasks are to be fulfilled: A proposal with suggested time plan – Review of the available literature including web search of the related subjects- Design stage.

In phase II of the graduation project, the student(s) build on their achievements in phase I to finalize the fulfilment of the task(s) assigned. This phase includes: finalizing of the design stage – Implementation (computer simulation and/or hardware realization) – Testing and finishing - Writing of the thesis. The duration of this phase is one semester in addition to extra four weeks. The student(s) are to present their work in front of an examination board for evaluation. At least one member of the examination board is an external examiner from industry or from other university.

7.5 Practical Training

Each student is required to spend a minimum of 8 weeks in practical training (Industrial or field training). This training can be carried out in Egypt or abroad. The student must write a report to be presented and evaluated as **Pass/ Fail** by the academic Department. Carrying out the practical training with a (Pass) evaluation is a requirement for graduation.

7.6 Suggested Schedule:

First Semester							
No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/Lab	Total	CrH	
1	MTH 111	Mathematics 1	3	2	5	3	-
2	MEC 121	Mechanics 1	2	2	4	2	-
3	PHY 131	Physics 1	3	3	6	4	-
4	GRA 141	Graphics 1	1	3	4	2	-
5	CHM 151	Chemistry 1	2	2	4	2	-
6	CMP 101	Introduction to Computers	2	1	3	2	-
7	ENG 101	English Language 1	2	0	2	2	-
Total			15	13	28	17	

Second Semester							
No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/Lab	Total	CrH	
1	MTH 112	Mathematics 2	3	2	5	3	MTH 111
2	MEC 122	Mechanics 2	2	2	4	2	MEC 121
3	PHY 132	Physics 2	3	3	6	4	-
4	GRA 142	Graphics 2	1	3	4	2	GRA 141
5	CMP 132	Computer Programming	2	2	4	2	CMP 101
6	MAN 121	Production Technology	2	2	4	2	-
7	ENG 102	English Language 2	2	0	2	2	ENG 101
Total			15	14	29	17	

Third Semester							
No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/Lab	Total	CrH	
1	EPR 266	Electric Circuits	3	3	6	4	PHY 132
2	MAN 221	Production Engineering 1	2	1	3	2	MAN 121
3	MAN 231	Properties of Materials	2	2	4	3	PHY 131
4	MAN 241	Mechanical Engineering Drawing	0	4	4	2	GRA 142
5	MPR 251	Engineering Thermodynamics	3	2	5	4	PHY 131
6	MTH 211	Functions of Several Variables and ODE (Math 3)	2	2	4	3	MTH 112
Total			12	14	26	18	

Fourth Semester							
No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/Lab	Total	CrH	
1	ELE 216	Basic Electronic Circuits	2	2	4	3	PHY 132
2	GEN 313	Report Writing and Presentation Skills	2	1	3	2	None
3	MAN 232	Stress Analysis	2	2	4	3	PHY 131
4	MEC 221	Dynamics of Rigid Bodies	2	2	4	3	MEC 122
5	MPR 252	Fluid Mechanics	3	3	6	4	MEC 122, PHY 131
6	MTH 212	Transformation and Numerical Analysis (Math 4)	2	2	4	3	MTH 211
Total			13	12	25	18	

Fifth Semester							
No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/Lab	Total	CrH	
1	MAN 311	Mechanical Mechanisms	2	2	4	3	MEC 221
2	MAN 321	Fundamentals of Manufacturing Processes	2	1	3	2	MAN 221
3	MAN 331	Structural Mechanics	2	2	4	3	MAN 232
4	MPR 355	Thermal Power Systems	2	2	4	3	MPR 251
5	MTH 311	Complex Variables and Special Functions (Math 5)	2	2	4	3	MTH 212
6	PSC 110	Human Rights	2	0	2	2	None
7	UNV E01	University Elective 1	2	1	3	2	None
Total			14	10	24	18	

Sixth Semester							
No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/Lab	Total	CrH	
1	ELE 366	Digital Systems	2	2	4	3	PHY 132
2	EPR 340	Electrical Machines	2	2	4	3	EPR 200
3	MAN 341	Mechanical Design 1	2	2	4	3	MAN 232 MAN 241 MAN 311
4	MAN 350	Industrial Automation (CAD/ CAM)	2	1	3	2	MAN 221 CMP 132
5	MAN 380	Modeling and Simulation	2	1	3	2	CMP 132 MTH 311
6	MPR 321	Measurements and Measuring Instruments	2	1	3	2	MPR 251 MPR 252
7	MTH 312	Probability and Statistics (Math 6)	2	2	4	3	MTH 311
Total			14	11	25	18	

Seventh Semester							
No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/Lab	Total	CrH	
1	CMP 470	Control Systems	2	2	4	3	MTH 212
2	ELE 410	Introduction to Microprocessors	2	2	4	3	ELE 366
3	MAN 441	Mechanical Design 2	2	2	4	3	MAN 341
4	MKT 411	Mechatronics	2	2	4	3	EPR 266 ELE 216
5	MKT 471	Robot Mechanics	2	2	4	3	MAN 311
6	MPR 459	Fluid Systems Control	2	2	4	3	MPR 252
Total			12	12	24	18	

Eighth Semester							
No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/Lab	Total	CrH	
1	CMP 456	Design of Real – Time Embedded Systems	2	2	4	2	ELE 410
2	CMP 475	Digital Control Systems	2	2	4	3	CMP 470
3	MAN 481	Quality Control	2	1	3	2	MTH 312
4	MKT 412	Mechatronics System Design	2	2	4	3	MKT 411
5	MKT 440	Programmable Logic Controllers (PLCs)	2	1	3	2	ELE 216
6	MKT 472	Robot Control	2	2	4	3	MKT 471
7	MPR 456	Heat Transfer	2	2	4	3	MPR 251
Total			14	12	26	18	

Ninth Semester							
No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/Lab	Total	CrH	
1	EPR 442	Actuators and Power Electronics	2	2	4	3	EPR 340
2	MAN 515	Electromechanical Design	2	1	3	3	MAN 441 EPR 340
3	MAN 592	Project Management	2	1	3	2	None
4	MKT 500	Graduation Project I	0	4	4	2	As Advised
5	MKT E01	Elective 1	2	1	3	2	See List
6	MKT E02	Elective 2	2	1	3	2	See List
7	UNV E02	University Elective 2	2	0	2	2	None
Total			12	10	22	16	

Tenth Semester							
No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/Lab	Total	CrH	
1	GEN 441	Law for Professional Engineers	2	0	2	2	None
2	MAN 381	Engineering Economics	2	1	3	2	None
3	MKT 501	Graduation Project II	0	4	4	4	MKT 500
4	MKT E03	Elective 3	2	1	3	2	See List
5	MKT E04	Elective 4	2	1	3	2	See List
6	MKT E05	Elective 5	2	1	3	2	See List
7	MPR 555	Energy Conversion Systems	2	2	4	3	MPR 355
Total			12	10	22	17	

8 Program admission requirements

In order to be admitted to the Mechatronics program at FUE, students should satisfy the minimum requirements decided by the supreme council of the Egyptian universities for acceptance to the faculty of Engineering at FUE. This is in addition to completing at least 20 credit hours with GPA of "1" or higher.

9 Regulations for Registration, Progression and Program Completion

9.1 Registration Procedure

Before the start of each semester, students should register the courses which they select, in certain templates specially designed for this propose, at the date specified by the faculty. The ordinary load for the fall and spring semester ranges between 12 to 19 credit hours, while the maximum load of the summer semester is 9 credit hours. Excellent students are allowed to register up to 21 credit hours, subject to the approval of the academic advisor and the faculty Dean.

9.2 Course Withdrawal and Addition

After the primary registration, students are allowed to drop and add courses, during the first two weeks of the semester after the advice of the academic advisor and the approval of the faculty Dean. It is not possible to add any course to the student's time table after the end of the registration period. The student may withdraw from a course or more during the first 10 weeks provided that the number of remaining registered hours is not less than the minimum requirements of the semester. It is not allowed for a student to withdraw from a course after the allowed period (the first ten weeks of the semester) without an excuse acceptable to the faculty council. However, if the faculty council accepts the excuse, the student is then allowed to register once more in this course, and keeps his course grade.

9.3 Attendance and Absence

Attendance of lectures, tutorials and labs is considered to be an important issue in the educational process inside the program, as the student gets benefits from the interaction inside the class room between him and the staff members, teaching assistants and colleagues. Therefore, students should attend regularly so that their grades are not affected by their absences.

Students that do not attend a term exam without an excuse that his/her academic advisor and the course's instructor agree upon are not given a make-up examination. Students may be forced to withdraw from a course if the absence ratio exceeds 25% of the lectures and tutorials during the first 10 weeks of the semester, but if the absence ratio exceeds 25% after the first 10 weeks, students are not allowed to withdraw the course, attending lectures or attending the final term examination. The student gets grade (F) in this course. The students have to be warned at least once before preventing them from attending the examination.

The Final exam may be postponed for a student till the start of the next semester if he/she has an excuse accepted by the faculty council. In this case, the semester work mark is kept, and the student is allowed to enter the final exam at the beginning of the next semester, and gets a final grade (Incomplete) in this course in the semester in which he/she did not take the examination. This incomplete grade is changed to the actual grade obtained by the student in the postponed examination.

9.4 Semester Withdrawal

The student has the right to withdraw from an academic semester within the withdrawal period announced in the academic calendar of the semester. He/ She will be considered to have failed if he withdraws after the aforementioned period, unless he has a valid reason which is acceptable to his/her advisor, and the faculty Dean.

9.5 System of Examinations

The final mark of a given course is composed of the sum of semester year work and the final examination mark. The total grade distribution of each type is as follows:

Final Exam	40%
Semester work (<i>Assignments, Midterm Exams, Sketch designs, Design projects, Quizzes, and other similar things</i>). <i>-The course instructor may suggest the suitable distribution for these marks</i>	60%

Students are to be informed about their grades two times: 25% by the 6th week and 50% by the 11th week.

9.6 Grading System

Grade	Range	Points
A	From 90% to 100%	4.0
A-	From 85 to < 90%	3.7
B+	From 80 to <85%	3.3
B	From 75 to < 80%	3.0
B-	From 70 to < 75%	2.7
C+	From 65 to < 70%	2.3

At the end of the semester students receive a final grade in each course. The grade is the professor's official estimate of the student achievement as reflected in examinations, assignments and class participation. The final grades are recorded on the student permanent record at the Office of the University Registrar. The adjacent table illustrates the used grading system.

C	From 60 to < 65%	2.0
C-	From 55 to <60%	1.7
D+	From 53 to < 55%	1.3
D	From 50 to < 53%	1.0
F	Less than 50 %	0.0

The grade point average (G.P.A) is calculated as follows: $G.P.A = (\text{Sum of: the multiplication of the credit hours of each course by the points earned for that course}) / (\text{Total number of credit hours completed})$

9.7 Repetition of courses in the case of failure

If a student fails a compulsory course in any semester, he/she should restudy this course. However, if he fails an elective course, he may restudy the same course or register in another elective course with the approval of the academic advisor. If the student succeeds a repeated course, the (F) grade remains in his academic record, but its mark is replaced by the new mark which is then used in calculating his G.P.A.

9.8 Repetition of courses for improving the G.P.A

A student is allowed to register one course or more in order to improve his G.P.A. In this case the student gets his new mark whatever its value and the old mark is removed with its credit hours from his academic record. In case a student wants to re-register a course for the second time, he/she has to take the permission of his advisor and the approval of the college council.

9.9 Registration for a student with low G.P.A.

If the G.P.A of a student in any semester drops below 2.0, he is put on probation (under close observation) for the next two semesters and is not allowed to register more than 12 credit hours in these semesters.

9.10 Degree Requirements

To be awarded the Bachelor of Science Degree in Mechatronics Engineering, students must earn 175 credit hours. The student must earn a grade of D or better in all the required courses and earn a grade-point average (GPA) of (C) or better in order to graduate. The following table gives the rating & the corresponding G.P.A. range.

G.P.A	RATING	Rank of Honour*
3.7- 4.0	Distinction	First Rank*
3.3 – Less than 3.7	Very Good	Second Rank*
2.3 – Less than 3.3	Good	-
2.0 – Less than 2.3	Pass	-
* In addition, the student should have not failed any course during his study.		

10 Program ILOs Assessment Methods

The following table illustrates the assessment methods and what they assess in most courses. But for further details refer to the courses specifications.

	Program ILOs			
	K&U	Intellectual	Professional	General
Written Exams	■	■	■	
Practical Exams	■		■	
Oral Exams	■	■		■
Projects	■	■	■	■
Researches	■		■	■
Assignments & Follow up	■	■	■	■

11 Evaluation of program intended learning outcomes

Evaluator	Tool	Sample
1- Faculty	Final Exams Results	100%
2- Faculty	Evaluation sheet	100%
3- Senior students	Evaluation sheet	50%
4- Alumni	Evaluation sheet &	5%
5- Stakeholders (Employers)	Evaluation sheet &	5
6-External Evaluator(s) (External	Evaluation report	1
5- Other		

12: Program Approval by the Ministry of High Education:

The Mechatronics program has been approved by the Ministry of High Education on September 2006 (Ministerial decree No.2299)

Table [1] Matrix Of Program Aims VS “Faculty Mission

<u>Faculty Mission</u>		Graduating of outstanding engineers	Conducting innovative Research	Conducting community service and development
The Faculty of Engineering and Technology at Future University in Egypt provides a promising academic and cultural environment that enables the graduation of outstanding engineers who are capable of competing nationally and regionally and well acquainted with the job market professionally and ethically. It also motivates conducting innovative scientific research and contributes to community serving and development.				
<u>Program Aims</u>	1. Apply knowledge of mathematics, science and engineering concepts to the solution of engineering and Mechatronics problems.			
	2. Design a system, component, or process in the area of multidisciplinary specialization of Mechatronics engineering to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.			
	3. Design and conduct experiments as well as analyze and interpret data.			
	4. Identify, formulate and solve engineering problems especially in the area of integrated mechanics, electronics, computers, and software systems.			
	5. Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.			
	6. Work effectively on multidisciplinary teams.			
	7. Communicate effectively.			
	8. Have a broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.			
	9. Have a knowledge of contemporary engineering issues especially in the area of Mechatronics.			
	10. Apply professional and ethical responsibilities; and display contextual understanding			
	11. Recognize the need for, and can engage in life-long learning.			
	12. Apply knowledge of engineering sciences to electro-mechanical systems.			
	13. Solve problems in the areas of integrated mechanics, electronics, computers and software systems.			
	14. Analyze and investigate the inter-disciplinary characteristics of mechanical, electrical, and hydraulic systems.			
	15. Have a wide choices leading to specialization in mechanics, electronics, design, or computer software and its applications.			
	16. Acquire entrepreneurial skills			

Table [2] Matrix Of Program Aims VS The Program ILOs

Graduate Attributes	Program ILOs																																								
	Knowledge & Understanding										Intellectual																														
	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19
PA - 1.	■																						■																		
PA - 2.		■																								■															
PA - 3.																																									
PA - 4.																																									
PA - 5.																																									
PA - 6.																																									
PA - 7.																																									
PA - 8.																																									
PA - 9.																																									
PA - 10.																																									
PA - 11.																																									
PA - 12.																																									
PA - 13.																																									
PA - 14.																																									
PA - 15.																																									
PA - 16.																																									

Table [2] Matrix Of Program Aims VS The Program ILOs (Continued)

Graduate Attributes	Program ILOs																									
	Professional & Practical										General & Transferable															
	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14	C15	C16	D01	D02	D03	D04	D05	D06	D07	D08	D09	
PA - 01																										
PA - 02																										
PA - 03																										
PA - 04																										
PA - 05																										
PA - 06																										
PA - 07																										
PA - 08																										
PA - 09																										
PA - 10																										
PA - 11																										
PA - 12																										
PA - 13																										
PA - 14																										
PA - 15																										
PA - 16																										

Table [3] Matrix Of Program ILOs VS NARS (Knowledge & Understanding)

		PROGRAM ILOS																						
		A1	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	
NARS ILOS	a)																							
	b)																							
	c)																							
	d)																							
	e)																							
	f)																							
	g)																							
	h)																							
	i)																							
	j)																							
	k)																							
	l)																							
	m)																							
	n)																							
	o)																							

Table [3] Matrix Of Program ILOs vs NARS (Intellectual)

		PROGRAM ILOs																		
		B1	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19
NARS ILOs	a)	■																		
	b)		■																	
	c)			■																
	d)				■															
	e)					■														
	f)						■													
	g)							■												
	h)								■											
	i)									■										
	j)										■									
	k)											■								
	l)												■							
	m)													■						
	n)														■					

Table [3] Matrix Of Program ILOs VS NARS (Professional & Practical)

		PROGRAM ILOs																
		C1	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14	A15	A16	
NARS ILOs	a)																	
	b)																	
	c)																	
	d)																	
	e)																	
	f)																	
	g)																	
	h)																	
	i)																	
	j)																	
	k)																	
	l)																	
	m)																	
	n)																	
	o)																	
	p)																	

Table [3] Matrix Of Program ILOs VS NARS (General & Transferable)

		PROGRAM ILOs									
		A01	A02	A03	A04	A05	A06	A07	A08	A09	
NARS ILOs	a)										
	b)										
	c)										
	d)										
	e)										
	f)										
	g)										
	h)										
	i)										

Table [4] Matrix Of Program Aims Vs NARS Graduate Attributes

NARS Graduate's Attributes	Program Aims															
	PA-1	PA-2	PA-3	PA-4	PA-5	PA-6	PA-7	PA-8	PA-9	PA-10	PA-11	PA-12	PA-13	PA-14	PA-15	PA-16
a) Apply knowledge of mathematics, science and engineering concepts to the solution of engineering problems.																
b) Design a system; component and process to meet the required needs within realistic constraints.																
c) Design and conduct experiments as well as analyze and interpret data.																
d) Identify, formulate and solve fundamental engineering problems.																
e) Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.																
f) Work effectively within multi-disciplinary teams.																
g) Communicate effectively.																
h) Consider the impacts of engineering solutions on society & environment.																
i) Demonstrate knowledge of contemporary engineering issues.																
j) Display professional and ethical responsibilities; and contextual understanding																
k) Engage in self- and life- long learning.																
l) Use of mathematics, physical science and systems analysis tools in components and system design.																
m) Students will learn engineering sciences and demonstrate the application of this knowledge to electro-mechanical systems.																
n) Solve problems in the areas of integrated mechanics, electronics, computers and software systems.																
o) Analyze and investigate the inter-disciplinary characteristics of mechanical, electrical and hydraulic systems.																
p) Graduates should have wide choices leading to specialization in mechanics, electronics, design, computer software or other areas																

Table [5] Matrix Of Program ILOs Vs The Program Courses.

Please open the file: [COURSES_PROG_ILOs_Mech_3_017.xlsx](#)

- 1 university req.
- 2 faculty req.
- 3 Core req.
- 4 Specialization req.

FUE		MECHATRONICS PROGRAM																		
		INTELLECTUAL SKILLS																		
		B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19
PROGRAM ILOS		CHEK	27	6	25	28	13	11	8	19	5	11	5	6	6	7	9	5	6	
COURSES		5	2																6	
LEVEL 1	1	CHM 151	Chemistry 1																	
		CMP 101	Introduction to Computers	2																
		ENG KET	English KET	2																
		GRA 141	Graphics 1	10			2													
		MEC 121	Mechanics I (Statics)	3	2															
		MTH 111	Differentiation (Math 1)	8	2	2	2				2									
		PHY 131	Prop. of Matter Physics (1)	4	2															
		CMP 132	Computer Programming	4																
		ENG PET	English PET	3																
		GRA 142	Graphics 2	10			2													
		MAN 121	Production Technology	9			2			2	2									
		MEC 122	Mechanics 2	3	2															
		MTH 112	Integration (Math 2)	9	2	2	2				2									
	PHY 132	Elect. & Mag. (Physics 2)	4	2																
LEVEL2	3	EPR 266	Electric Circuits	11	3										3					
		MAN 221	Production Engineering 1	17		3	3												3	
		MAN 231	Properties of Materials	14		3			3	3										
		MAN 241	Mechanical Engineering Drawing	15			3				3				3					
		MPR 251	Eng. Thermodynamics	11	3	3								3						
		MTH 211	Functions of several variables (Math 2)	7	3	3			3	3										
		ELE 216	Basic Electronic Circuits	18	3		3		3	3					3					
		GEN 313	Report Writing and Presentation Skills	5																
		MAN 232	Stress Analysis	13		3	3			3	3									
		MEC 221	Dynamics of Rigid Bodies	11	3	3														
	MPR 252	Fluid Mechanics	13	3	3					3										
	MTH 212	Transmitt. and Numerical Analysis (Math 2)	9	3	3	3						3								

1
2
3
4

1 university req.
2 faculty req.
3 Core req.
4 Specialization req.

FUE		MECHATRONICS PROGRAM																
		PRACTICAL AND PROFESSIONAL SKILLS																
		C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14	C15	C16	
PROGRAM ILOS		CHEK	12	8	24	15	14	5	6	8	5	3	6	7	19	12	5	7
COURSES		CHEK	16		4		4					4	4					
9	EPR 442	Actuators and Power Elect.																
	MAN 515	Electromechanical Design				4	4							4				
	MAN 592	Project Management			3					3								
	MKT 500	Graduation Project I		4	4		4											4
	MKT E01	Elective 1	0															
	MKT E02	Elective 2	0															
	UNV E02	University Elective 2	2															
	GEN 441	Law for Professional Eng.	3															
	MAN 381	Engineering Economics	12									3	3					
10	MKT 501	Graduation Project II	36				4	4	4					4	4	4	4	4
	MKT E03	Elective 3	0															
	MKT E04	Elective 4	0															
	MKT E05	Elective 5	0															
	MPR 555	Energy Conversion Systems	19													4	4	4

LEVEL 5

1 university req.
2 faculty req.
3 Core req.
4 Specialization req.

		FUE	MECHATRONICS PROGRAM											
			GENERAL & TRANSFERABLE SKILL											
			D01	D02	D03	D04	D05	D06	D07	D08	D09			
		PROGRAM ILOS	CHECK	11	26	34	11	6	29	20	4	12		
		COURSES												
LEVEL 1	1	CHM 151	Chemistry I	5	2				2					
		CMP 101	Introduction to Computers	2					1					
		ENG KET	English KET	2		1								
		GRA 141	Graphics 1	10	2				2	2		2		
		MEC 121	Mechanics I (Statics)	3					2					
		MTH 111	Differentiation (Math 1)	8	2									
		PHY 131	Prop. of Matter Physics (1)	4					2					
		CMP 132	Computer Programming	4			2	2						
		ENG PET	English PET	3			1			1				
		GRA 142	Graphics 2	10	2				2	2		2		
		MAN 121	Production Technology	9			2							
		MEC 122	Mechanics 2	3					2					
		MTH 112	Integration (Math 2)	9	2					2				
PHY 132	Elect. & Mag. (Physics 2)	4						2						
LEVEL2	3	EPR 266	Electric Circuits	11	3		3		3	3				
		MAN 221	Production Engineering 1	17	3	3	3		3	3				
		MAN 231	Properties of Materials	14		3			3	3				
		MAN 241	Mechanical Engineering Drawing	15		3		3	3	3	3	3		
		MPR 251	Eng. Thermodynamics	11								3		
		MTH 211	Functions of Several Variables	7		3								
		ELE 216	Basic Electronic Circuits	18	3	3	3		3	3				
		GEN 313	Report Writing and Presentation Skills	5				1						
		MAN 232	Stress Analysis	13	3	3								
		MEC 221	Dynamics of Rigid Bodies	11		3			3	3				
		MPR 252	Fluid Mechanics	13			3		3	3	3	3		
		MTH 212	Transform. and Numerical Analysis (Math 4)	9		3								



FUTURE
UNIVERSITY IN EGYPT

جامعة المستقبل



Courses Specifications

Mechanical Engineering Department

C - DEPARTMENTAL REQUIREMENTS

1. Core Courses List (73 credit hours)

No.	Code	Course Title	Cr. H
1	CMP 470	Control Systems	3
2	CMP 475	Digital Control Systems	3
3	ELE 216	Basic Electronic Circuits	3
4	EPR 266	Electrical Circuits	4
5	EPR 340	Electrical Machines	3
6	MAN 221	Production Engineering 1	2
7	MAN 231	Properties of Materials	3
8	MAN 232	Stress Analysis	3
9	MAN 241	Mechanical Engineering Drawing	2
10	MAN 311	Mechanical Mechanisms	3
11	MAN 321	Fundamentals of Manufacturing Processes	2
12	MAN 331	Structural Mechanics	3
13	MAN 341	Mechanical Design 1	3
14	MAN 380	Modeling and Simulation	2
15	MAN 381	Engineering Economics	2
16	MAN 441	Mechanical Design 2	3
17	MAN 481	Quality Control	2
18	MAN 592	Project Management	2
19	MEC 221	Dynamics of Rigid Bodies	3
20	MPR 251	Engineering Thermodynamics	4
21	MPR 252	Fluid Mechanics	4
22	MPR 321	Measurements and Measuring Instruments	2
23	MTH 211	Functions of Several Variables and ODE (Math 3)	3
24	MTH 212	Transformation and Numerical Analysis (Math 4)	3
25	MTH 311	Complex Variables and Special Functions (Math 5)	3
26	MTH 312	Probability and Statistics (Math 6)	3

Mechatronics Engineering

D - SPECIALIZATION REQUIREMENTS

1. Compulsory Courses List **(48 credit hours)**

No.	Code	Course Title	Cr. H
1	CMP 456	Design of Real-Time Embedded Systems	2
2	ELE 366	Digital Systems	3
3	ELE 410	Introduction to Microprocessors	3
4	EPR 442	Actuators and Power Electronics	3
5	MAN 350	Industrial Automation (CAD/CAM)	2
6	MAN 515	Electromechanical Design	3
7	MKT 411	Mechatronics	3
8	MKT 412	Mechatronics System Design	3
9	MKT 440	Programmable Logic Controllers	2
10	MKT 471	Robot Mechanics	3
11	MKT 472	Robot Control	3
12	MKT 500	Graduation Project I	2
13	MKT 501	Graduation Project II	4
14	MPR 355	Thermal Power Systems	3
15	MPR 459	Fluid Systems Control	3
16	MPR 456	Heat Transfer	3
17	MPR 555	Energy Conversion systems	3

2. Elective Courses List **(10 credit hours)**

No.	Code	Course Title	Cr. H
1	MAN 547	Reverse Engineering in Mechanical Design	2
2	MAN 570	Mechanisms Computer Aided Design	2
3	MKT 505	Sensors and Signal Conditioning	2
4	MKT 506	Micro Processor- Based Instrumentation	2
5	MKT 507	Introduction to Micro- Electro Mechanical Systems (MEMS)	2
6	MKT 510	Vibration Principles and Monitoring	2
7	MKT 590	Smart Systems	2
8	MKT 599	Special Topics in Mechatronics	2
9	MPR 466	Heating, Ventilation and Air Conditioning	2
10	MPR 561	Plant Engineering and Maintenance	2
11	MPR 563	Pollution Control	2



FUTURE
UNIVERSITY IN EGYPT

جامعة المستقبل



Department Requirements



Future University in Egypt
Faculty of Engineering and Technology
Mechanical Engineering Department

Fall 2017

Course Specifications

CMP 470: Control Systems

Program at which the course is given:	All Mechanical Departments
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering Department
Department offering the course:	Mechanical Engineering Department
Academic level / semester:	Level Four– 1 st semester
Date of specification approval:	November 2017

A- Basic Information

Title: Control Systems	Code: CMP 470
Credit Hours: 3 Hrs.	Lectures: 2 Hrs. Tutorial/Lab: 2 Hrs.
Prerequisite Course	MTH 212: Math 4

B- Professional Information

1. Catalog Course Description

Introduction to feedback control systems; Block diagram reduction and signal flow graphs; System time response and stability; Feedback systems performance specifications; Time; Root-Locus; Frequency response analysis techniques; State space analysis of multivariable systems; Controllability, observability, and sensitivity; Basic controller design in frequency domain and state space; PID, lead-lag and lag-lead compensation; Analysis and design of feedback control systems using Matlab.

2. Overall aims of the course:

At the end of this course, students should:

- Comprehend the basic concepts of classical control systems.
- Comprehend control systems theory considering only the Continuous Linear Time Invariant systems.
- Derive transient response and steady state error.
- Be able to do stability analysis
- Perform root locus analysis

- Perform frequency response analysis and state space methods.

3. Intended learning outcomes of course (ILOs):

a. Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Define the objective of continuous control system.
- a2. Outline the Mathematical Modeling of different analog system.
- a3. Recall the mathematical tools in dealing with control systems.
- a4. Explain the different transient time responses and steady state error in control systems.
- a5. Illustrate how the stability of control systems could be evaluated.
- a6. Explain how to draw the root locus and bode diagram for control systems.
- a7. Understanding modeling and analysis using state space representation.
- a8. Knowledge about controller and observer.

b. Intellectual skills:

By the end of this course the student should be able to:

- b1. Select appropriate mathematical and different methods for modeling and analyzing problems.
- b2. Design continuous control systems applying appropriate knowledge and principles.
- b3. Select appropriate solutions for engineering problems based on analytical thinking.
- b4. Analyze system, processes and components critically.

c. Professional and practical skills:

By the end of this course the student should be able to:

- c1. Write MatLab code for developed design methods.
- c2. Apply gained hardware and software skills to controller design in diverse mechatronics applications

d. General and transferable skills:

By the end of this course the student should be able to:

- d1. Collaborate effectively within multidisciplinary team.
- d2. Use digital libraries and/or learning systems and demonstrate efficient IT capabilities

4. Course ILOs versus Program ILOs relation

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

5. Course Contents:

Period	Topic	Lecture (hours)	Tutorial (hours)	Total (hours)
Week 1	Transient Response Analysis	2	2	4
Week 2	Steady-State Response Analysis	2	2	4
Week 3	The Root Locus Methods	2	2	4

Week 4	The Root Locus Methods	2	2	4
Week 5	Lead Compensation Design Based on The Root Locus Methods	1	2	4
Week 6	Lag Compensation Design Based on The Root Locus Methods	2	2	4
Week 7	1 st Mid Term Exam	2	2	4
Week 8	Bode Diagrams	2	2	4
Week 9	Lead & Lag Compensation Design Based on Bode Diagrams	2	2	4
Week 10	State Space Representation and Analysis	2	2	4
Week 11	2 nd Mid Term Exam	2	2	4
Week 12	Pole Placement Design	2	2	4
Week 13	State Observers	2	2	4
Week 14	Servo Systems	2	2	4

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

6. Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7. Assessment

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	30
Final Exam		Written	16 th - 17 th week.	40
Total				100

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

a. List of references:

- 1) Course Notes (in MS Power Point or PDF format)
- 2) Essential Book (Text Book)
 - Modern Control engineering, K. Ogata, 5th edition or higher, 2010, Prentice Hall.
- 3) Recommended Books
 - Automatic Control Systems, B. C. Kuo and F. Golnaraghi, 9th edition or higher, 2010, John Wiley & Sons, Inc.
 - Modern Control Systems, R. C. Dorf, R. H. Bishop, 12th edition or higher, 2010, Prentice Hall
 - Linear Control System Analysis and Design with Matlab, J. J. D’Azzo, C. H. Houpis and S. N. Sheldon, 5th edition or higher, 2003, Marcel Dekker, Inc.
 - Control Systems Engineering, N. S. Nise, 6th edition or higher, 2010, John Wily

4) Periodicals, Web Sites, ... etc

9. Facilities required for teaching and learning:

- 1) White board.
- 2) Data show for presentations.
- 3) Electrical Engineering Library.

Course coordinator: **Prof. M. Abdelatif**
Head of Department: **Prof. Yehia Hendawy**
Date: **Nov. 2017**
Course Instructor: **Prof. Abdelmonem Seif**

Appendix

Table [1]: Course ILOs / Program ILOs Matrix

Program ILOs	Course ILOs															
	Knowledge & Understanding								Intellectual Skills				Prof. & practical skills		Gen. & trans. skills	
	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	b4	c1	c2	d1	d2
A09	Principles of design including elements design, process and/or a system related to mechatronics	√	√	√	√	√	√	√								
A13	Current engineering technologies as related to Mechatronics, including modern techniques in sensors, actuators, control units and their interfaces	√	√	√	√	√	√									
B04	Think in a creative and innovative way in problem solving and design							√	√	√	√					
B13	Create systematic and methodic approaches when dealing with new and advanced technology							√	√	√	√					
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to mechatronics											√	√			
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs											√	√			
D01	Collaborate effectively within multidisciplinary team														√	
D02	Use digital libraries and/or learning systems and demonstrate efficient IT capabilities															√

Table (2): Course Contents/Course ILOs Matrix

Topic	Course ILOs													
	Knowledge & Understanding								Intellectual Skills				Prof. & practical skills	
	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	b4	c1	c2
Transient Response Analysis			√	√	√									
Steady-State Response Analysis			√	√	√									
The Root Locus Methods			√			√								
Lead Compensation Design Based on The Root Locus Methods	√									√			√	
Lag Compensation Design Based on The Root Locus Methods	√									√			√	
Bode Diagrams			√			√								
Lead & Lag Compensation Design Based on Bode Diagrams	√									√			√	
State Space Representation and Analysis		√	√		√		√		√					
Pole Placement Design	√							√		√	√	√	√	√
State Observers	√							√		√	√	√	√	√
Servo Systems	√							√		√	√	√	√	√

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs													
	Knowledge & Understanding								Intellectual Skills				Prof. & practical skills	
	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	b4	c1	c2
Interactive Lecturing	√	√	√	√	√	√	√	√						
Problem solving									√	√	√	√		
Experiential learning													√	√

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs													
	Knowledge & Understanding								Intellectual Skills				Prof. & practical skills	
Learning/Teaching Method	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	b4	c1	c2
Written Exams	√	√	√	√	√	√	√	√	√	√	√	√		
Discussion and Participation	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Report									√	√	√	√	√	√
Relative weight %	40%								50%				10%	



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018 Course Specifications

CMP 475: Digital Control Systems

Program at which the course is given:	All Mechanical Departments
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering Department
Department offering the course:	Mechanical Engineering Department
Academic level / semester:	Level Four– 2 nd semester
Date of specification approval:	19/6/2013

A- Basic Information

Title: Digital Control Systems	Code: CMP 475
Credit Hours: 3 Hrs.	Lectures: 2 Hrs.
Tutorial/Lab: 2 Hrs.	Total: 4 Hrs.
Prerequisite	CMP 470 Control Systems

B- Professional Information

1- Catalogue Course Description:

Discrete-time signals and systems; z-Transform analysis; Pulse transfer function and discrete-time feedback system; Static error, Jury stability test, and system sensitivity; Frequency-domain and state space analysis and design of discrete-time systems using Matlab; Digital controller implementation issues.

2- Overall aims of the course:

The Overall aims of this course are:

- Get familiar with the basic concepts of discrete-time control systems (Digital Control Systems) Discrete Linear Time Invariant systems only will be considered.
- Comprehend Transient response analysis
- Understand Steady state error analysis,
- Understand Stability analysis,
- Understand Root locus analysis,
- Understand Frequency response methods and State space methods.

This analysis will be used in the different advanced design methods for various controllers.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Define the objective of digital control system.
- a2. Outline the Mathematical Modeling of different digital system.
- a3. Recall the mathematical tools in dealing with control systems.
- a4. Explain the different transient time response in control systems.
- a5. Illustrate how the stability of control systems could be evaluated.
- a6. Explain how to draw the root locus and bode diagram for control systems.
- a7. Understanding modeling and analysis using state space representation.
- a8. Knowledge about controller and observer.

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.
- b2. Design digital control systems applying appropriate knowledge and principles.
- b3. Select appropriate solutions for engineering problems based on analytical thinking.
- b4. Analyze system, processes and components critically.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Write MatLab code for developed design methods.
- c2. Apply gained hardware and software skills to controller design in diverse mechatronics applications

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Collaborate effectively within multidisciplinary team.
- d2. Use digital libraries and/or learning systems and demonstrate efficient IT capabilities

4- Course ILOs versus Program ILOs relation:

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

5- Course Contents:

No	Topic	Lecture	Tutorial	Total
1	Review of Continuous-Time Systems Analog versus Digital Systems	2	2	4
2	The z-transform and its Inverse. Difference Equations and State Space Models Solution via the z-transform.	4	4	8
3	Discretization Methods and Sampled-Data Converters.	2	2	4

4	Stability Analysis of Discrete-Time Systems and root locus method.	4	4	8
5	State Space analysis and Controllability and Observability of Discrete-Time Systems.	4	4	8
6	Design Using Static Gain State Feedback Dynamic Observer Design.	4	4	8
7	Discrete-Time Systems Stability and Control via the Second Method of Lyapunov.	4	4	8
8	Frequency Domain design methods of Discrete-Time Systems.	4	4	8
9	Computer Controlled Systems and digital controller implementation issues.	2	2	4
Total		30 hours	30 hours	60 hours

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

6- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	30
Final Exam		Written	16 th - 17 th week.	40
Total				100

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

- 1) Course Notes (in MS Power Point or PDF format)
- 2) Essential Book (Text Book)
 - Discrete-Time Control Systems, K. Ogata, 2nd edition or higher, 1995, Prentice Hall.
- 3) Recommended Books
 - Digital Control System Analysis and Design, Charles L. Phillips, H. Troy Nagle, 3rd Edition, 1994, Prentice-Hall
 - Digital Control of Dynamic Systems, G. Franklin and J. Powell and M. Workman, 3rd Edition, 1998, Prentice-Hall
 - Discrete Time Control Problems Using Matlab by Joe H. Chow, Dean K. Frederick, Nicolas W. Chbat, October 2002, CL Engineering
 - Periodicals, Web Sites, ... etc
Any web site on control systems

9. Facilities required for teaching and learning:

- 1) White board.
- 2) Data show for presentations.
- 3) Electrical Engineering Library.

Course coordinator: **Prof. M Abdellatif.**
Head of Department: **Prof. Yehia Hendawy.**
Date: **November - 2017**
Course Instructor:

Appendix

Table [1]: Course ILOs / Program ILOs Matrix

Program ILOs	Course ILOs															
	Knowledge & Understanding								Intellectual Skills				Prof. & practical skills		Gen. & trans. skills	
	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	b4	c1	c2	d1	d2
A09	Principles of design including elements design, process and/or a system related to mechatronics	√	√	√	√	√	√	√								
A13	Current engineering technologies as related to Mechatronics. including modern techniques in sensors, actuators, control units and their interfaces	√	√	√	√	√	√									
B04	Think in a creative and innovative way in problem solving and design							√	√	√	√					
B13	Create systematic and methodic approaches when dealing with new and advanced technology							√	√	√	√					
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to mechatronics											√	√			
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs											√	√			
D01	Collaborate effectively within multidisciplinary team														√	
D02	Use digital libraries and/or learning systems and demonstrate efficient IT capabilities															√

Table (2): Course Contents/Course ILOs Matrix

Topic	Course ILOs													
	Knowledge & Understanding								Intellectual Skills				Prof. & practical skills	
	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	b4	c1	c2
The z Transform		√												
The Pulse Transfer Function		√												
Mapping between the s Plane and the z Plane and Stability Analysis		√												
Transient and Steady-State Response Analysis			√	√	√									
The Root Locus Methods			√			√								
Design Based on The Root Locus Methods	√									√			√	√
Bode Diagrams			√			√								
Design Based on Bode Diagrams	√		√			√				√			√	√
State Space Representation and Analysis		√	√		√		√		√					
Pole Placement Design	√							√		√	√	√	√	√
State Observers	√							√		√	√	√	√	√
Servo Systems	√							√		√	√	√	√	√

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs													
	Knowledge & Understanding								Intellectual Skills				Prof. & practical skills	
	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	b4	c1	c2
Interactive Lecturing	√	√	√	√	√	√	√	√						
Problem solving										√	√	√	√	
Experiential learning														√

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs													
	Knowledge & Understanding								Intellectual Skills				Prof. & prac. skills	
Learning/Teaching Method	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	b4	c1	c2
Written Exams	√	√	√	√	√	√	√	√	√	√	√	√		
Discussion and Participation	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Report									√	√	√	√	√	√
Relative weight %	40%								50%				10	



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
ELE 216: Basic Electronic circuits

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	December 2016

A- Basic Information

Title:	Basic Electronic circuits	Code:	ELE 216
Credit Hrs:	3	Lect.:	2
		Tut. /Lab:	2
Prerequisite:	PHY 132, Physics		

B- Professional Information

1-Catalog Course Description.

Passive and active electronic components; Diodes and transistors; Amplifiers, Operational amplifier circuits and applications; Difference and instrumentation amplifiers; Active filters, analog processing and signal conditioning; Digital-to-analog and analog-to-digital circuits; Wave shaping circuits; timers , Voltage to Current , Voltage to frequency converters , and multiplier circuits; Mini projects.

2-Overall aims of the course.

By the end of this course, students will be able to:

- 1- Characterize Semiconductor Materials;
- 2- Analyze the Conduction Mechanism in Semiconductors;
- 3- Give the Structure, Analyze, and Characterize Diodes;
- 4- Give the Structure, Analyze, and Characterize BJT's;
- 5- Give the Structure, Analyze, and Characterize MOSFET's;

3-Intended learning outcomes of course (ILOs).

Upon successful completion of this course the students will be able to:

a- Knowledge and understanding:

- a1- Understand the atomic structure and the energy band diagram of semiconductor materials.
- a2- Understand the conduction mechanisms in semiconductors.

- a3- Know and Classify different diode structures.
- a4- Know and Classify different BJT's structures.
- a5- Know and Classify different FET's structures.
- a6- Enumerate built-in potential, transition region capacitance, and diffusion capacitance of the PN junction.
- a7- Derive the PN junction I-V characteristics.
- a8- Implement clipping and rectifier circuits
- a9- Derive the BJT input and output characteristics.
- a10- Understand the use of BJT to amplify signals and its use as a switch.
- a11- Derive the FET input and output characteristics.
- a12- Understand the Operational Amplifier Characteristics and applications

b- Intellectual skills:

- b1- Compare between different kinds of diodes.
- b2- Compare between different kinds of transistors.
- b3- Analyze Diode circuits (clipper, rectifier,..etc).
- b4- Analyze BJT biasing circuits
- b5- Analyze MOSFET biasing circuits

c- Professional and practical skills:

- c1- Measure the diode I-V characteristics.
- c2- Measure the BJT input and output characteristics
- c3- Measure the FET input and output characteristics

d- General and transferable skills:

- d1- Work effectively in team.
- d2- Develop skills related to creative thinking, problem solving, oral and written communication, and teamwork

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Total
1	Introduction to Semiconductor Solid State	4	4	8
2	Semiconductor Diode	4	4	8
3	Diode Models	4	4	8
4	Diode Circuit Applications	4	4	8
5	Bipolar Junction Transistor (BJT)	4	4	8
6	Metal Oxide Semiconductor Field Effect Transistor (MOSFET)	4	4	8
7	Operational Amplifier	6	6	12
Total		30	30	60

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	30
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

Written exams	to assess	information delivered by the course
Laboratory assignment	to assess	The ability measuring devices I-V characteristics

8-List of references:

1. Text Book:
Electronic Principles (7th edition or later), A. Malvino and D. Bates,, ISBN-10: 0073222771Lecture notes on the course Moodle page, FUE website.
2. Recommended Readings:
Microelectronic Circuits, (5th edition), A. Sedra and J. Smith, Oxford University Press, ISBN-10: 0195338839, 2004.
Instructor notes

9-Facilities required for teaching and learning:

Data-show
Electronic circuits laboratory

Course coordinator: Prof. Mohamed Abdellatif
Head of Department: Prof. Yehia Hendawy
Date: November 2017
Course Instructor:

ELI 216: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs																						
		a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	
A17	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.	x	x	x	x	x	x																	
A19	Fundamentals of electrical, electronic, and digital instrumentation and transducers.						x			x		x												
B15	Analyze and design electrical and electronics including logic circuits, and microprocessor based systems.													x	x	x	x							
C14	Compete, in-depth, in at least one engineering discipline, namely: mechanics, electronics or interfacing and software;																		x	x				
D1	Collaborate effectively within multidisciplinary team																						x	x
D7	Search for information and engage in life-long self-learning discipline																							x

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs																						
		a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	
1	Introduction to Semiconductor Solid State	x															x							
2	Semiconductor Diode		x											x										
3	Diode Models			x										x										
4	Diode Circuit Applications				x					x				x										
5	Bipolar Junction Transistor (BJT)					x					x				x			x						
6	Metal Oxide Semiconductor Field Effect Transistor (MOSFET)								x			x			x			x						x
7	Operational Amplifier												x											x

Table [3]: Learning-Teaching method / ILOs Matrix

Method	Course ILOs																						
	a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	
Interactive Lecturing	x	x	x	x	x	x	x	x	x	x	x	x											
Problem solving													x	x	x	x	x	x	x	x			
Experiential learning																							x

Table [4]: Assessment method / ILOs Matrix

Method	Course ILOs														Σ								
	a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	b1	b2		b3	b4	b5	c1	c2	c3	d1	d2
Written Exams	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x						60
Discussion and Participation	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			30
Report													x	x	x	x	x	x			x	x	10
Relative weight %	40														50					5	5	100	



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017

Course Specifications

EPR 266: Electric Circuits

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Two
Date of specification approval:	November 2017

A- Basic Information

Title:	Electric Circuits	Code:	EPR 266
Credit Hrs:	4	Lect.:	3
		Tut. /Lab:	2
Prerequisite:	PHY 132 : Physics 2		

B- Professional Information

1-Catalog Course Description.

Analysis of resistive circuits by simplifications (source transformations, combination of elements, star/delta and delta/star transformation, node and loop analysis), Sinusoidal steady state analysis, Phasor diagram representation, network theorems (superposition, Thevenin, Norton, compensation and maximum power transfer), Analysis of circuits with AC (Alternate Current) excitation in the time domain, Analysis of AC circuits in the frequency domain using complex number algebra, Application of network theorems on alternating current circuits, Electric power, Complex power calculations and power factor, Circuits with nonlinear resistances, Analysis of electrical circuits with non-sinusoidal alternating currents, Higher order harmonics.

2-Overall aims of the course.

By the end of the course the students will be able to:

- ✓ Understand the fundamentals of electrical circuits.
- ✓ Know the main components used of electrical circuits.
- ✓ Analyse DC/AC electrical circuits using different techniques and theorems.
- ✓ Develop practical skills of testing electrical components.
- ✓ Share ideas and work in a team or a group.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Demonstrate knowledge and understanding the components and concepts of electrical circuits including Ohm's Law, Kirchhoff's Laws, resistance and source combinations, and voltage and current division.
- a2. Demonstrate knowledge and understanding of techniques to solve DC electric circuits: nodal and mesh analysis, source transformation. Theorems: superposition, and Thevenin's theorem.
- a3. Illustrate the characteristics of inductance and capacitance.
- a4. Define the impedance, admittance, and phasors for AC electric circuits.
- a5. Demonstrate knowledge and understanding of techniques and theorems to solve AC electric circuits.
- a6. Demonstrate knowledge and understanding of analysis the electrical circuits with non-sinusoidal sources.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Apply different techniques to solve DC circuit problems in different topologies.
- b2. Apply different techniques to solve AC circuit problems in different topologies.
- b3. Compare between solutions of AC and DC circuits, and evaluate the maximum power transfer on electrical circuits.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Testing electrical components.
- c2. Implementation of simple electrical circuits.
- c3. Applying solution techniques on simple circuits in the lab.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work coherently and successfully as a part of a team in the Lab.
- d2. Communicate effectively.
- d3. Effectively manage tasks, time, and resources.
- d4.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Circuit variables, Basic Circuit Elements, Basic Laws of Circuit Theory (Ohm's Law, Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL))	3	2	5
2	Resistors in Parallel, Voltage Divider, Current Divider, and Delta-Way Transformation	3	2	5
3	Techniques of Circuit Analysis: Node Voltage Method (NVM)	3	2	5
4	Node-Voltage Method and dependent sources Concept of "Super-node"	3	2	5
5	Techniques of Circuit Analysis: Mesh Current Method (MCM)	3	2	5
6	Mesh Current Method and dependent sources Concept of "Super-mesh"	3	2	5
7	Source Transformation (ST) Thevenin (Norton) Equivalent	3	2	5
8	Maximum Power Transfer Superposition (SP)	3	2	5
9	Inductors & Capacitors, Sinusoidal Steady-State Analysis: Sinusoidal Source, and Sinusoidal Response.	3	2	5
10	The Phasor, and Inverse Phasor. Phasor Diagrams Transformation Between Polar and Rectangular Forms Phasor Relations For Circuit Elements: Resistor.	3	2	5
11	Phasor Relations For Circuit Elements: inductor, and capacitor. Impedance & Admittance Kirchhoff's laws (KVL and KCL)	3	2	5
12	Source Transformation in phasor domain Node-Voltage Method (NVM) in phasor domain Mesh Current Method in phasor domain	3	2	5
13	Thevenin/Norton Equivalents in phasor domain Superposition (SP) in phasor domain Power calculations	3	2	5
14	Circuits with nonlinear resistances Analysis of electrical circuits with non-sinusoidal alternating currents Fourier series and Four Transform in circuit analysis and their practical applications in spectrum analyzers and filters.	6	4	10
Total		45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

- Final exam:.....40%
- Semester work:
 - Mid-Term exams.....30%
 - In Class Quizzes.....10%
 - Participations.....10%
 - Performance and Lab.....10%

The assessment methods are mapped to the course ILOs in Table (3) in the Appendix.

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
James W. Nilsson and Susan A. Riedel, "Electric Circuits", 9th Edition, Prentice Hall, 2011.Lecture notes on the course Moodle page, FUE website.
2. Recommended Readings:
Charles K. Alexander and Matthew N. O. Sadiku, "Fundamental of Electric Circuits," 5th Edition, McGraw Hill, 2013.

9-Facilities required for teaching and learning:

- White board.
- Data show for presentations.

Course coordinator: Prof. Yehia Hendawy
Head of Department: Prof. Yehia Hendawy
Date: Nov. 2017
Course Instructor: Dr. Rania Abdelwahed Abdelhalim Swief

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs							
		A17	B15	C01	D1	D3	D6		
Course ILOs		a1.	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.						
		a2.	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.						
		a3.	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.						
		a4.	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.						
		a5.	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.						
		a6.	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.						
		b1.		Analyze and design electrical and electronics including logic circuits, and microprocessor based systems.					
		b2.		Analyze and design electrical and electronics including logic circuits, and microprocessor based systems.					
		b3.		Analyze and design electrical and electronics including logic circuits, and microprocessor based systems.					
		c1.			Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyse and interpret results.				
		c2.			Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyse and interpret results.				
		c3.			Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyse and interpret results.				
		d1.				Collaborate effectively within multidisciplinary team.			
		d2.					Communicate effectively.		
		d3.						Effectively manage tasks, time, and resources.	

Table (2): Course Contents/Course ILOs Matrix

Topic	Course ILOs														
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills		
	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3
Circuit variables, Basic Circuit Elements, Basic Laws of Circuit Theory (Ohm's Law, Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL))	■									■			■		
Resistors in Parallel, Voltage Divider, Current Divider, and Delta-Way Transformation	■						■			■			■		
Techniques of Circuit Analysis: Node Voltage Method (NVM)	■	■					■		■						
Node-Voltage Method and dependent sources Concept of "Super-node"	■	■					■		■						
Techniques of Circuit Analysis: Mesh Current Method (MCM)	■	■					■		■						
Mesh Current Method and dependent sources Concept of "Super-mesh"	■	■					■		■						
Source Transformation (ST) Thevenin (Norton) Equivalent	■	■					■		■						
Maximum Power Transfer Superposition (SP)	■	■					■		■		■	■	■	■	■
Inductors & Capacitors, Sinusoidal Steady-State Analysis: Sinusoidal Source, and Sinusoidal Response.			■												
The Phasor, and Inverse Phasor. Phasor Diagrams Transformation Between Polar and Rectangular Forms Phasor Relations For Circuit Elements: Resistor.				■					■						
Phasor Relations For Circuit Elements: inductor, and capacitor. Impedance & Admittance Kirchhoff's laws (KVL and KCL)					■				■						
Source Transformation in phasor domain Node-Voltage Method (NVM) in phasor domain Mesh Current Method in phasor domain					■				■	■					
Thevenin/Norton Equivalentents in phasor domain Superposition (SP) in phasor domain Power calculations					■				■	■					
Circuits with nonlinear resistances Analysis of electrical circuits with						■			■						

non-sinusoidal alternating currents Fourier series and Four Transform in circuit analysis and their practical applications in spectrum analyzers and filters.																				
---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs														
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills		
	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3
Interactive Lecturing															
Problem solving															
Experiential learning															

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Course ILOs														
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills		
	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3
Written Exams															
Discussion and Participation															
Lab work and Report															
Relative weight %	30%						50%			10%			10%		



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

EPR 340: Electrical Machines

Programme(s) on which the course is given: B.Sc. in **Mechatronics Engineering**
Major or minor element of programmes: (Not Applicable)
Department offering the programme: Mechanical Engineering
Department offering the course: Mechanical Engineering
Academic level/ semester: Level Three
Date of specification approval: November 2017

A- Basic Information

Title:	Electric Machines	Code:	EPR 340
Credit Hrs:	3	Lect.:	2
Prerequisite:	Electrical circuits	Tut. /Lab:	2
		Code :	EPR 266

B- Professional Information

1- Catalogue Course Description:

Magnetic circuits. Construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, basic characteristics, and experiments of each of the following machines: DC Machines, 1-ph Transformers, 3-ph Induction Motors, and 3-ph Synchronous Machines.

2- Overall aims of the course:

This course aims to:

- Understand the definitions and construction of magnetic circuit.
- Recognize the construction, theory of operation, equivalent circuit, (voltage, current) equations, basic characteristics and testing of **1-ph Transformers**
- Empathize the construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, basic characteristics and testing of **DC Machines**.
- Understand the construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, basic characteristics and testing of **3-ph Synchronous Machines**.
- Realize the construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, basic characteristics and testing of **3-ph Induction Motors**.
- Develop practical skills and perform the required experiments to get the equivalent circuit parameters and load characteristics of each of the previous machines.
- Share ideas and work in a team or a group.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1- Identify the magnetic circuit definitions and concepts.
- a2- Define knowledge and understanding of construction, theory of operation, equivalent circuit, and basic characteristics of **1-ph Transformers**.
- a3- Recognize knowledge and understanding of construction, theory of operation, equivalent circuit, and basic characteristics of **DC Machines**.
- a4- Recognize knowledge and understanding of construction, theory of operation, equivalent circuit, and basic characteristics of **3-ph Synchronous Machines**.
- a5- Define knowledge and understanding of construction, theory of operation, equivalent circuit, and basic characteristics of **3-ph Induction Motors**.

b- Intellectual skills:

By the end of this course the student should be able to:

- b1- Analyze and solve operating conditions of **1-ph Transformers**.
- b2- Employ and solve operating conditions of **DC Machines**.
- b3- Apply and solve operating conditions of **3-ph Synchronous Machines**.
- b4- Illustrate and solve operating conditions of **3-ph Induction Motors**.
- b5- Decide and chose among different solution alternatives.
- b6- Evaluate obtained results both individually or as a part of team.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1- Explore practical skills and perform the required experiments to get the equivalent circuit parameters of **1-ph Transformers**.
- c2- Develop practical skills and perform the required experiments to get the load characteristics of **DC Machines**.
- c3- Develop practical skills and perform the required experiments to get the equivalent circuit parameters of **3-ph Synchronous Machines**.
- c4- Apply practical skills and perform the required experiments to get the load characteristics of **3-ph Induction Motors**.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1- Write technical reports in accordance with standard scientific guidelines.
- d2- Work in a self-directed manner.
- d3- Work coherently and successfully as a part of a team in the Lab.
- d4- Analyze problems and use innovative thinking in their solution.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
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1	Electric power system components	2	2	4
2	3 phase systems	2	2	4
3	Magnetic circuits	4	4	8
4	1- phase transformer & 3-phase transformer	4	4	8
5	D. C. Machines	6	4	10
6	AC Machines	6	8	14
7	Lab session for DC Machine and Transformer	4	4	8
8	Lab session for AC Machines	2	2	4
Total		30	30	60

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment#1	Electric Machines Lab	Characteristics of a separately excited DC generator.
Experiment#2	Electric Machines Lab	Equivalent circuit and characteristics of a single-phase transformer.
Experiment#3	Electric Machines Lab	Characteristics of a 3-Phase Squirrel-Cage Induction Motor

6- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	30
Final Exam		Written	16 th - 17 th week.	40
Total				100

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

- 1-“**Electric Machinery fundamentals**”, Chapman, S. J., McGraw Hill Co., 4th edition, 2005. n (Text Book).
- 2-“Schaum's Electric Machines and Electromechanics”, by Syed A. Nasar. Nasar

9. Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electrical Engineering Library.
- Elect. Machines Lab.

Course coordinator: **Prof. M Abdellatif.**
Head of Department: **Prof. Yehia Hendawy.**
Date: **November - 2017**
Course Instructor:

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs								
		A6	B5	C4	C7	C10	D1	D2	D6	
Course ILOs		a1.	Elements, theories, techniques of analysis of DC/AC circuits, electrical machines, and energy systems.							
		a2.	Apply different theories and techniques to analyze problems of DC/AC circuits, energy systems and DC/AC machines.							
		a3.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results.							
		a4.	Follow up safety requirements at work and observe the appropriate steps to manage risks..							
		a5.	Edit and present technical report.							
		b1.		Collaborate effectively within multidisciplinary team.						
		b2.		Elements, theories, techniques of analysis of Work in stressful environment and within constraints						
		b3.		Effectively manage tasks, time, and resources.						
		b4.								
		b5.								
		b6.								
		c1.			Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results.	Follow up safety requirements at work and observe the appropriate steps to manage risks..	Edit and present technical report.			
		c2.			Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results.	Follow up safety requirements at work and observe the appropriate steps to manage risks..	Edit and present technical report.			
		c3.			Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results.	Follow up safety requirements at work and observe the appropriate steps to manage risks..	Edit and present technical report.			
		c4.			Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results.	Follow up safety requirements at work and observe the appropriate steps to manage risks..	Edit and present technical report.			
		d1.						Collaborate effectively within multidisciplinary team.		
		d2.							Elements, theories, techniques of analysis of Work in stressful environment and within constraints	
		d3.								Effectively manage tasks, time, and resources.
		d4.						Collaborate effectively within multidisciplinary team.		

Table (2): Course Contents/Course ILOs Matrix

Topic	Course ILOs																		
	Knowledge & Understanding					Intellectual Skills						Practical Skills				General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	c4	d1	d2	d3	d4
Magnetic circuits																			
1- phase transformer & 3-phase transformer																			
D. C. Machines																			
AC Machines																			
Lab session for DC Machine and Transformer																			
Lab session for AC Machines																			

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs																		
	Knowledge & Understanding					Intellectual Skills						Practical Skills				General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	c4	d1	d2	d3	d4
Interactive Lecturing																			
Problem solving																			
Experiential learning																			

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Course ILOs																		
	Knowledge & Understanding					Intellectual Skills						Practical Skills				General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	c4	d1	d2	d3	d4
Written Exams																			
Lab Report and Discussion																			
Relative weight %	20%					60%						10%				10%			



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017 Course Specifications

MAN 221: Production Engineering 1

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Two
Date of specification approval:	December 2016

A- Basic Information

Title:	Production Engineering 1	Code:	MAN 221
Credit Hrs:	3	Lect.:	2
		Tut. /Lab:	1
Prerequisite:	MAN 121	Code :	MAN 121 Production Technology

B- Professional Information

1-Catalog Course Description.

2-Overall aims of the course.

By the end of the course the students will be able to:

- Get a basic idea of solidification and casting, alloys, structure and properties, casting products and applications,
- know about the different casting processes, mould and core-making, sand properties and testing, behaviour of liquid metals, melting and melt treatment,
- Make design for a sound casting using basic equations and to specify the required moulding materials,
- Deal with casting quality control methods,

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1- Get a basic idea of solidification and casting, alloys, structure and properties, casting products and applications.
- a2- Explain different casting processes, mold and core-making, sand properties and testing, behavior of liquid metals, melting and melt treatment.
- a3- State the design basics for a sound casting using basic equations, and to specify the required molding materials.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1- To be able to design for a sound casting using basic equations.
- b2- Design weld-joints for safe constructions.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Identify different casting processes, mould and core-making, sand properties and testing, behaviour of liquid metals, melting and melt treatment.
- c2. Deal with design of casting mold, and cores.
- c3. Analyse the casting and predict the various casting defects.

i. General and transferable skills:

By the end of this course the student should be able to:

- d1- Know and make scientific Presentation by the casting project.
- d2- Write technical reports about the casting processes.
- d3- Practice working in team in the casting project.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1				
2				
3				
4				
5				
6				
7				
8				
9				
Total				

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	25
	2 nd	Written Exam	10 th -11 th week	25
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	10
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
 - M. Lal – O. P. Khanna, 1979, Text Book of Foundry Technology,
 - John Campell, Casting, 2nd edition, Butterworth-Heinemann 2003----
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
 - Materials Handbook, v. 15 – casting, ASM Int., USA, 1998.
 - Journal of Metals, ASM, USA
 - Websites on casting and websites on casting.

9-Facilities required for teaching and learning:

- -----
- -----
- -----

Course coordinator: Dr. Hassan

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Dr. Sherif Abdelrahman Abdelrahman Elatriby

MAN 221: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs														
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3			
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	X														
A07	Fundamentals of technical report writing considering one of the standard format.		X													
A08	Characteristics of engineering materials including material structure and properties.				X											
A09	Principles of design including elements design, process and/or a system related to Mechatronics.					X		X								
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design, vibration analysis, fluid power control, and energy systems.					X		X								
B03	Select appropriate solutions for engineering problems based on analytical thinking.					X		X								
B04	Think in a creative and innovative way in problem solving and design.							X								
B19	Create solutions to mechatronics systems especially to manufacturing, maintenance and interfacing problems in a creative way, taking account of industrial and commercial constraints.								X							
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.								X							
C14	Compete, in-depth, in at least one engineering discipline, namely: mechanics, electronics or interfacing and software;												X			
D01	Collaborate effectively within multidisciplinary team												X			
D02	Work in stressful environment and within constraints												X			
D03	Communicate effectively												X			
D05	Lead and motivate individuals												X			
D06	Effectively manage tasks, time, and resources												X			X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs												
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3	
1	Introduction to Machining Operations	X	X		X		X							
2	Fundamentals of Machining: Cutting Elements, Cutting With single Edge Cutting Tools, Chip Formation, Mechanics of Cutting and Power Consumption		X	X		X								
3	Cutting-Tools: Materials and Characteristics and Tool Wear, Cutting Fluids	X	X		X			X			X			
4	Machining Processes: Turning, Shaping and Hole Making	X									X			
5	Machining Processes: Milling, Broaching, Sawing, Filing, and Gear Manufacturing	X		X		X								X
6	Machining Time, and Machining Economics, Break-even point					X					X		X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs												
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3	
1	Interactive Lecturing	X	X	X	X	X	X	X			X			
2	Problem solving				X	X	X	X				X		
3	Discussion	X	X	X	X	X	X	X			X			
4	Experiential learning										X			X
6	Collaborative Research	X					X	X			X		X	X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs												%			
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3				
1	Assignments	X	X	X	X	X	X	X	X								5
2	Participation (L & T)				X	X	X	X	X	X	X	X	X	X	X	X	5
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X										90
5	Over all %																100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MAN 221: Production Engineering 1

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Two
Date of specification approval:	November 2017

A- Basic Information

Title:	Production Engineering 1	Code:	MAN 221
Credit Hrs:	3	Lect.:	2
		Tut. /Lab:	1
Prerequisite:	MAN 121	Code :	MAN 121 Production Technology

B- Professional Information

1-Catalog Course Description.

Introduction to machining processes, Cutting elements, Cutting with single edge cutting tools, Cutting tool materials and its characteristics, Cutting velocity and feed, Machining time, Power consumption in cutting, Practical machining operations: turning, shaping, drilling, Cutting with multi-edge, Cutting tools: milling, grinding, lapping, Simple dividing and dividing head, Basic elements of machine tools and specifications, Work fixation, Tool fixation, Process sheet, Machining time allowances, Cost elements, Break-even point.

2-Overall aims of the course.

By the end of the course the students will be able to:

- Get a basic idea of solidification and casting, alloys, structure and properties, casting products and applications,
- know about the different casting processes, mould and core-making, sand properties and testing, behaviour of liquid metals, melting and melt treatment,
- Make design for a sound casting using basic equations and to specify the required moulding materials,

- Deal with casting quality control methods,

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1- Get a basic idea of solidification and casting, alloys, structure and properties, casting products and applications.
- a2- Explain different casting processes, mold and core-making, sand properties and testing, behavior of liquid metals, melting and melt treatment.
- a3- State the design basics for a sound casting using basic equations, and to specify the required molding materials.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1- To be able to design for a sound casting using basic equations.
- b2- Design weld-joints for safe constructions.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Identify different casting processes, mould and core-making, sand properties and testing, behaviour of liquid metals, melting and melt treatment.
- c2. Deal with design of casting mold, and cores.
- c3. Analyse the casting and predict the various casting defects.

i. General and transferable skills:

By the end of this course the student should be able to:

- d1- Know and make scientific Presentation by the casting project.
- d2- Write technical reports about the casting processes.
- d3- Practice working in team in the casting project.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab	Total
1	Introduction to Machining Operations	4	1	1	6
2	Fundamentals of Machining: Cutting Elements, Cutting With single Edge Cutting Tools, Chip Formation, Mechanics of Cutting and Power Consumption	6	3		9
3	Cutting-Tools: Materials and Characteristics and Tool Wear Cutting Fluids	6	2	1	9
4	Machining Processes: Turning, Shaping and Hole Making	6	2	1	9
5	Machining Processes: Milling, Broaching, Sawing, Filing, and Gear Manufacturing	4	2		6
6	Machining Time, and Machining Economics Break-even point	4	2		66 6
Total		30	12	3	45

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	20
	2 nd	Written Exam	10 th -11 th week	20
Assignments		Reports	Weekly	10
		Follow up during tut. /lab work, & written exam.		
Quizzes				10
Final Exam		Written	16 th - 17th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
 - M. Lal – O. P. Khanna, 1979, Text Book of Foundry Technology,
 - John Campell, Casting, 2nd edition, Butterworth-Heinemann 2003----
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
 - Materials Handbook, v. 15 – casting, ASM Int., USA, 1998.
 - Journal of Metals, ASM, USA
 - Websites on casting and websites on casting.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: **Dr. Hassan.**
Head of Department: **Prof. Yehia Hendawy.**
Date: **November - 2017**
Course Instructor:



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MAN 231: Properties of material

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level three
Date of specification approval:	November 2017

A- Basic Information

Title:	Properties of material	Code:	MAN 231
Credit Hrs:	3	Lect.:	2
		Tut. /Lab:	2
Prerequisite:	PHY 131 : Physics 1		

B- Professional Information

1- Catalogue Course Description.

Introduction to materials, Crystal structure of solids, Construction and use of phase diagrams in materials systems, Relationship of crystal structure to properties of metallic materials and their applications, Heat treatment of steels, Types of polymers: ceramics, glasses, and semi conducting materials and their applications, Internal reactions, load-stress relations and transformation of stresses for generally loaded rods, Generalized concepts of stress, strain and material relations, Energy methods, Elastic-plastic behavior of beams, Analysis of thin walled beams, Membrane theory of axisymmetric shells, Stress concentrations.

2-Overall aims of the course.

- Describe the principal forms of mechanical tests and calculate the mechanical properties of materials.
- Outline the influence of both atomic structure and microstructure on the deformation mechanism of metal materials.
- Understand the meaning of equilibrium phase diagrams, tie-line constructions.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1 outline the influence of both atomic structure and microstructure on the deformation mechanism of metal materials
- a2 Understand the meaning of stress and strain in describing the mechanical response of engineering materials
- a3 Identify important mechanical properties of some engineering materials

b- Intellectual skills.

By the end of this course the student should be able to:

- b1 Understand how to perform, and the role of, the uniaxial tensile test
- b2 Understand the meaning of hardness, strength, and toughness, and their significance for engineering performance
- b3 Identify different types of heat treatment

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1 Identify basics of engineering material classification
- c2 Identify important material properties
- c3 Identify basics of engineering material selection

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Use digital libraries and/or Learning systems.
- d2. Introduce ideas and solutions for many practical and engineering problems efficiently in predetermined time plan.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut./Lab
1	Introduction to materials	4	4
2	materials and their applications	6	6
3	Generalized concepts of stress, strain and material relations	6	4
4	load-stress relations	2	2
5	Elastic-plastic behavior of beams	4	4
6	Stress concentrations	2	2
7	phase diagrams	2	2
8	Heat treatment	2	2
9	Midterm Exams ,Quizzes	2	4
Total		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes	1 st	Reports follow up during tut. /lab work, & written exam.	Weekly	10
	2 nd		Weekly	10
Project.	Practical		Proposal: 5 th week	10
			Delivery: 12 th week	
Final Exam	Written		14 th - 16 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book: Fundamentals of Materials Science and Engineering, William D. Callister, fifth edition
2. Lecture notes on the course moodle page, FUE website.
3. Recommended Readings:---

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Dr. Hassan Elheshy

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Dr. Tarek Mohamed Mahmoud Moussa

MAN 231:Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs C	Course ILOs												
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2		
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	X												
A08	Characteristics of engineering materials including material structure and properties.		X											
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design, vibration analysis, fluid power control, and energy systems.			X										
B03	Select appropriate solutions for engineering problems based on analytical thinking.				X									
B07	Investigate the failure of components, systems, and processes.					X								
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.								X					
C01	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.										X			
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.											X		
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.													
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs.							X						
C09	Apply safe systems at work and observe the appropriate steps to manage risks.											X		

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs											
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	
1	Interactive Lecturing	X	X	X	X	X	X	X	X				
2	Problem solving	X	X	X	X	X	X	X	X	X	X	X	
3	Discussion						X	X	X	X	X	X	
4	Project											X	

Table [4]: Assessment method / ILOs Matrix

Method	Course ILOs												Σ
	a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	%	
1	X	X	X	X	X	X	X	X					5
2	X	X	X	X	X	X	X	X	X	X	X		5
3									X	X	X		10
4	X	X	X	X	X	X	X	X	X	X	X		80
5	Over all %	12	8	12	8	10	8	8	12	6	6	6	100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MAN 232: Stress Analysis

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level three
Date of specification approval:	November 2017

A- Basic Information

Title:	Stress Analysis	Code:	MAN 232
Credit Hrs:	3	Lect.:	2
		Tut. /Lab:	2
Prerequisite:	PHY 131		

B- Professional Information

1- Catalogue Course Description.

Equilibrium, Continuity, Material mechanical behavior, Normal force, Shearing force, Bending and twisting moment diagrams, Stresses in simply loaded elastic bars: axial loading, bending and torsion, deformation, stiffness, strain Energy, Stresses in elastic and elasto-plastic bars, Residual stresses. Combined loading, Eccentric normal load, Oblique bending: combined bending and torsion, Two-dimensional stresses, Principal stresses, Maximum shear stress, Allowable stresses, Mohr's circle representation, Application to some simple frames, Thin-vessels, Springs, Load and displacement measurement.

2-Overall aims of the course.

1. Develop engineering ability and analyze a given mechanical elements under different stresses.
2. Discuss problem in a simple and logical manner and to apply its solution a few fundamental and well-understood principles of stress analysis.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1 Define the characteristics of stress analysis related to mechanical production engineering
- a2 Identify the principles of design including elements stress analysis

b- Intellectual skills.

By the end of this course the student should be able to:

- b1 Think in a creative and innovative way in stress and strain problem solving and design
- b2 Classify numerical data and apply analytical methods for engineering design purposes
- b3 Analyze and interpret data, and design experiments to obtain primary data

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1 Analyze knowledge of science, information technology, design, and engineering practice to solve stress problems
- c2 Explain a component or system, and carry out stress analysis problems.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Use digital libraries and/or Learning systems.
- d2. Introduce ideas and solutions for many practical and engineering problems efficiently in predetermined time plan.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut./Lab
1	Reactions & Normal force diagram, Shear force diagram	4	4
2	bending moment diagram, Normal stress	6	6
3	Shear stress & Torsional Stress	6	4
4	Combined stress	4	4
5	Principal stresses, , Allowable stresses,	2	2
6	Maximum shear stress	2	2
7	Mohr's circle representation	2	2
8	Project follow -up.	2	2
9	Midterm Exams ,Quizzes	2	4
Total		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes	1 st	Reports follow up during tut. /lab work, & written exam.	Weekly	10
	2 nd		Weekly	10
Project.		Practical	Proposal: 5 th week	10
			Delivery: 12 th week	
Final Exam		Written	14 th - 16th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Ferdinand P. Beer E. Russell Johnston, Jr. , MECHANICS OF MATERIALS ,
SIXTH EDITION,2004.
2. Lecture notes on the course moodle page, FUE website.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Dr. Hassan.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MAN 232: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs C	Course ILOs											
		a1	a2	b1	b2	b3	c1	c2	d1	d2			
A08	Characteristics of engineering materials including material structure and properties.	X											
A09	Principles of design including elements design, process and/or a system related to Mechatronics.		X										X
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design, vibration analysis, fluid power control, and energy systems.			X									
A22	The principles of sustainable design and development				X								
B03	Select appropriate solutions for engineering problems based on analytical thinking.					X							
B04	Think in a creative and innovative way in problem solving and design.						X	X					
B07	Investigate the failure of components, systems, and processes.					X							X
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.							X					
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.									X			
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.												X
C16	Apply the principles of sustainable design and development;											X	
D02	Work in stressful environment and within constraints												
D03	Communicate effectively										X		

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs										
		a1	a2	b1	b2	b3	c1	c2	d1	d2		
1	Reactions & Normal force diagram, Shear force diagram	X	X			X						
2	bending moment diagram, Normal stress		X	X	X							
3	Shear stress & Torsional Stress			X	X		X					
4	Combined stress			X	X		X					
5	Principal stresses, , Allowable stresses,			X	X			X				X
6	Maximum shear stress			X	X						X	
7	Mohr's circle representation			X	X						X	
8	Project follow -up.										X	X
9	Midterm Exams ,Quizzes	X	X	X	X	X						

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs										
		a1	a2	b1	b2	b3	c1	c2	d1	d2		
1	Interactive Lecturing	X	X	X	X	X	X	X	X			
2	Problem solving	X	X	X	X	X	X	X	X	X		
3	Discussion						X	X	X	X		

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs										Σ	
		a1	a2	b1	b2	b3	c1	c2	d1	d2	%		
1	Assignments	X	X	X	X	X	X	X	X				5
2	Participation (L, T, & Lab)	X	X	X	X	X	X	X	X				5
3	Oral& Practical exams											X	10
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X			X	80
5	Over all %	10	15	10	15	10	14	8	8	10			100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017

Course Specifications

MAN 241: Mechanical Engineering Drawing

Programme(s) on which the course is given: B.Sc. in Petroleum Engineering
Major or minor element of programmes: (Not Applicable)
Department offering the programme: Petroleum Engineering
Department offering the course: Mechanical Engineering
Academic year/Level: 2nd year – 2nd semester – Level Two
Date of specification approval: November 2017

A- Basic Information

Title:	Mechanical Engineering Drawing	Code:	MAN 241
Credit Hrs:	2	Lect.:	1
		Tut. /Lab:	3
Prerequisite:	Graphics 2	Code :	GRA 142

B- Professional Information

1- Catalog Course Description:

Computer-aided drafting, Mechanical details and assembly drawings, Working drawings, Geometrical tolerances, Welding symbols and details, Introduction to 3D modelling.

2- Overall aims of the course:

The Main Goals of this course are:

- Understand the fundamental of engineering drawing using computer software.
- Identify various technical drawings with necessary views and dimensions using computer software.
- Recognize the rules of drawing engineering metal sections and details.
- Recognize the rules of different mechanical drawing and assembling parts

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Explain the fundamental of assembly drawings.
- a2. Describe the various mechanical assembly drawings

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Develop skills in visualizing the various mechanical assembly drawings.
- b2. Create own design ideas expressed in mechanical assembly drawings.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

No	Topics	Lec.	Tut.	Total
1	Introduction to the fundamental of assembly drawing	1	3	4
2	Types of bolts and its represented drawing	2	6	8
3	Transmission shaft assembly	2	6	8
4	Bearing assembly (sliding bearing)	2	6	8
5	Valves assembly (non-return valves)	1	3	4
6	Valves assembly (Safety valves	2	6	8
7	Power screw assembly (Screw Jack)	1	3	4
8	Coupling assembly (Rigid flange) and flexible	2	6	8
9	Machine vise assembly	2	6	8
Total		15	45	60

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- Assessment

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes	1 st	Reports follow up during tut. /lab work, & written exam.	Weekly	10
	2 nd		Weekly	10
Project.	Practical		Proposal: 5 th week	10
			Delivery: 12 th week	
Final Exam	Written		14 th - 16th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8- List of references:

Text Book:

- Thomas, E.F., “Fundamentals of Engineering Drawing”, McGraw-Hill, 2004
- Thomas, E.F. and Vierck, C.J., “Engineering Drawing and Graphic Technology”, McGraw-Hill, 2001
- Hart, K.R., “Engineering Drawing”, The English Universities Press Ltd, 2003

Recommended Readings:

- Dobrovolsky, Machine elements, MIR Publisher Co. 2007.

Facilities required for teaching and learning:

- White board.
- Data show for presentations.

Course coordinator: Prof. Sayed Atta
Head of Department: Prof. Yehia Hendawy
Date: Nov. 2017
Course Instructor: Prof. Sayed Atta

Appendix

Table [1]

	A1	A14	B9	B10
	Review mathematics, science, and chemistry for engineering.	Use the methodologies of solving engineering problems, data collection and interpretation.	Select appropriate mathematical and computer-based methods for modeling.	Select appropriate solutions for engineering problems based on analytical thinking.
Course ILOs	a1.			
	a2.			
	b1.			
	b2.			

Table [2]

Topic	a1	a2	b1	b2
Introduction to the fundamental of assembly drawing				
Types of bolts and its represented drawing				
Transmission shaft assembly				
Bearing assembly (sliding bearing)				
Valves assembly (non-return valves)				
Valves assembly (Safety valves)				
Power screw assembly (Screw Jack)				
Coupling assembly (Rigid flange) and flexible				
Machine vise assembly				

Table [3]

Topic	a1	a2	b1	b2
Interactive Lecturing				
Problem solving				

Table [4]

Topic	a1	a2	b1	b2
Assignments				
Quizzes				
Midterm & Final Exam				
Overall Percentage	20%	30%	20%	30%



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MAN 241: Mechanical Engineering Drawing

Programme(s) on which the course is given: B.Sc. in Mechatronics Engineering
Major or minor element of programmes: (Not Applicable)
Department offering the programme: Mechanical Engineering
Department offering the course: Mechanical Engineering
Academic year/Level: Level Two
Date of specification approval: November 2017

A- Basic Information

Title: **Mechanical Engineering Drawing** Code: **MAN 241**
Credit Hrs: 2 Lect.: 1 Tut. /Lab: 3
Prerequisite: Graphics 2 Code : GRA 142

B- Professional Information

1- Catalog Course Description:

Computer-aided drafting, Mechanical details and assembly drawings, Working drawings, Geometrical tolerances, Welding symbols and details, Introduction to 3D modelling.

2- Overall aims of the course:

The Main Goals of this course are:

- Understand the fundamental of engineering drawing using computer software.
- Identify various technical drawings with necessary views and dimensions using computer software.
- Recognize the rules of drawing engineering metal sections and details.
- Recognize the rules of different mechanical drawing and assembling parts

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Explain the fundamental of assembly drawings.
- a2. Describe the various mechanical assembly drawings

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Develop skills in visualizing the various mechanical assembly drawings.
- b2. Create own design ideas expressed in mechanical assembly drawings.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

No	Topics	Lec.	Tut.	Total
1	Introduction to the fundamental of assembly drawing	1	3	4
2	Types of bolts and its represented drawing	2	6	8
3	Transmission shaft assembly	2	6	8
4	Bearing assembly (sliding bearing)	2	6	8
5	Valves assembly (non-return valves)	1	3	4
6	Valves assembly (Safety valves	2	6	8
7	Power screw assembly (Screw Jack)	1	3	4
8	Coupling assembly (Rigid flange) and flexible	2	6	8
9	Machine vise assembly	2	6	8
Total		15	45	60

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- Assessment

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes	1 st	Reports follow up during tut. /lab work, & written exam.	Weekly	10
	2 nd		Weekly	10
Project.	Practical		Proposal: 5 th week	10
			Delivery: 12 th week	
Final Exam	Written		14 th - 16 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8- List of references:

Text Book:

- Thomas, E.F., “Fundamentals of Engineering Drawing”, McGraw-Hill, 2004
- Thomas, E.F. and Vierck, C.J., “Engineering Drawing and Graphic Technology”, McGraw-Hill, 2001
- Hart, K.R., “Engineering Drawing”, The English Universities Press Ltd, 2003

Recommended Readings:

- Dobrovolsky, Machine elements, MIR Publisher Co. 2007.

Facilities required for teaching and learning:

- White board.
- Data show for presentations.

Course coordinator: Dr. Sayed Atta.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

Appendix

Table [1]

		A1	A14	B9	B10
		Review mathematics, science, and chemistry for engineering.	Use the methodologies of solving engineering problems, data collection and interpretation.	Select appropriate mathematical and computer-based methods for modeling.	Select appropriate solutions for engineering problems based on analytical thinking.
Course ILOs	a1.				
	a2.				
	b1.				
	b2.				

Table [2]

Topic	a1	a2	b1	b2
Introduction to the fundamental of assembly drawing				
Types of bolts and its represented drawing				
Transmission shaft assembly				
Bearing assembly (sliding bearing)				
Valves assembly (non-return valves)				
Valves assembly (Safety valves)				
Power screw assembly (Screw Jack)				
Coupling assembly (Rigid flange) and flexible				
Machine vise assembly				

Table [3]

Topic	a1	a2	b1	b2
Interactive Lecturing				
Problem solving				

Table [4]

Topic	a1	a2	b1	b2
Assignments				
Quizzes				
Midterm & Final Exam				
Overall Percentage	20%	30%	20%	30%



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MAN 311: Mechanical Mechanisms

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level three
Date of specification approval:	November 2017

A- Basic Information

Title:	Mechanical Mechanisms	Code:	MAN 311		
Credit Hrs:	3	Lect.:	2	Tut. /Lab:	2
Prerequisite:	MEC 122, Mechanics 2				

B- Professional Information

1- Catalogue Course Description.

Kinematics Fundamentals: geometry of motion and mechanism topology, Linkage mechanisms and planar robots: position, displacement, velocity, and acceleration (Graphical, Analytical and Computers Assisted Methods), Cam-follower mechanisms: design and analysis (Graphical, Analytical and Computers Assisted Methods), Standard cams and equivalent mechanisms, Kinematics of gear trains: gears terminology, simple, compound, and planetary gear trains, Dynamics fundamentals: force analysis of mechanisms, Applications to engine balancing machines, Applications and use of Computers for Mechanism Simulation and Animation.

2-Overall aims of the course.

- Analyze position, displacement, velocity and acceleration for planar mechanisms.
- Define and design different types of standard cams and equivalent mechanisms.
- Explain the kinematics of gear train and force analysis of planar mechanisms and applications to engine balancing machines.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Understand various parts involved in kinematics of machines for different applications.
- a2. Identify requirements and the design aspects of basic machine elements.
- a3. Develop an ability to design a system, component, or process to meet desired needs within realistic constraints.
- a4. Develop an ability to identify, formulate, and solve engineering problems.
- a5. Understand the fundamentals of the theory of kinematics and dynamics of machines

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Understand various cam motion profiles and follower mechanism, their classification and design based on the prescribed follower motion.
- b2. Understand importance gear trains and their practical applications.
- b3. Analyze the available inputs to attain the required outputs.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Create a schematic drawing of a real-world mechanism.
- c2. Use graphical methods to study the motion of a planar mechanism.
- c3. Use computer software to study the motion of a mechanism.
- c4. Utilize the common mechanisms used in machines and everyday life.
- c5. Apply graphical and analytical techniques for analysis of different mechanism types.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Use digital libraries and/or Learning systems.
- d2. Introduce ideas and solutions for many practical and engineering problems efficiently in predetermined time plan.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut./Lab
1	Introduction to kinematics Fundamentals, Geometry of motion and mechanism topology, Linkage mechanisms and planar. robots	4	4
2	Velocity and acceleration analysis of any point on linkage for a plane motion.	6	6
3	Cam-follower mechanisms: design and analysis (Graphical, Analytical and Computers Assisted Methods).	6	4
4	Analysis of some standard cams and equivalent mechanisms.	2	2
5	Kinematics of gear trains: gears terminology, simple, compound, and planetary gear trains	4	4
6	Dynamics fundamentals: force analysis of mechanisms.	2	2
7	Balancing of rotating masses.	2	2
8	Project follow -up.	2	2
9	Midterm Exams ,Quizzes	2	4
Total		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes	1 st	Reports follow up during tut. /lab work, & written exam.	Weekly	10
	2 nd		Weekly	10
Project.	Practical		Proposal: 5 th week	10
			Delivery: 12 th week	
Final Exam	Written		14 th - 16 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Robert Norton, “Design of Machinery, Fourth Edition”, McGraw Hill, ISBN: 0071236716, (2009)
2. Lecture notes on the course moodle page, FUE website.
3. Recommended Readings:
Charles E. Wilson and J. Peter Sadler, “Kinematics and Dynamics of Machinery, SI Third Edition”, Prentice Hall, ISBN: 0131866419, (2003)

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Prof. Hassan Mohamed Shams Eldin Elsayed

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Dr. Hassan Mohamed Shams Eldin Elsayed

MAN 311: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs C	Course ILOs															
		a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2	
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	X															
A09	Principles of design including elements design, process and/or a system related to Mechatronics.		X														
A10	Methodologies of solving engineering problems, data collection and interpretation				X												
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design, vibration analysis, fluid power control, and energy systems.					X											
A22	The principles of sustainable design and development			X													
B03	Select appropriate solutions for engineering problems based on analytical thinking.						X										
B04	Think in a creative and innovative way in problem solving and design.							X									
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.									X							
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.										X						
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.											X					
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs.												X				
C15	Utilize practical systems approach for design and performance evaluation;													X			
C16	Apply the principles of sustainable design and development;																
D02	Work in stressful environment and within constraints														X		
D06	Effectively manage tasks, time, and resources																X
D07	Search for information and engage in life-long self-learning discipline																X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs															
		a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2	
1	Introduction to kinematics Fundamentals, Geometry of motion and mechanism topology, Linkage mechanisms and planar. robots	X	X			X							X				
2	Velocity and acceleration analysis of any point on linkage for a plane motion.		X	X	X								X	X			
3	Cam-follower mechanisms: design and analysis (Graphical, Analytical and Computers Assisted Methods).			X	X		X						X	X			
4	Analysis of some standard cams and equivalent mechanisms.			X	X		X						X				
5	Kinematics of gear trains: gears terminology, simple, compound, and planetary gear trains			X	X		X			X			X	X			
6	Dynamics fundamentals: force analysis of mechanisms.			X	X									X			
7	Balancing of rotating masses.			X	X								X				
8	Project follow -up.															X	X
	Midterm Exams ,Quizzes																X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs															
		a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2	
1	Interactive Lecturing	X	X	X	X	X	X	X	X								
2	Problem solving	X	X	X	X	X	X	X	X	X	X	X	X	X			
3	Discussion								X	X	X	X	X	X			
5	Project										X	X	X		X	X	

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs															Σ				
		a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2		%			
1	Assignments	X	X	X	X	X	X	X										5			
2	Participation (L, T, &Lab)	X	X	X	X	X	X	X	X	X	X	X	X	X				5			
3	Oral& Practical exams								X	X	X	X	X	X	X	X		10			
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X	X	X	X	X	X				80			
5	Over all %	8	8	8	8	8	8	8	8	8	8	8	8	8	6	6	5	5	5	4	100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017 Course Specifications

Course Code: MAN 321 Fundamentals of manufacturing Processes

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Three
Date of specification approval:	November 2017

A- Basic Information

Title:	Fundamentals of manufacturing Processes	Code:	MAN 321
Credit Hrs:	3	Lect.:	2
Prerequisite: Production Engineering 1	Code: MAN 221	Tut. /Lab:	2

B- Professional Information

1-Catalog Course Description.

2-Overall aims of the course.

By the end of the course the students will be able to:

- Get a basic idea of solidification and casting, alloys, structure and properties, casting products and applications,
- know about the different casting processes, mould and core-making, sand properties and testing, behaviour of liquid metals, melting and melt treatment,
- Make design for a sound casting using basic equations and to specify the required moulding materials,
- Deal with casting quality control methods,

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1- know different casting processes, capabilities, and limitations.
- a2- Identify of solidification and casting, alloys, structure and properties, casting products and applications.
- a3- Explain different casting processes, mold and core-making, sand properties and testing, behavior of liquid metals, melting and melt treatment.
- a4- State the design basics for a sound casting using basic equations, and to specify the required molding materials.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1- Design casting pattern
- b2- Design casting mould using basic equations.
- b2- Design for a sound casting using basic equations.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Differentiate between different casting processes, mould and core-making, sand properties and testing, behaviour of liquid metals, melting and melt treatment.
- c2. Deal with design of casting mold, and cores.
- c3. Analyse the casting and predict the various casting defects.

i. General and transferable skills:

By the end of this course the student should be able to:

- d1- Make scientific Presentation in the casting project.
- d2- Write technical reports about the special casting processes.
- d3- Practice working in team in the casting project.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Σ
1	Introduction to metal casting processes	2	2	4
2	Casting wrought alloys, continuous casting	2	2	4
3	Shaped casting, & products, and processes	4	4	8
4	Sand, molding and core-making processes	2	2	4
5	Casting design, and pattern design	4	4	8
6	Special Casting Techniques	4	4	8
7	Rapid Prototyping	2	2	4
8	Design of gating system	2	2	4
9	Design of feeding system	2	2	4
10	Heat extraction & solidification	2	2	4
11	Liquid metal behavior & fluid dynamics	2	2	4
12	Casting project	2	2	4
Total		30	30	60

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	25
	2 nd	Written Exam	10 th -11 th week	25
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	10
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

- Text Book:
 - M. Lal – O. P. Khanna, 1979, Text Book of Foundry Technology,
 - John Campell, Casting, 2nd edition, Butterworth-Heinemann 2003----
- Lecture notes on the course Moodle page, FUE website.
- Recommended Readings:
 - Materials Handbook, v. 15 – casting, ASM Int., USA, 1998.
 - Journal of Metals, ASM, USA
 - Websites on casting and websites on casting.

9-Facilities required for teaching and learning:

- -----
- -----
- -----

Course coordinator: Prof. Hassan Mohamed Shams Eldin Elsayed

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Dr. Maha Mahmoud Aly Lashin

MAN 321: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs													
		a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3	
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	X													
A07	Fundamentals of technical report writing considering one of the standard format.		X												
A08	Characteristics of engineering materials including material structure and properties.				X										
A09	Principles of design including elements design, process and/or a system related to Mechatronics.					X			X						
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design, vibration analysis, fluid power control, and energy systems.					X									
B03	Select appropriate solutions for engineering problems based on analytical thinking.					X									
B04	Think in a creative and innovative way in problem solving and design.							X							
B19	Create solutions to mechatronics systems especially to manufacturing, maintenance and interfacing problems in a creative way, taking account of industrial and commercial constraints.								X						
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.									X					
C14	Compete, in-depth, in at least one engineering discipline, namely: mechanics, electronics or interfacing and software;										X				
D01	Collaborate effectively within multidisciplinary team											X			
D02	Work in stressful environment and within constraints											X	X		
D03	Communicate effectively											X	X		
D05	Lead and motivate individuals												X	X	
D06	Effectively manage tasks, time, and resources											X	X		X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs													
		a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3	
1	Introduction to metal casing processes	X	X			X		X							
2	Casting wrought alloys, continuous casting		X	X						X					
3	Shaped casting, & products, and processes	X	X			X				X					
4	Sand, molding and core-making processes	X									X				
5	Casting design, and pattern design	X		X						X					X
6	Special Casting Techniques									X				X	X
7	Rapid Prototyping				X									X	
8	Design of gating system														X
9	Design of feeding system					X							X		
10	Heat extraction & solidification			X											X
11	Liquid metal behavior & fluid dynamics		X			X								X	
12	Casting project												X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs													
		a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3	
1	Interactive Lecturing	X	X	X		X	X	X		X					
2	Problem solving				X	X	X	X					X		
3	Discussion	X	X	X		X	X	X		X	X	X			
4	Experiential learning				X						X	X			X
5	Search	X								X	X	X	X	X	X

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs												%		
		a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2		d3	
1	Assignments	X	X	X		X	X	X		X	X					5
2	Participation (L & T)					X	X	X		X	X		X	X	X	5
3	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X		X	X					90
4	Over all %															100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MAN 321: Fundamentals of manufacturing Processes

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Three
Date of specification approval:	November 2017

A- Basic Information

Title:	Fundamentals of manufacturing Processes	Code:	MAN 321
Credit Hrs:	3	Lect.:	2
Prerequisite: Production Engineering 1	Code: MAN 221	Tut. /Lab:	2

B- Professional Information

1-Catalog Course Description.

Fundamentals of metal casting, metal-casting processes and equipment, casting design, materials and economics. Powder-Metal processing and equipment. Metal Extrusion and drawing processes and equipment. Plastics and Composite Materials: Forming and shaping. Fusion-Welding Processes, brazing, soldering, adhesive-bonding, and mechanical-fastening processes, Finishing processes.

2-Overall aims of the course.

By the end of the course the students will be able to:

- Get a basic idea of solidification and casting, alloys, structure and properties, casting products and applications,
- know about the different casting processes, mould and core-making, sand properties and testing, behaviour of liquid metals, melting and melt treatment,
- Make design for a sound casting using basic equations and to specify the required moulding materials,
- Deal with casting quality control methods.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1- Outline different casting processes, capabilities, and limitations.
- a2- Identify of solidification and casting, alloys, structure and properties, casting products and applications.
- a3- Explain different casting processes, mold and core-making, sand properties and testing, behavior of liquid metals, melting and melt treatment.
- a4- State the design basics for a sound casting using basic equations, and to specify the required molding materials.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1- Design casting pattern
- b2- Design casting mould using basic equations.
- b3- Design for a sound casting using basic equations.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Differentiate between different casting processes, mould and core-making, sand properties and testing, behaviour of liquid metals, melting and melt treatment.
- c2. Deal with design of casting mold, and cores.
- c3. Analyse the casting and predict the various casting defects.

i. General and transferable skills:

By the end of this course the student should be able to:

- d1- Make scientific Presentation in the casting project.
- d2- Write technical reports about the special casting processes.
- d3- Practice working in team in the casting project.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Σ
1	Introduction to metal casing processes	2	2	4
2	Casting wrought alloys, continuous casting	2	2	4
3	Shaped casting, & products, and processes	4	4	8
4	Sand, molding and core-making processes	2	2	4
5	Casting design, and pattern design	4	4	8
6	Special Casting Techniques	4	4	8
7	Rapid Prototyping	2	2	4

8	Design of gating system	2	2	4
9	Design of feeding system	2	2	4
10	Heat extraction & solidification	2	2	4
11	Liquid metal behavior & fluid dynamics	2	2	4
12	Casting project	2	2	4
Total		30	30	60

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	20
	2 nd	Written Exam	10 th -11 th week	20
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	20
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
 - M. Lal – O. P. Khanna, 1979, Text Book of Foundry Technology,
 - John Campell, Casting, 2nd edition, Butterworth-Heinemann 2003----
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
 - Materials Handbook, v. 15 – casting, ASM Int., USA, 1998.
 - Journal of Metals, ASM, USA
 - Websites on casting and websites on casting.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations.

Course coordinator: Dr. Hassan.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017

Course Specifications

MAN 331: Structural Mechanics

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level three
Date of specification approval:	November 2017

A- Basic Information

Title:	Structural Mechanics	Code:	MAN 331
Credit Hrs:	3	Lect.:	2
		Tut. /Lab:	2
Prerequisite:	MAN 232, Stress Analysis		

B- Professional Information

1- Catalogue Course Description.

Displacement and deflections, Statically indeterminate structures, Energy methods applied to bar problems, Buckling of columns, Curved beams, Analysis of bars of thin walled sections in shear, Transverse shear, torsion, shear center, Analysis of axisymmetric shells: thin walled cylinders, spheres, cones, discontinuity stresses, Introduction to structural analysis by matrix methods, Stresses in elastic structures with applications.

2-Overall aims of the course.

- Review and apply the principles of static equilibrium to the analysis of structures such as pressure vessels, beams, and torsion members.
- Evaluate stress and strain within various structures by applying the appropriate engineering theories.
- Formulate solutions to problems requiring the application of suitable engineering theories for stress and strain.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1 Know the characteristics of engineering materials related to discipline
- a2 Know the principles of design including elements design, process and/or a system related to specific disciplines.
- a3 Apply the basic theories and principles of some other engineering and mechanical engineering
- a4 Understand principles of design including elements stress analysis

b- Intellectual skills.

By the end of this course the student should be able to:

- b1 Think in a creative and innovative way in stress and strain problem solving and design
- b2 Analyze and interpret data, and design experiments to obtain primary data.
- b3 Interpret numerical data and apply analytical methods for engineering design purposes

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1 Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.
- c2 Create and/or re-design a process, component or system, and carry out specialized engineering designs.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Use digital libraries and/or Learning systems.
- d2. Introduce ideas and solutions for many practical and engineering problems efficiently in predetermined time plan.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut./Lab
1	Transverse shear, torsion, shear center	4	4
2	thin walled cylinders	6	6
3	Buckling of columns	6	4
4	Displacement and deflections	2	2
5	Displacement and deflections	4	4
6	Stresses in elastic structures with applications.	2	2
7	Statically indeterminate structures	2	2
8	Project follow -up.	2	2
9	Midterm Exams ,Quizzes	2	4
Total		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes	1 st	Reports follow up during tut. /lab work, & written exam.	Weekly	10
	2 nd		Weekly	10
Project.		Practical	Proposal: 5 th week	10
			Delivery: 12 th week	
Final Exam		Written	14 th - 16 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
MECHANICS OF MATERIALS, SIXTH EDITION Ferdinand P. Beer E. Russell Johnston, Jr.
2. Lecture notes on the course moodle page, FUE website.
3. Recommended Readings:--

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Prof. Hassan Mohamed Shams Eldin Elsayed

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Dr. Hassan Mohamed Shams Eldin Elsayed

MAN 331: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs C	Course ILOs												
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2		
A08	Characteristics of engineering materials including material structure and properties.	X												
A09	Principles of design including elements design, process and/or a system related to Mechatronics.		X											
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design, vibration analysis, fluid power control, and energy systems.			X										
A22	The principles of sustainable design and development				X									
B03	Select appropriate solutions for engineering problems based on analytical thinking.					X								
B04	Think in a creative and innovative way in problem solving and design.									X				
B07	Investigate the failure of components, systems, and processes.					X								
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.									X				
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.										X			
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.											X		
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs.												X	
C13	Prepare and present technical reports.													X
C16	Apply the principles of sustainable design and development;													X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs										Σ				
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1		d2			
1	Assignments	X	X	X	X	X	X	X	X							5
2	Participation (L, T, &Lab)	X	X	X	X	X	X	X	X			X	X			5
3	Oral& Practical exams											X	X			10
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X			X	X			80
5	Over all %	10	10	10	10	10	10	8	8	8	10	6	10			100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MAN 341: Mechanical Design1

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level three
Date of specification approval:	November 2017

A- Basic Information

Title:	Mechanical Design1	Code:	MAN 341		
Credit Hrs:	3	Lect.:	2	Tut. /Lab:	2
Prerequisite:	MAN 232, MAN 241, MAN 311				

B- Professional Information

1- Catalogue Course Description.

Introduction to Mechanical Engineering Design. Design Philosophy and Methodology: Phases of design process, design considerations, standards and codes. Engineering materials; classification, specification and selection. Factors affecting construction details, manufacturing and assembly processes, safety, aesthetics and economy. Design of Mechanical Elements: Shafts and shaft- components, Screws, fasteners, design of non-permanent joints, welding and design of permanent joints. Thin pipes and pressure vessels Application of CAD and Solid Works Group design project.

2-Overall aims of the course.

1. Develop engineering concepts to analyze a given mechanical elements under different design considerations.
2. Discuss problems in a simple and logical manner to apply fundamentals of mechanical design.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1 Define the fundamentals of mechanical design related to production engineering
- a2 Identify the principles of shaft design and shaft component design.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1 Think in a creative and innovative way in design problems solving
- b2 Classify numerical data and apply analytical methods for engineering design purposes
- b3 Analyze and interpret data, and design experiments to obtain primary data

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1 Analyze knowledge of science, information technology, design, and engineering practice to solve design problems
- c2 Explain a component or system, and carry construction drawing.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Use digital libraries and/or Learning systems.
- d2. Introduce ideas and solutions for many practical and engineering problems efficiently in predetermined time plan.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut./Lab
1	Introduction & Design Basics	4	4
2	Variable Loads	2	2
3	Bolts & Fasteners	2	2
4	Power Screw Design	4	4
5	Shaft component design	6	4
6	Fits & Tolerance	2	2
7	bearing	6	6
8	Project follow -up.	2	2
9	Midterm Exams ,Quizzes	2	4
Total		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes	1 st	Reports follow up during tut. /lab work, & written exam.	Weekly	10
	2 nd		Weekly	10
Project.		Practical	Proposal: 5 th week	10
			Delivery: 12 th week	
Final Exam		Written	14 th - 16 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
2. Shigley's Mechanical Engineering Design, Tenth Edition, 2014.
3. Lecture notes on the course moodle page, FUE website.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: **Dr. Hassan.**
Head of Department: **Prof. Yehia Hendawy.**
Date: **November - 2017**
Course Instructor:

MAN 341: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs C	Course ILOs										
		a1	a2	b1	b2	b3	c1	c2	d1	d2		
A08	Characteristics of engineering materials including material structure and properties.	X										
A09	Principles of design including elements design, process and/or a system related to Mechatronics.		X									X
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design, vibration analysis, fluid power control, and energy systems.			X								
A22	The principles of sustainable design and development				X							
B03	Select appropriate solutions for engineering problems based on analytical thinking.					X						
B04	Think in a creative and innovative way in problem solving and design.						X	X				
B07	Investigate the failure of components, systems, and processes.					X						X
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.							X				
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.									X		
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.											X
C16	Apply the principles of sustainable design and development;										X	
D02	Work in stressful environment and within constraints											
D03	Communicate effectively									X		

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs											
		a1	a2	b1	b2	b3	c1	c2	d1	d2			
1	Reactions & Normal force diagram, Shear force diagram	X	X			X							
2	bending moment diagram, Normal stress		X	X	X								
3	Shear stress & Torsional Stress			X	X		X						
4	Combined stress			X	X		X						
5	Principal stresses, , Allowable stresses,			X	X			X				X	
6	Maximum shear stress			X	X							X	
7	Mohr's circle representation			X	X							X	
8	Project follow -up.											X	X
9	Midterm Exams ,Quizzes	X	X	X	X	X							

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs											
		a1	a2	b1	b2	b3	c1	c2	d1	d2			
1	Interactive Lecturing	X	X	X	X	X	X	X	X	X			
2	Problem solving	X	X	X	X	X	X	X	X	X	X		
3	Discussion										X	X	X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs										Σ	
		a1	a2	b1	b2	b3	c1	c2	d1	d2	%		
1	Assignments	X	X	X	X	X	X	X	X				5
2	Participation (L, T, &Lab)	X	X	X	X	X	X	X	X	X			5
3	Oral& Practical exams									X			10
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X	X	X	X	80
5	Over all %	10	15	10	15	10	14	8	8	10			100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MAN 380: Modelling and simulation

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Three
Date of specification approval:	November 2017

A- Basic Information

Title:	Modeling and simulation	Code:	MAN 380
Credit Hrs:	2	Lect.:	2
		Tut. /Lab:	1
Prerequisite:	MTH 311 - CMP 132		

B- Professional Information

1-Catalog Course Description.

Mathematical models for mechanical, pneumatic, electrical, hydraulic, and mechatronic systems in the time domain for single and multivariable systems; Laplace and state space formulation Continuous, discrete, and combined system models; Hardware-in-the-loop simulation and rapid prototyping of real-time electromechanical systems; Mat Lab, SimMechanics, Simulink, etc. are used to build models and virtual prototypes.

2-Overall aims of the course.

This course aims to:

- Enrich the student's basic theoretical knowledge about the modeling of physical systems and their governing differential equations.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By completing this course successfully, the student will be able to:

- a1. Identify the type control system.

- a2. Identify the type of physical system; mechanical, electrical, hydraulic, pneumatic, electric and electronic.
- a3. Predict time response of first and second order differential equations.

b- Intellectual skills.

By completing this course successfully, the student will be able to:

- b1. Deduce the differential equations of physical systems.
- b2. Apply Laplace transformation to change functions from time domain to s-domain and vice versa.
- b3. Transform differential equations to transfer function.
- b4. Solve the differential equations of physical systems.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Use of MATLAB software to get inverse Laplace transform for certain transfer function.
- c2. Solve first and second order transfer functions using SIMULINK.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work coherently and successfully as a part of a team in assignments.
- d2. Write reports in accordance with the standard scientific guidelines.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

No	Topics	Lec.	Tut	Lab
1	Introduction to control systems	1		
2	Classification of physical systems	2		
3	Modeling of mechanical systems: linear and rotational	4	2	
4	Modeling of hydraulic systems	4	2	
5	Modeling of pneumatic systems	2	1	
6	Modeling of electrical systems	4	2	
7	Modeling of electronic systems: Operational amplifiers	3	2	
8	Laplace Transform : definition, transformation of various functions from time domain to s-domain	4	1	
9	Inverse Laplace Transform and partial fraction method. The use of MATLAB software.	4	2	2
10	Solution of first and second order differential equations using Laplace transform and transfer function approach. Use of SIMULINK software.	2	1	
Total		30	13	2

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	20
	2 nd	Written Exam	10 th -11 th week	20
Assignments, Participation		Progress marks for Tutorial	Weekly	10
Quizzes		Written	Twice a term	10
Final Exam		Written	16 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:

Ogata, K., "Modern Control Engineering", Prentice Hall Int., Fourth Edition 2002.

2. Lecture notes on the course.

3. Recommended Readings:

Bolton, W; "Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering", Pearson; 6 edition, 2016.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations.
- PC Lab.

Course coordinator: Prof. M Abdellatif.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MAN 380: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs											
		a1	a2	a3	b1	b2	b3	b4	c1	c2	d1	d2	
A20	Principles, theories, and techniques of classical and modern control systems.	X											
A21	Fundamentals of problem identification, formulation and solution in the interdisciplinary fields of Mechatronics.		X										
B1	Apply basic mathematics and physics knowledge to solve physical and engineering problems.				X	X							
B6	Assess and evaluate the characteristics and performance of components, systems and processes related to Mechatronics including mechanical systems, sensors, interfacing, controllers and actuators.						X						
B17	Apply different theories and techniques to solve problems of classical and modern control systems.						X						
C3	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.								X				
C7	Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.								X	X			
D2	Work in stressful environment and within constraints											X	
D6	Effectively manage tasks, time, and resources.												X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs												
		a1	a2	a3	b1	b2	b3	b4	c1	c2	d1	d2		
1	Introduction to control systems	X												
2	Classification of physical systems		X											
3	Modeling of mechanical systems: linear and rotational				X									
4	Modeling of hydraulic systems				X									
5	Modeling of pneumatic systems				X									
6	Modeling of electrical systems				X									
7	Modeling of electronic systems: Operational amplifiers				X									
8	Laplace Transform					X								
9	Inverse Laplace Transform and partial fraction method. Use of MATLAB software.					X							X	X
10	Solution of first and second order differential equations using Laplace transform and transfer function approach. Use of SIMULINK software.			X						X		X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs												
		a1	a2	a3	b1	b2	b3	b4	c1	c2	d1	d2		
1	Interactive Lecturing	X	X	X	X	X	X	X	X	X				
2	Problem solving	X	X	X	X	X	X	X	X	X				
3	Experiential learning								X	X	X	X	X	X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs										Σ %	
		a1	a2	a3	b1	b2	b3	b4	c1	c2	d1		d2
1	Assignments		X	X	X	X	X	X			X	X	15
2	Participation (L, T, &Lab)	X	X	X	X	X	X	X	X	X			5
4	Written Exams (QZs + MIDTERMS + FINAL).		X	X	X	X	X	X					80
5	Over all %	2	5	17	15	15	15	18	5	5	1	2	100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MAN 381: Managerial and Engineering Economics

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Five
Date of specification approval:	November 2017

A- Basic Information

Title:	Managerial and Engineer- ing Economics	Code:	MAN 381		
Credit Hrs:	2	Lect.:	2	Tut. /Lab:	1
Prerequisite:	None				

B- Professional Information

1-Catalog Course Description

Introductory finance: time value of money, cash flow analysis, and Investment evaluation methods: present worth, annual worth and internal rate of return, Depreciation models and asset replacement analysis, the impact of inflation, taxation, uncertainty and risk on investment decisions.

2-Overall aims of the course.

- Develop the student's ability to use the concepts of engineering economy as part of the decision making process.
- Enrich the student's knowledge and understanding about the time value of money, engineering economic factors, cash flow analysis, depreciation models, breakeven analysis and the different investment evaluation methods.
- Train the student on how to use the different evaluation methods for comparison between different alternatives and how to utilize the spreadsheet functions for performing economic calculations.
- Enhance the student's understanding by applying the steps of the engineering economic analysis in a group project.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course, the student should be able to:

- a1. Comprehend the basic concepts of engineering economy as part of a decision making process.
- a2. Derive and use the different engineering economy factors.
- a3. Identify and understand the different methods for comparison of alternatives.
- a4. Differentiate between investment alternatives and proposals
- a5. Understand the different depreciation models.
- a6. Recognize the impact of the sensitivity analysis on comparison of alternatives.

b- Intellectual skills.

By the end of this course, the student should be able to:

- b1. Apply the basic concepts of engineering economy as part of a decision making process.
- b2. Identify investment alternatives & proposals for an engineering project.
- b3. Utilize spreadsheet functions to perform economic calculations.
- b4. Perform breakeven analysis and sensitivity analysis under uncertainty conditions.
- b5. Evaluate investment opportunities and compare between alternatives using single and combined engineering economy factors.

c- Professional and practical skills:

By the end of this course, the student should be able to:

- c1. Select an engineering project and collect its economic data.
- c2. Apply engineering economic analysis on an engineering project
- c3. Prepare and present a project technical report.

d- General and transferable skills:

By the end of this course, the student should be able to:

- d1. Estimate cost and economic data for a new project
- d2. Work in a group project
- d3. Submit on time assignments and project.
- d4. Utilize spreadsheet functions for economic analysis of investment alternatives.
- d5. Conduct appropriately course project presentation using power point.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut
1	Course Outline Introduction to Engineering Economic analysis	2	2
2	Time Value of Money Cash flow diagram Simple and compound interest Single cash flows Multiple cash flow series: Uniform, Gradient and geometric Factors for present, future and annuity worth Nominal and effective interest rates Continuous Compounding	8	8
3	Borrowing, Lending and investing Methods for repaying the loans Equivalence and Indifference Variable interest rates Immediate and deferred payment of loans	2	2
4	Planning Horizon and Minimum attractive rate of return Cost of capital Minimum attractive rate of return Choosing the planning horizon	2	2
5	Comparison of Alternatives Ranking Vs. Incremental approach Investment Alternative vs proposal Present Worth Future Worth Annual Worth Capitalized Worth Benefit/ Cost ratio Payback period Discounted Payback period Internal rate of return External rate of return	6	6
6	Depreciation Straight line Depreciation Declining balance Depreciation Double Declining balance Depreciation	2	2
7	Supplementary Analysis Break-even analysis Sensitivity analysis and expected value decisions	2	2
8	Project Follow up	0	4
9	Midterm Exams	4	0
10	Project Presentations	2	2
Total		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Submitted Assignments, and in class Quizzes	Biweekly	10
Attendance and class participation		Lecture and tutorial attendance and class participation	Weekly	10
Project		Presentation & Technical Report	Proposal: 4 th week	10
			Due date: 14 th week	
Final Exam		Written	Examination Period	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Blank, Ieland & Traquin, Anthony; "Engineering Economy", McGraw Hill, Latest edition.
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
White, J., Case, K., and Pratt, D. "Principles of Engineering Economic Analysis", 5th edition, John Wiley & Sons. Inc., 2010.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Dr. Badran.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MAN 381: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs																			
		a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	d3	d4	d5	
A12	Business and management principles relevant to engineering.	x	x	x	x																
A21	Fundamentals of problem identification, formulation and solution in the inter-disciplinary fields of Mechatronics	x		x	x																
B05	Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.							x			x										
B09	Select and appraise appropriate ICT tools to a variety of engineering problems.									x											
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.							x			x										
C12	Exchange knowledge and skills with engineering community and industry.													x							
C13	Prepare and present technical reports.														x						
D02	Work in stressful environment and within constraints																x				
D03	Communicate effectively																	x			
D04	Demonstrate efficient IT capabilities																			x	
D06	Effectively manage tasks, time, and resources																			x	
D08	Acquire entrepreneurial skills																x				

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs																			
		a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	d3	d4	d5	
1	Introduction to Engineering Economic analysis	x																			
2	Time Value of Money	x	x					x	X	x				x						X	
3	Borrowing, Lending and investing	x		x				x	X	x				x							
4	Planning Horizon and Minimum attractive rate of return	x	X	X				X													
5	Comparison of Alternatives	x	X	X	X			X	x	X				X						X	
6	Depreciation					X				X											
7	Supplementary Analysis		X				x			X	X								X		
8	Project Follow up				X				X	X				X	X	X	X	X	X	X	
10	Project Presentations													X	X	X	X	X	X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs																			
		a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	d3	d4	d5	
1	Interactive Lecturing	x	x	x	x	x	x	X													
2	Problem solving							X		X	X										
3	Project				x			X	X	x	X	x	x	x	x	x	x	x	x	x	x
4	Research				X			X	X	x	X	x	x	x	x	x	x	x	x	x	x

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs																			
		a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	d3	d4	d5	
1	Assignments	x	x	x		x		x		x	x										
2	Attendance and Class Participation	x	x	x	x	x	x	x	x				x								
3	Written exams and quizzes	x	x	x	x	x		x	x			x	x								
4	Project Report	x	x	x	x		x		x	x	x	x	x	x	x	x	x	x	x	x	
5	Project Presentation																				x



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MAN 441: Mechanical Design 2

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level 5
Date of specification approval:	November 2017

A- Basic Information

Title:	Mechanical Design 2	Code:	MAN 441		
Credit Hrs:	3	Lect.:	2	Tut. /Lab:	2
Prerequisite:	MAN 341: Mechanical Design 1				

B- Professional Information

1-Catalog Course Description

Design of Mechanical Elements: Gears (spur, helical, bevel and worm gears). Clutches, Brakes, Couplings, Flywheels. Design of Flexible Mechanical Elements (Belts, Chains, Flexible shafts). Mechanical springs, Power transmission, Bearings (Rolling-contact bearing, journal Bearing). Case studies, Use of interactive computer programs for problem solving, Group design project.

2-Overall aims of the course.

- Enrich the student's understanding of the design of different mechanical elements.
- Develop the student's ability to apply the different design principles on power transmission system.
- Enhance the student's ability to integrate the different design principles in a group design project where they use computer aided design software.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course, the student should be able to:

- a1. Understand the different types of mechanical elements such as gears, flexible mechanical elements, clutches, brakes, couplings, flywheels, springs and bearings.
- a2. Comprehend the different forces associated with the different mechanical elements.
- a3. Understand the design principles for the different mechanical elements.
- a4. Learn how to use computer aided design programs such as solid works to draft different mechanical components.

b- Intellectual skills.

By the end of this course, the student should be able to:

- b1. Analyse the forces on different mechanical elements.
- b2. Design of gear trains
- b3. Apply the design principles on a power transmission case study.
- b4. Utilize computer aided design software such as Solidworks in a design project.

c- Professional and practical skills:

By the end of this course, the student should be able to:

- c1. Train and utilize computer aided design programs such as Solid-Works.
- c2. Select an engineering project and collect the information about its activities.
- c3. Apply design principles and procedures on an engineering design project.

d- General and transferable skills:

By the end of this course, the student should be able to:

- d1. Work in a group project
- d2. Submit on time assignments and project.
- d3. Utilize computer aided drafting software such as Solid Works
- d4. Present the project in a technical report.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut
1	Course Outline Introduction to Mechanical Engineering Design	2	
2	Solid Works tutorials (Drafting, and assembly)		10
3	Gears Types, Nomenclature, conjugate action, involute properties, fundamentals, contact ratio, interference	2	
4	Tooth systems and Gear trains	2	2
5	Spur gears, bevel, helical and worm gears	2	
6	Force Analysis- Spur gearing, bevel gearing, helical gearing and worm gearing	6	6
7	Flexible Mechanical Elements Belts (Flat, V, timing and metal)	4	6
8	Introduction to Rolling-contact bearing	2	
9	Introduction to Journal Bearing	2	
10	Introduction to Mechanical Springs	2	
11	Introduction to Clutches, brakes, coupling and fly-wheels	2	
11	Introduction to gear box		2
12	Midterm Exams	4	0
13	Project submission and oral discussion		4
Total hours		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, & Quizzes		Submitted Assignments, and in class Quizzes	Biweekly	10
Attendance and class participation		Lecture and tutorial attendance and class participation	Weekly	10
Project		Discussion & Technical Report	Due date: 14 th week	10
Final Exam		Written	Examination Period	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Budynas, Richard G. and Nisbett, J. Keith “Shigley’s Mechanical Engineering Design”, 10th edition, McGraw Hill. Inc., latest edition
2. Lecture notes on the course Moodle page, FUE website.

9-Facilities required for teaching and learning:

- White board
- Computer lab with Solidworks installed
- Data show for presentations

Course coordinator: Dr. M.Badran

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Dr. M.Badran

MAN 441: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs															
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4	
A03	Techniques of engineering graphical representations including computer aided drafting.				x												
A09	Principles of design including elements design, process and/or a system related to Mechatronics.	x	X														
A10	Methodologies of solving engineering problems, data collection and interpretation			x													
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design vibration analysis, fluid and fluid power control, in addition to energy systems.	x	X	x													
B03	Select appropriate solutions for engineering problems based on analytical thinking.									x							
B04	Think in a creative and innovative way in problem solving and design.					x		x									
B05	Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.							x									
B06	Assess and evaluate the characteristics and performance of components, systems and processes related to Mechatronics including mechanical systems, sensors, interfacing, controllers, and actuators.					x											
B14	Analyze and design Mechanical systems considering modern techniques including modern CAD tools.									x							
C02	Construct engineering graphics to visualize various engineering applications including computer aided drafting.										x						
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.										x	x					
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs.										x	x					
D02	Work in stressful environment and within constraints												x				x
D03	Communicate effectively												x	x			
D04	Demonstrate efficient IT capabilities															x	x
D06	Effectively manage tasks, time, and resources												x	x			x

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs															
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4	
1	Introduction to Mechanical Engineering Design	x															
2	Solidworks tutorials (Drafting and Assembly)				x												x
3	Gears	x	x	x		x											
4	Flexible Mechanical Elements	x	x	x		x											
5	Introduction to Rolling Contact Bearing	x	x	x		x											
6	Introduction to Journal Bearing	x	x	x		x											
7	Introduction to Mechanical Springs	x	x	x		x											
8	Introduction to Clutches, brakes, coupling and flywheels	x	x	x		x											
9	Introduction to gearbox transmission									x							
10	Project submission and oral discussion												x	x	x	x	x

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs															
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4	
1	Interactive Lecturing	x	x	x		x											
2	Problem solving					x											
3	Experiential learning																x
4	Project					x				x			x	x	x	x	x

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs												Σ						
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1		d2	d3	d4			
1	Assignments					x				x								x		5
2	Attendance and Class Participation	x	x	x	x															10
3	Written exams and quizzes	x	x	x		x														75
4	Project Report and Discussion													x	x	x	x	x	x	10



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MAN 481: Quality Control

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Quality Control	Code:	MAN 481
Credit Hrs:	2	Lect.:	2
		Tut. /Lab:	1
Prerequisite:	MTH 312: Mathematics 1.		

B- Professional Information

1-Catalog course description.

Fundamentals of Statistical Quality Control; Frequency Distributions; Measures of Central Tendency; Dispersion and Shapes; Probability Distributions: Binomial, Poisson and Normal. Control Charts: Introduction, Attribute Control Charts and Variable Control Charts. Process Capability Analysis; Acceptance Sampling: Introduction; Sampling Plans and Techniques: Single, Double, Multiple and Sequential Sampling Plans.

2-Overall aims of the course.

- Introduce the basic concepts of quality control of products, and services and classify the quality characteristics of products, and services.
- Enrich the student's basic knowledge about the characteristics of the quality control system of an enterprise.
- Train students to use the quality improvement tools, and measure the capability of a process to meet stated specifications.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Define the dimensions of product's quality.
- a2. Classify the basic types of SQC data
- a3. Describe the basic types of control charts and the conditions of using each one.
- a4. Explain the rules of switching among the types of sampling inspection (normal, tightened, and reduced inspections).

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Analyse the results of statistical test models to take a proper decision.
- b2. Calculate the parameters of several types of quality control tools.
- b3. Select the proper type of a control chart with respect to the type of the process data.
- b4. Analyse the capability of a manufacturing process.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Analyse the data of a process quality to evaluate the status of a process and take corrective actions if needed.
- c2. Use the suitable type of control chart to each type of quality characteristic.
- c3. Use the acceptance sampling techniques to accept or reject the incoming lots of materials and spare parts.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work in stressful environment and within constraints through assignments and course project.
- d2. Effectively manage tasks, time, and resources.
- d3. Search for information and engage in life-long self-learning discipline through self-learning assignments.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1	Introduction: Course outlines & Information – Quality Engineering – Eight dimensions of product quality-Six sigma quality control-	2	1	0
2	Basics of data analysis: Measures of central tendency –Measures of dispersion.	4	1	0
3	Statistical probability distributions: Discrete probability distributions – Continuous probability distributions.	4	1	0
4	QC improvement tools: CE diagrams- Pareto analysis- Defect concentration chart- Stratification analysis Control charts.	4	1	0
5	Statistical tests: Tests on mean (z-test and t-test) - Test on variance (chi-square-test).	4	2	0
6	Control charts for variables: x-bar & R charts - x-bar & s charts – Natural tolerance limits – process capability indices – Type-I & Type-II errors.	4	2	0
7	Control charts for attributes: p- chart - c- chart – u-chart.	4	2	0
8	Acceptance sampling plans for attributes.	4	2	0
9	Project follow-up.	0	1	0
10	Midterm Exams	0	2	0
Total		30	15	0

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	20
Project.		Practical & oral Project Exam	Proposal: 3 rd week	10
			Delivery: 12 th week	
Final Exam		Written	Examination Period	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Montgomery, D; “Introduction to Statistical Quality Control”, ISBN 978-0-470-16992-6, Publisher: John Wiley and Sons, Latest editions.
2. Lecture notes on the course moodle page, FUE website.
3. Recommended Readings:
Chandra, M; “Statistical Quality Control”, ISBN 0-8493-2347-9, Publisher: CRC Press, Latest editions.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Dr. Hassan.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MAN 481: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs														
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	
A10	Methodologies of solving engineering problems, data collection and interpretation		X		X											
A11	Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.	X														
A12	Business and management principles relevant to engineering.	X	X	X												
B03	Select appropriate solutions for engineering problems based on analytical thinking.					X	X									
B05	Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.							X								
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.						X				X					
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.					X										
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.									X				X		
C10	Use the basic organizational and project management skills.													X		
C11	Apply quality assurance procedures and follow codes and standards.												X			
D02	Work in stressful environment and within constraints														X	X
D03	Communicate effectively													X	X	X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs														
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	
1	Introduction: Course outlines & Information – Quality Engineering – Eight dimensions of product quality- Six sigma quality control-	X														
2	Basics of data analysis: Measures of central tendency – Measures of dispersion.	X								X						
3	Statistical probability distributions: Discrete probability distributions – Continuous probability distributions.	X								X						
4	QC improvement tools: CE diagrams- Pareto analysis- Defect concentration chart- Stratification analysis Control charts.			X	X		X				X					
5	Statistical tests: Tests on mean (z-test and t-test) - Test on variance (chi-square-test).					X								X		
6	Control charts for variables: x-bar & R charts - x-bar & s charts – Natural tolerance limits – process capability indices – Type-I & Type-II errors.										X	X		X	X	X
7	Control charts for attributes: p- chart - c-chart – u-chart.										X			X		
8	Acceptance sampling plans for attributes.				X							X				
9	Project follow-up.												X	X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs														
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	
1	Interactive Lecturing	X	X	X	X	X	X	X	X	X	X	X	X			
2	Problem solving					X	X	X	X	X	X	X				
3	Discussion	X	X	X	X	X	X	X	X	X						
5	Project										X		X	X	X	
6	Research	X		X					X			X				

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs												Σ	%			
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1			d2	d3	
1	Assignments		X	X		X	X	X	X								10	5
2	Participation (L & T)																	
3	Term Project							X		X	X	X	X	X	X		10	10
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X		X	X						X	75	75
5	Overall %	5	5	5	5	16	16	16	16	7	10	12	1	1	1	1	100	100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MAN 592: Project Management

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level 5
Date of specification approval:	November 2017

A- Basic Information

Title:	Project Management	Code:	MAN 592
Credit Hrs:	2	Lect.:	2
		Tut. /Lab:	1
Prerequisite:	None		

B- Professional Information

1-Catalog Course Description

Modeling of projects, tasks and sub tasks as activity networks, Principles and practices of critical path methodology under conditions of certainty (CPM) and uncertainty (PERT), Resource loading and cost crashing concepts, Project control, and extensive use of computer programs used in managing.

2-Overall aims of the course.

- Enrich the student's understanding of the different aspects of project management.
- Develop the student's ability to apply the different principles and practices of project management.
- Enhance the student's ability to integrate the different principles and practices of project management in a group project.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course, the student should be able to:

- a1. Comprehend the different knowledge areas of project management

- a2. List project constraints
- a3. Define project, project players and project deliverables
- a4. Define and describe project lifecycle
- a5. Describe quality and quality management tasks
- a6. Define the four cost categories related to quality management
- a7. Understand the critical path method
- a8. Estimate the duration of the stochastic activity duration
- a9. Understand the team and communication management.

b- Intellectual skills.

By the end of this course, the student should be able to:

- b1. Identify and analyse risks associated with an engineering project
- b2. Evaluate the impact of the resources limitation on the duration of the project.
- b3. Develop the activity on arrow, activity on node, and Gantt charts for projects.
- b4. Determine the crashed duration of a project.
- b5. Determine the cost profile for a project.
- b6. Evaluate the duration of the project under uncertainty of activity durations.

c- Professional and practical skills:

By the end of this course, the student should be able to:

- c1. Utilize computer programs such as Microsoft project to perform time management for a project.
- c2. Select an engineering project and collect the information about its activities.
- c3. Apply project management principles and procedures on an engineering project
- c4. Prepare and present a project technical report.

d- General and transferable skills:

By the end of this course, the student should be able to:

- d1. Estimate duration, cost, resources for different activities for an engineering project
- d2. Work in a group project
- d3. Submit on time assignments and project.
- d4. Utilize computer software such as Microsoft project for time management.
- d5. Conduct appropriately course project presentation using power point.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut
1	Course Outline Introduction to Project Management	2	2
2	Project Life Cycle Scope Management	4	4
3	Time Management	4	4
4	Quality Management	2	2
5	Risk Management	4	4
6	Resources Management	2	2
7	Teamwork and Communication Management	2	2
8	Cost Management	2	2
9	Project description and phases follow up	2	4
10	Midterm Exams	4	0
11	Project Presentations	2	4
Total hours		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools	Assessment Method	Time Schedule	%	
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, & Quizzes	Submitted Assignments, and in class Quizzes	Biweekly	10	
Attendance and class participation	Lecture and tutorial attendance and class participation	Weekly	10	
Project	Presentation & Technical Report	Proposal: 4 th week	10	
		Due date: 14 th week		
Final Exam	Written	Examination Period	40	
Total			100	

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:

Smith, Nigel J. “Engineering Project Management” 3rd Edition, Wiley-Blackwell, *Latest edition*.

2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
 - Kerzner, Harold R. “Project Management: A Systems Approach to Planning, Scheduling, and Controlling” 11th edition, John Wiley & Sons Inc., 2013.
 - “A Guide to Project Management Body of Knowledge (PMOK Guide)”, 4th edition, Project Management Institute (PMI), 2008.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Dr. M. Badran

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Dr. M. Badran

MAN 592: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs																								
		a1	a2	a3	a4	a5	a6	a7	a8	a9	b1	b2	b3	b4	b5	b6	c1	c2	c3	c4	d1	d2	d3	d4	d5	
A11	Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.					x																				
A12	Business and management principles relevant to engineering.	x	x	x	x		x	x																		
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.										x	x	x	x	x											
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.																x									
C10	Use the basic organizational and project management skills.																	x								
C13	Prepare and present technical reports.																		x							
D02	Work in stressful environment and within constraints																				x	x				
D03	Communicate effectively																									
D04	Demonstrate efficient IT capabilities																									
D05	Lead and motivate individuals																									
D06	Effectively manage tasks, time, and re-sources																									
D08	Acquire entrepreneurial skills																									

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs																								
		a1	a2	a3	a4	a5	a6	a7	a8	a9	b1	b2	b3	b4	b5	b6	c1	c2	c3	c4	d1	d2	d3	d4	d5	
1	Course Outline Introduction to Project Management	x	x																							
2	Project Life Cycle																									



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechanical Program

Spring 2018

Course Specifications

MEC 221: Mechanics (3)

Programme(s) on which the course is given:	B.Sc. in Mechanical Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Two
Date of specification approval:	November 2017

A- Basic Information

Title:	Mechanics (3)	Code:	MEC 221
Credit Hrs:	3	Lect.:	2
		Tut. /Lab:	2
Prerequisite:	MEC 122: Mechanics (2).		

B- Professional Information

1-Catalog Course Description.

Kinematics of rigid bodies: Types of planar motion of rigid body: translation, rotation about a fixed axis and general motion. Angular velocity and angular acceleration, instantaneous center, relative velocity and relative acceleration. Kinetics of rigid bodies, Newton's laws, friction and elastic forces, equations of motion. Principle of work and energy. Conservation forces and principle of conservation of mechanical energy. Principle of impulse and momentum, impulsive forces, impact. Introduction of free and forced vibrations.

2-Overall aims of the course.

- Recognize the fundamental principles of kinematics of a rigid body.
- Analyze the concepts of planar motion and its types (translation, rotation and general plane motion) of a rigid body or systems of connected bodies using vector and scalar methods.

- Learn how to represent and apply relations of position, velocity and acceleration for rolling motion problems.
- Study and analyze the various principles of Kinetics such as force-acceleration, work-energy and the impulse-momentum principles for various types of problems that containing the motion of a rigid body.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1- Describe position, velocity and acceleration for a moving rigid body.
- a2- Define the equations of motion of a rigid body
- a3- Explain the analysis of work and energy, impulse and momentum methods.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1- Discriminate between different types of motion.
- b2- Formulate the kinematic and kinetic equations in order to describe the motion of the rigid body.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1- Design and perform experiments for motion studies.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1: Work effectively in a team and develop the skills which are related to creative thinking, problem solver, and teamwork in different fields of the motion of rigid bodies.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lecture	Tutorial
1	Planar kinematics of a rigid body, Translation, rotation and general motion	2	2
2	Vector and scalar methods for analysis of position, velocity and acceleration	4	4
3	Analysis of a mechanism of connected rigid bodied	2	2
4	Rolling motion and applications.	2	2
5	Kinetics of a rigid body	2	2
6	Force-acceleration method of a rigid body	6	6
7	Work – energy method of a rigid body	6	6
8	Impulse and momentum method of a rigid body and impact problems	4	4
9	Midterm Exams and Quizzes	2	2
Total		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written exam.	5 th - 6 th week	15
	2 nd	Written exam.	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports follow up during tutorial & written exam.	Weekly	30
Final Exam		Written exam.	Examination Period	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Beer F., Johnston R. and Claysen W., " Vector Mechanics for Engineering ", McGraw Hill, 10th Edition, 2015.
2. Lecture notes on the course moodle page, FUE website.
3. Recommended Readings:
Hibbeler R., " Engineering Mechanics: Dynamics ", 12th Edition.
Riley W. and Sturges L., " Engineering Mechanics: Dynamics ".

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Prof. Mohammed Rafat Okelah.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MEC 221: Appendix

Table [1]: Course ILOs / Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs							
		a1	a2	a3	b1	b2	c1	d1	
A01	Concepts and theories of mathematics including differential and integral calculus, complex variable analysis, P.D. equations, algebra, analytical geometry, vector analysis, probability & statistics, and numerical analysis.	X	X	X					
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	X	X	X					
A10	Methodologies of solving engineering problems, data collection and interpretation	X	X	X					
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design, vibration analysis, fluid power control, and energy systems.	X	X	X					
B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems.	X	X	X	X	X			
B03	Select appropriate solutions for engineering problems based on analytical thinking.				X	X			
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.						X		
C07	Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.						X		
C14	Compete, in-depth, in at least one engineering discipline, namely: mechanics, electronics or interfacing and software;						X		
D03	Communicate effectively								X
D06	Effectively manage tasks, time, and resources								X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs							
		a1	a2	a3	b1	b2	c1	d1	
1	Planar kinematics of a rigid body, Translation, rotation and general motion	X			X	X			
2	Vector and scalar methods for analysis of position, velocity and acceleration	X			X	X			
3	Analysis of a mechanism of connected rigid bodies	X			X	X	X	X	X
4	Rolling motion and applications.	X			X	X	X	X	X
5	Kinetics of a rigid body	X	X		X	X	X	X	X
6	Force-acceleration method of a rigid body	X	X		X	X	X	X	X
7	Work – energy method of a rigid body	X		X			X	X	X
8	Impulse and momentum method of a rigid body and impact problems	X		X			X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs							
		a1	a2	a3	b1	b2	c1	d1	
1	Interactive Lecturing	X	X	X	X	X			
2	Problem solving	X	X	X	X	X	X	X	X
3	Discussion	X	X	X	X	X	X	X	X
4	Research	X	X	X	X	X	X	X	X

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs								Σ
		a1	a2	a3	b1	b2	c1	d1		
1	Assignments	X	X	X	X	X				%
2	Participation (L, T)	X	X	X	X	X	X	X	X	10
3	Written Exams (QUIZZES + MIDTERMS + FINAL).	X	X	X	X	X				10
										80



Faculty of Engineering and Technology
Department of Mechanical Engineering
Petroleum Program

Spring 2018
Course Specifications
MPR 251: Engineering Thermodynamics

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Two
Date of specification approval:	November 2017

A- Basic Information

Title:	Engineering Thermodynamics	Code:	MPR 251
Credit Hrs:	3	Lect.:	3
		Tut. /Lab:	3
Prerequisite:	PHY 131- Physics 2		

B- Professional Information

1-Catalog Course Description.

Fundamental concepts and definitions, Thermodynamic processes, Pure substances and perfect gases, first law of thermodynamics, The second law of thermodynamics, and Carnot cycle, Thermodynamic relations, Reversibility and entropy, Introduction to heat transfer by conduction, convection, and radiation, Basic formulation and solution of steady and transient problems, Issues relevant to cooling of electrical devices, Vapor power cycles, Air standard power cycles, Reversed cycles, Irreversibility and availability, Thermodynamic relations and real gas effects , Non-reacting ideal gas mixtures.

2-Overall aims of the course.

- Understand fundamentals of thermodynamics
- Apply the fundamental principles of thermodynamics
- Explore the fundamental principles of thermodynamics through experimentation
- Develop skills for analyzing experimental data and working in teams
- Share ideas and work in a team.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

1. Define the basic concepts of thermodynamics
2. Understand the first and second law of thermodynamics
3. Understand the properties of pure substances
4. Describe power and refrigeration cycles
5. Define different modes of heat transfer
6. Understand the properties of gas mixtures

b- Intellectual skills.

By the end of this course the student should be able to:

1. Ability to define and solve problems related to principles of first law of thermodynamics.
2. Ability to define and solve problems related to principles of second law of thermodynamics.
3. Ability to define and solve problems related to principles of heat transfer
4. Ability to define and solve problems related to thermodynamics and heat transfer for practical thermal systems.

c- Professional and practical skills:

By the end of this course the student should be able to:

1. Ability to analyze performance of practical thermal system
2. Writing technical reports

d- General and transferable skills:

By the end of this course the student should be able to:

1. Ability to work in a team.
2. Ability to share ideas and communicate with others
3. Ability to deal with others according to the rules of the professional ethics

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1	Basic concepts and definitions, system and control volume	3	3	
2	Property and state, processes and cycles	3	3	
3	Definition of work and heat transfer	6	6	
4	Ideal gases; state equation; specific heat at constant pressure and volume	3	3	
5	Pure substances and phase equilibrium	3	3	
6	Tables of thermodynamic properties	3	3	
7	First law of thermodynamics; internal energy and enthalpy	3	3	
8	First law for closed and open systems	3	3	
9	Steady flow and uniform state uniform flow	6	6	
10	Application of first law of thermodynamics	6	6	
11	Second law of thermodynamics	6	6	
Total		45	45	

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	25
	2 nd	Written Exam	10 th -11 th week	25
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	10
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book: Essential Book
Thermodynamics, an Engineering Approach, Yunus A. Cengel and Michael A. Boles, Seventh Edition, McGraw-Hill, New York, USA
2. Lecture notes
3. Recommended Readings:
 - ✓ Fundamentals of Thermodynamics, Richard E. Sonntag, Claus Borgnakke, and Gordon J. Van Wylen, John Wiley & Sons, Inc., 2003
 - ✓ Applied Thermodynamics for Engineering Technologists, T.D. Eastop and A. McConkey, Longman Group, Ltd. 1998

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Prof. Mahmoud Abdel Rashid.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MPR 251: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs											
	a1	a2	a3	a4	a5	b1	b2	c1	c2	c3	d1	d2
A02	X	X										
A08			X									
A10				X								
A16					X							
B01						X						
B03							X					
B06							X					
C01								X	X	X		
C03								X				
D03											X	X

Table [2] : Course Content/ ILOs Matrix

#	Topics	a1	a2	a3	a4	a5	b1	b2	c1	c2	c3	d1	d2
1	Basic concepts and definitions, system and control volume	X	X										
2	Property and state, processes and cycles			X									
3	Definition of work and heat transfer		X						X		X		
4	Ideal gases; state equation; specific heat at constant pressure and volume.			X					X	X	X		
5	Pure substances and phase equilibrium			X									
6	Tables of thermodynamic properties												
7	First law of thermodynamics; internal energy and enthalpy				X								
8	First law for closed and open systems				X		X						
9	Steady flow and uniform state uniform flow				X		X						
10	Application of first law of thermodynamics				X		X					X	X
11	Second law of thermodynamics					X		X					

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method												
		a1	a2	a3	a4	a5	b1	b2	c1	c2	c3	d1	d2
1	Interactive Lecturing	X	X	X	X	X						X	
2	Experiential learning								X	X	X		
3	Problem solving						X	X					X

Table [4]: Assessment method / ILOs Matrix

	Method												
		a1	a2	a3	a4	a5	b1	b2	c1	c2	c3	d1	d2
1	Written exams. : Quiz1	X	X	X	X	X	X	X					
2	Laboratory reports. : Ideal gas Properties								X	X	X		
3	Written exams. : Quiz2	X	X	X	X	X	X	X					
4	Laboratory reports. : Energy conversion								X	X	X	X	
5	Written exams. : Quiz3	X	X	X	X	X	X	X					
6	Laboratory reports. : Heat Energy conversion								X	X	X		
7	Oral exams. : Oral exam												X
8	Final exam : Final exam	X	X	X	X	X							



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MPR 251: Engineering Thermodynamics

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Two
Date of specification approval:	November 2017

A- Basic Information

Title:	Engineering Thermodynamics	Code:	MPR 251
Credit Hrs:	4	Lect.:	3
Prerequisite:	PHY 132: Physics 2	Tut. /Lab:	3

B- Professional Information

1-Catalog Course Description.

Introduction; Fields of application, Fundamental concepts and definitions, Thermodynamics Systems; System Classification, Properties and State Processes and Cycles, Properties of a Pure substance; Vapor - Liquid - Solid - Phases of Pure substance, Ideal gas relations, Work and Heat; definitions; kinds of work, Heat transfer modes, The first law of thermodynamics; closed system analysis; Control - Volume analysis and applications, Transient Process analysis, The second law of Thermodynamics, Heat engines and Refrigerators, Carnot cycle, reversed cycles, irreversibility and availability, mixtures of gases.

2-Overall aims of the course.

By the end of the course the students will be able to:

- 1) Understand fundamentals of thermodynamics
- 2) Apply the fundamental principles of thermodynamics
- 3) Explore the fundamental principles of thermodynamics through experimentation
- 4) Develop skills for analyzing experimental data and working in teams
- 5) Share ideas and work in a team.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Identify basic applied and engineering science.
- a2. Identify principles in the of design of mechanical components, different materials, and manufacturing technologies in the field of mechanical power engineering and some other engineering disciplines.
- a3. Identify principles in the field of design of fluid flow, thermodynamics, gas dynamics, turbo- machinery, heat transfer engineering and fundamentals of thermal and fluid processes
- a4. Develop conceptual and detailed design of construction projects and fluid power systems.
- a5. Design of applications in energy technologies, and design of power stations, considering the constraints which mechanical power engineers have to judge to reach at an optimum solution .
- a 6. Design of combustion, internal combustion engines, and boilers. Installations.
- a7. Design of refrigeration & air conditioning, and automatic control systems and to demonstrate knowledge of mechanical power engineering contemporary issues.
- a8. Identify engineering economy, legislation, business and management techniques and practices appropriate to mechanical power engineering applications.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Define the mechanical power engineering problems and evaluate designs, processes, and performance and propose improvements.
- b2. Derive different solution alternatives for the engineering problems, analyze, interpret data and design experiments to obtain new data, and evaluate the power losses in the fluid transmission lines and networks
- b3. Analyze the performance of the basic types of internal combustion engines, hydraulic machines, fluid power systems, subsystems and various control valves and actuators. Analyze the solution alternatives and choose the optimum one.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Use laboratory, workshop e4quipment and field devices competently and safely.

- c2. Analyze the record data in the laboratory.
- c3. Prepare engineering drawings, computer graphics, and write specialized technical reports.
- c4. Write computer programs pertaining to mechanical power and energy engineering to describe the basic thermal and fluid processes mathematically, and use the computer software for their simulation and analysis..
- c5. Conduct various mechanical engineering measurements, design, operate, repair and maintain fluid hydraulic power systems and flow networks for diverse applications
- c6. Finish drawings both manually and using CAD
- c7. Work in mechanical power and energy operations, maintenance and overhaul and carry out maintenance of different types of projects

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Collaborate effectively within multidisciplinary team.
- d2. Share ideas, communicate effectively and work stressful environment and within constraints.
- d3. Lead and motivate individuals and work with others according to the rules of the professional Ethics.
- d4. Use digital libraries and/or Learning systems and demonstrate efficient IT capabilities..

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

No	Topic	Lecture	Tutorial	Total
1	Basic concepts and definitions, system and control volume	3	3	6
2	Property and state, processes and cycles	3	3	6
3	Definition of work and heat transfer	6	6	12
4	Ideal gases; state equation; specific heat at constant pressure and volume	3	3	6
5	Pure substances and phase equilibrium	3	3	6
6	Tables of thermodynamic properties	3	3	6
7	First law of thermodynamics; internal energy and enthalpy	3	3	6
8	First law for closed and open systems	3	3	6
9	Steady flow and uniform state uniform flow	6	6	12
10	Application of first law of thermodynamics	6	6	12
11	Second law of thermodynamics	6	6	12
Total		45	45	90

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	10
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	10
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

8.1 Essential references (textbooks)

Fundamentals of Thermal-Fluid Sciences, Yunus A. Cengel et. al.,
Third Edition, McGraw-Hill, New York, USA

8.2 Recommended books (references)

- 1) Fundamentals of Thermodynamics, Richard E. Sonntag, Claus Borgnakke, and Gordon J. Van Wylen , John Wiley & Sons, Inc., 2003
- 2) Applied Thermodynamics for Engineering Technologists, T.D. Eastop and A.McConkey, Longman Group, Ltd. 1998

9-Facilities required for teaching and learning:

- Teaching Aids (Presentation board, overhead projector, data show)

Course coordinator: Prof. M.Abdelrashid
Head of Department: Prof. Yehia Hendawy
Date: Nov. 2017
Course Instructor: Prof. M.Abdelrashid



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MPR 252: Fluid Mechanics

Program at which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of program:	N.A.
Department offering the course:	Mechanical engineering department
Academic year/ Level :	Level Two
Date of specification approval :	November 2017

A- Basic Information

Title:	Fluid Mechanics	Code:	MPR 252
Credit Hrs:	4	Lect.:	3
		Tut. /Lab:	3
Prerequisite:	MEC 122, PHY 131		

B- Professional Information

1. Catalogue Description:

Basic properties of fluids and fundamental concepts, Statics of fluids, Hydrostatic forces and buoyancy, Fluid kinematics, Characterization of fluid flow, Basic equations: conservation of mass, momentum and energy, Bernoulli's equation, Energy Equation Applications. Momentum equation. Laminar and Turbulent flow in ducts and pipes and their External flow; Lift and Drag forces, Basics of dimensional analysis and dynamic similarity.

2. Overall aims of course:

By the end of the course the students will be able to:

- 1) Demonstrate knowledge of Types and characteristics of flow, fluid statics, kinematics of flows and basics of fluid dynamics.
- 2) Define and solve problems in fluid dynamics in various engineering applications.
- 3) Predict performing of basic applications of fluid mechanics systems in modern life.

3. Intended learning outcomes (ILOs)

a- Knowledge and understanding:

- a1. Define fluid properties, stresses in fluids at rest and in motion and types of fluid flows.
- a2. Identify the governing equations of fluid flow: continuity, energy and momentum equations from principles of mass, energy and momentum conservation.
- a3. Identify the terms of Bernoulli's equation, include major and minor losses and draw the energy and the hydraulic gradient lines for flow systems.
- a4. Explain velocity and flow measuring devices, boundary layers, separation, friction, drag, lift, circulation and occurrence of the problem of cavitation.

b-Intellectual Skills:

- b1. Analyze Bernoulli's equation and energy equation in flow problems.
- b2. Predict friction losses in pipes and ducts.
- b3. Calculate drag and lift forces for different flow conditions.

c-Professional and practical skills:

- c1. Use appropriate fluid measurement with lab equipment.
- c2. Perform experiments in the lab within proper technical, safety and ethical framework.

d-General and transferable skills:

- d1. Write reports in accordance with the standard scientific guidelines
- d2. Present reports, discuss results and defend his/her ideas.
- d3. Work coherently and successfully as a part of a team in assignments.

4. Course contents:

No	Topic	Lecture	Tutorial	Lab	Total
1	<u>Introduction and Basic Concepts</u> History of Fluid Mechanics, No-slip condition, Classification of fluid flows.	3	3		6
2	<u>Fluid Properties,</u> Vapor pressure and Cavitation, Compressibility and speed of sound, Viscosity, Surface tension and capillary effect.	3	3		6
3	<u>Pressure and Fluid Statics</u> Hydrostatic Forces on Submerged Plane Surfaces, Hydrostatic Forces on Submerged Curved Surfaces, Buoyancy and Stability.	6	3		9
4	<u>Fluid Kinematics</u> Lagrangian and Eulerian Descriptions, Flow Patterns and Flow Visualization, Vorticity and Rotationality.	3	3	3	9
5	<u>Mass, Bernoulli, and Energy Equations</u> Mechanical Energy and Efficiency, The Bernoulli Equation, General Energy Equation, Energy Analysis of Steady Flows.	12	9	3	24
6	<u>Fluid Momentum</u> Newton’s Laws, The Linear Momentum Equation.	3		3	6
7	<u>Internal Flow</u> Introduction, Laminar and Turbulent Flows, The Entrance Region, Laminar Flow in Pipes, Turbulent Flow in Pipes, Minor Losses.	6	3		9
8	<u>Internal Flow</u> Piping Networks and Pump Selection, Flow rate and velocity measurement.	3	3	3	9
9	<u>External Flow: Drag and Lift</u> Introduction, Drag and Lift, Friction and Pressure Drag, Drag Coefficients of Common Geometries, Parallel Flow Over Flat Plates, Flow Over Cylinders and Spheres, Lift.	6	6		12
Total Hours		45	33	12	90

5. Teaching and learning methods

- 5.1- Interactive Lecture
- 5.2- Problem based learning
- 5.3- Discussion
- 5.4- Experimental learning
- 5.5- Project based learning
- 5.6- Search

6. Assessment schedule:

Assessment method	No	Description	Week No	Weight (%)
General Performance	1	Participation + Search Reports	Week 14	10
1st -Mid-term evaluation	2	Written Exam + Lab Reports +Assignments + Quizzes	Week 6	25
2 nd -Mid-term evaluation	3	Written Exam + Lab Reports + Assignments + Quizzes	Week 11	25
Final examination	5	Written Exam	Week 16	40
				100 %

7. List of references:

7.1 Essential references (textbooks)

Yunus Cengel , "Fluid Mechanics –Fundamentals and Applications", 3rd Edition, 2014, By: McGraw-Hill, New York, USA

7.2 Recommended books (references)

Fluid Mechanics 6E , By Douglas, Gassiorik and Swaffield , Publisher: Pearson,new York, USA

Streeter, V.L., Wylie, E, B., and Bedford, K. W., " Fluid Mechanics " 9th Edition, McGraw Hill, New York, USA

8. Facilities required for teaching and learning Computers

- Teaching Aids (Smart board and data show)

Course coordinator: Prof. Mohammed Rafat Okelah.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MPR – 252 Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs															
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2	d3				
A01	Concepts and theories of mathematics including differential and integral calculus, algebra, analytical geometry, probability and statistics, and numerical analysis.	✓	✓														
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	✓	✓														
A10	Methodologies of solving engineering problems, data collection and interpretation			✓													
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design vibration analysis, fluid and fluid power control, in addition to energy systems.			✓	✓												
B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems.					✓											
B03	Select appropriate solutions for engineering problems based on analytical thinking.									✓							
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.									✓							
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.											✓					
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.												✓				
C14	Compete, in-depth, in at least one engineering discipline, namely: mechanics, electronics or interfacing and software;												✓				
D3	Communicate effectively													✓			
D6	Effectively manage tasks, time, and resources															✓	
D7	Search for information and engage in life-long self-learning discipline																✓

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs												
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2	d3	
1	<u>Introduction and Basic Concepts</u> History of Fluid Mechanics, No-slip condition, Classification of fluid flows.	✓	✓		✓									
2	<u>Fluid Properties,</u> Vapor pressure and Cavitation, Compressibility and speed of sound, Viscosity, Surface tension and capillary effect.	✓	✓		✓	✓								
3	<u>Pressure and Fluid Statics</u> Hydrostatic Forces on Submerged Plane Surfaces, Hydrostatic Forces on Submerged Curved Surfaces, Buoyancy and Stability.	✓	✓											
4	<u>Fluid Kinematics</u> Lagrangian and Eulerian Descriptions, Flow Patterns and Flow Visualization, Vorticity and Rotationality.		✓		✓					✓				✓
5	<u>Mass, Bernoulli, and Energy Equations</u> Mechanical Energy and Efficiency, The Bernoulli Equation, General Energy Equation, Energy Analysis of Steady Flows.		✓			✓					✓			✓
6	<u>Fluid Momentum</u> Newton's Laws, The Linear Momentum Equation.		✓								✓			✓
7	<u>Internal Flow</u> Introduction, Laminar and Turbulent Flows, The Entrance Region, Laminar Flow in Pipes, Turbulent Flow in Pipes, Minor Losses.				✓						✓			✓
8	<u>Internal Flow</u> Piping Networks and Pump Selection, Flow rate and velocity measurement.				✓						✓			✓
9	<u>External Flow: Drag and Lift</u> Introduction, Drag and Lift, Friction and Pressure Drag, Drag Coefficients of Common Geometries, Parallel Flow Over Flat Plates, Flow Over Cylinders and Spheres, Lift.				✓						✓			✓

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs												
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2	d3	
1	Interactive Lecture	✓	✓	✓	✓	✓	✓		✓					
2	Problem based learning					✓	✓	✓	✓	✓				
3	Discussion			✓	✓	✓	✓	✓						✓
4	Experimental learning					✓	✓		✓	✓	✓	✓	✓	✓
5	Project based learning							✓			✓	✓	✓	✓
6	Research							✓			✓	✓	✓	

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs												Σ		
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2	d3			
1	Assignments + Search Reports		✓	✓	✓	✓	✓									
2	Participation (L, T, &Lab)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
3	Oral& Practical exams							✓		✓						✓
4	Written Exams (QZs + MIDTERMS + FINAL).		✓	✓	✓	✓	✓									
5	Over all %															100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MPR 321: Measurements and Measuring Instruments

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Three
Date of specification approval:	November 2017

A- Basic Information

Title:	Measurements and Measuring Instruments	Code:	MPR 321
Credit Hrs:	2	Lect.:	2
Prerequisite:	MPR251, MPR 252	Tut. /Lab:	1

B- Professional Information

1-Catalog Course Description.

2-Overall aims of the course.

This course aims to:

- Enrich the student's basic theoretical knowledge about the measurement systems.
- Train students to build and test measuring sensors.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By completing this course successfully, the student will be able to:

- a1. Explain the static and dynamic performance of a measuring instrument.
- a2. Describe various measuring instruments of displacement, pressure, temperature and flow rate.
- a3. Explain different techniques employed by different instruments.

b- Intellectual skills.

By completing this course successfully, the student will be able to:

- b1. Evaluate uncertainty in a measured value for a set of data points.
- b2. Derive the governing equations measuring instruments.
- b3. Analyze the various operations of measurement instruments.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Construct the circuits of various sensors.
- c2. Calibrate different sensors.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work coherently and successfully as a part of a team in experiments.
- d2. Write reports in accordance with the standard scientific guidelines.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

No	Topics	Lec.	Tut	Lab
1	Basic concepts of measuring instruments: -static performance; accuracy, precision, sensitivity, resolution, threshold, hysteresis. -Generalized measurement system. -Impedance matching.	2	1	
2	Dynamic performance: Zero order, first order, second order systems.	2	1	
3	Analysis of experimental data: Type of errors, error analysis, standard deviation, Chauvenet's criterion for rejecting a reading, method of least squares fitting.	6	1	
4	Displacement transducers: LVDT, capacitive transducers, digital transducers.	3	1	1
5	Pressure measurements: inclined manometers, Burdon tube gauges, dead weight tester, variable reluctance diaphragm, LVDT diaphragm.	3	1	1
6	Flow measurements: -Positive displacement methods; rotary, lobed impeller, Turbine. -Rotameter, magnetic, Pitot tube, hot wire.-Obstruction methods: Nozzle, venturi, orifice.	4	2	1
7	Temperature measurements: -Mechanical sensors; liquid in glass thermometer. -Electrical sensors; thermocouples, resistance, optical sensors.	4	1	1
8	Force sensors: Load cell, strain gauges.	6	2	1
Total		30	10	5

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	20
	2 nd	Written Exam	10 th -11 th week	20
Assignments, Participation		Progress marks for Tutorial	Weekly	10
Quizzes		Written	Twice a term	5
Mini project		Practical	Once a term	5
Final Exam		Written	16 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Holman, J.P., "Experimental Methods for Engineers", McGraw Hill, 2005.
2. Recommended Readings:
Doebelin, Ernest O. , " Measurements Systems Applcation and Design", McGraw Hill, 1990.
3. Lecture notes on the course.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations.
- Measurement Lab

Course coordinator: Prof. M Abdellatif.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MPR 321: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs												
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2			
A1	Concepts and theories of mechanics including differential and integral calculus, algebra, analytical geometry, probability and statistics, and numerical analysis.	X												
A13	Current engineering technologies as related to Mechatronics, including modern techniques in sensors, actuators, control units and their interfaces.		X											
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design vibration analysis, fluid and fluid power control, in addition to energy systems.			X										
B6	Assess and evaluate the characteristics and performance of components, systems and processes related to Mechatronics including mechanical systems, sensors, interfacing, controllers and actuators.				X	X								
B18	Identify at an appropriate level the design, production, interfacing & software needs of different parts of Mechatronics systems.						X							
C1	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyse and interpret results.							X						
C7	Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.										X			
D2	Work in stressful environment and within constraints											X		
D6	Effectively manage tasks, time, and resources.													X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs													
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2				
1	Basic concepts of measuring instruments: -static performance; accuracy, precision, sensitivity, resolution, threshold, hysteresis. -Generalized measurement system. -Impedance matching.	X													
2	Dynamic performance: Zero order, first order, second order systems.	X				X									
3	Analysis of experimental data: Type of errors, error analysis, standard deviation, Chauvenet's criterion for rejecting a reading, method of least squares fitting.	X				X									
4	Displacement transducers: LVDT, capacitive transducers, digital transducers.	X	X	X				X	X	X	X	X	X	X	X
5	Pressure measurements: inclined manometers, Burdon tube gauges, dead weight tester, variable reluctance diaphragm, LVDT diaphragm.	X	X	X											
6	Flow measurements: -Positive displacement methods; rotary, lobed impeller, Turbine. -Rotameter, magnetic, Pitot tube, hot wire.-Obstruction methods: Nozzle, venturi, orifice.	X	X	X					X	X	X	X	X	X	X
7	Temperature measurements: -Mechanical sensors; liquid in glass thermometer. -Electrical sensors; thermocouples, resistance, optical sensors.		X	X						X	X	X	X	X	X
8	Force sensors: Load cell, strain gauges.			X						X	X	X	X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

Method	Course ILOs									
	a1	a2	a3	b1	b2	b3	c1	c2	d1	d2
1 Interactive Lecturing	X	X	X	X	X	X	X	X		
2 Problem solving	X	X	X	X	X	X	X	X		
3 Mini project									X	X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs												Σ	
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	%			
1	Assignments	X	X		X	X	X	X							10
2	Participation	X	X	X	X	X	X	X							5
3	Mini project							X				X			5
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X								80
5	Over all %	10	5	5	20	20	20	10	5	2	3				100



جامعة المستقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Mechanical Engineering

Fall 2017

Course Specifications

MTH 211: Functions of several variables and Ordinary Differential equations

Program (s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of Programs:	(Not Applicable)
Department offering the Program:	Mechanical Engineering
Department offering the course:	Engineering Mathematics and Physics
Academic year/Semester:	Level Two-3 rd Semester
Date of specification approval:	November 2017

A- Basic Information

Title: Functions of several variables and Ordinary Differential equations

Code: MTH 211

Credit Hours:	3 Cr. Hrs.
Lectures:	3 Hrs./week
Tutorial:	<u>2 Hrs.</u>
Total:	5 Hrs.

**Prerequisite: MTH 112: Integration with applications and analytic geometry
(Credit Hours 3)**

B- Professional Information

1- Catalog Course Description:

Functions of several variables: Limits, Continuity, partial derivatives, Extrema and Constrained Extrema. Multiple integrals in Cartesian and Polar coordinates. Jacobians, Vector analysis: Scalar and vector fields, Gradient, Divergence, Curl and Directional derivative. Line integral, Green's theorem, Gauss's theorems, and Stoke theorem. Ordinary differential equations of the first and higher orders. Complementary and Particular solutions. Undetermined coefficients, and variation of parameters. Euler's equations and system of linear differential equations. Differential Operator method.

2- Overall aims of the course:

Overall aims of the course are:

- Enrich students' knowledge about several variables, multiple integrals, ordinary differential equations, and vector Analysis.
- Develop students' skills to apply differential equations on applications related to Mechanical engineering.

3- Intended learning outcomes of course (ILOs):

a- **Knowledge and understanding:**

By the end of this course the student should be able to:

- a1. Define the behavior of the function of several variables, multiple integrals, Vector analysis, and Ordinary differential equations.
- a2. Recognize the Limits, Continuity, and partial derivatives, extrema and constrained extrema of functions of 2 variables, double and triple integrals in Cartesian and Polar coordinates.
- a3. Illustrate the surface integral of scalar and vector fields, Divergence and Stock theorems, Jacobians, line integrals, cylindrical and spherical coordinates and its application,
- a4. Describe Ordinary differential equations, distinguish between the degree and the order, and know various methods of the solution,
- a5. Identify the general and particular solutions of O.D.E of the first order, second order, higher order.

b- **Intellectual skills:**

By the end of this course the student should **be able to:**

- b1. Apply theories, techniques of Vector analysis, Ordinary differential equations to solve Mechanical engineering problems
- b2. Think creatively in solving problems related to Mechanical engineering.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

Weeks	Topics	Lect.	Tut.	Total
1,2	Functions of several variables: Limits, Continuity, and partial derivatives, Chain rule. Tangent planes and normal lines, Extrema and Constrained Extrema.	6	4	10
3,4	Multiple integrals: Double integrals in Cartesian and Polar coordinates, Jacobians, Cylindrical and spherical coordinates.	6	4	10
5,6	Vector analysis: Scalar and vector fields, Surface integrals of scalar and vector functions, gradient, divergence, curl, directional derivative, Line integrals.	6	4	10
7,8	Line integrals, Green's theorem, Gauss's theorem, Stoker's theorem and triple integrals in Cartesian and Polar coordinates.	6	4	10
9,10	Ordinary differential equations: Equations of the first order: Separable, Homogenous, nearly Homogenous, Exact, Linear, Bernoulli. Ricatti.	6	4	10
11,12	Higher order linear equations. Equations of the second order. Equations reducible to the first order. Complementary, and particular solutions.	6	4	10
13,14	Methods of Undetermined coefficients, and variation of parameters. Euler's equation	6	4	10
15	System of linear differential equations. Differential Operator method.	3	2	5
	Total	45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- Assessment Methods

See Appendix, table [4]

8-Weighing of Assessments

- Final exam:.....40%
 - Semester work:.....50%
 - First Mid Term Exam..... 20%
 - Second Mid Term Exam 20%
 - Quiz Exam 5%
 - Assignments5%
 - Participation and performance.....10%
-
- Total.....100%

9-List of references:

1. Text Book:

Warren S.Wright, Dennis G.Zill : " **Advanced Engineering Mathematics**",
Fifth Edition, Jones & Bartlett Learning

2. Recommended Readings:

- Earl W. Swokowski, "Calculus with Analytic Geometry
Peter V. O'Neil, "Advanced Engineering Mathematics"
- Larson, R, Edwards, B & Falvo, D 2004, Elementary linear algebra, 5th edn,
Houghton Mufflin, Boston, Massachusetts.
- Stewart, J 2005, Calculus: concepts & contexts, 3rd edn, Thomson/Brooks/Cole,
Australia.

10-Facilities required for teaching and learning:

- Library services
- Recently published books
- Student Advice and Information Center
- Computer workstations
- Internet web connection

Course coordinator:
Head of Department:
Date:

Prof. Dr. Emil Sobhy Shoukralla
Prof. Dr. Yehia Hossam El Din Hendawy
November 2017

Appendix

		Program ILOs				
		A01	B01	B03	B05	B08
		Concepts and theories of mathematics including differential and integral calculus, complex variable analysis, P.D. equations, algebra, analytical geometry, vector analysis, probability & statistics, and numerical analysis.	Apply basic mathematics and physics knowledge to solve physical and engineering problems.	Select appropriate solutions for engineering problems based on analytical thinking.	Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.	Solve engineering problems, often on the basis of limited and possibly contradicting information.
Course ILOs	a1.	•				
	a2.	•				
	a3.	•				
	a4.	•				
	a5.	•				
	b1.		•	•	•	•
	b2.		•	•	•	•

Table [2]: Course Content/ILO Matrix

Topics	a1	a2	a3	a4	a5	b1	b2
Functions of several variables: Limits, Continuity, and partial derivatives, Chain rule. Tangent planes and normal lines, Extrema and Constrained Extrema.	●	●					●
Multiple integrals: Double and triple integrals in Cartesian and Polar coordinates, Jacobians, Cylindrical and spherical coordinates.	●	●	●				●
Vector analysis: Scalar and vector fields, Surface integrals of scalar and vector functions, gradient, divergence, curl, directional derivative, Line integrals, Green's theorem, Gauss's theorems, Stokes's theorems.	●		●			●	●
Ordinary differential equations: Equations of the first order: Separable, Homogenous, nearly Homogenous, Exact, Linear, Bernoulli. Ricatti.	●			●		●	●
Higher order linear equations. Equations of the second order. Complementary and particular solutions. Undetermined coefficients, variation of parameters. Euler's equation, Equations reducible to the first order.	●				●	●	●
System of linear differential equations. Differential Operator method.						●	●

Table [3]: Learning Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	a6	b1	b2
Interactive Lecturing	●	●	●	●	●	●	●	●
Discussion		●	●	●	●	●	●	●
Problem solving							●	●

Table [4]: Assessment Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	a6	b1	b2
Final Exam	●	●	●	●	●	●	●	●
First Midterm Exam	●		●	●	●		●	●
Second Midterm Exam	●	●					●	●
Quizzes	●	●						●
Assignment				●	●	●	●	●
Participation and Performance	●	●	●	●	●	●	●	●
Weight	70 %						30 %	



جامعة المستقبل

FUE - Future University in Egypt
Faculty of Engineering and Technology
Department of Mechanical Engineering

Spring 2018

Course Specifications

MTH 212: Transformations and Numerical Analysis

Program(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of Program:	(Not Applicable)
Department offering the Program:	Mechanical Engineering
Department offering the course:	Engineering Mathematics and Physics
Academic year/Semester:	2 nd Level - 4th Semester
Date of specification approval:	November 2017

A. Basic Information

Title: Transformations and Numerical Analysis (Math4) Code: MTH 212

Credit Hours: 3 Cr. Hrs.

Lecture: 3 Hrs.

Tutorial: 2 Hrs.

Total: 5 Hrs.

Prerequisite: MTH 211: Functions of several variables and Ordinary Differential equations (Credit Hours 3).

B. Professional Information

1. Catalog Course Description:

Laplace Transforms. Definitions. Properties and theorems. Inverse Laplace transforms. Calculating of Laplace transforms, Periodic functions, unit-step functions, and Dirac delta functions. Calculating of Inverse Laplace Transforms. Solution of Initial value problems and integral equations by Laplace transforms. Fourier series. Periodic and non-periodic Functions. Series of odd and even functions. Convergence Theorem.. Definitions and properties of Fourier integrals and transforms. Finite Fourier transforms and Applications. Numerical solution of nonlinear equations, Newton's method. Secant method. Numerical solution of Initial Value problems. Euler, Modified Euler, and Runge Kutta methods. Least Squares methods. Interpolation.

2 - Overall aims of the course:

- Demonstrate a conscious understanding of the concepts of integral transforms, Laplace and Fourier transforms.
- Develop students' mathematical skills for the methods of solution of initial and boundary values problems by using Laplace and Fourier Transforms, Fourier series, and Fourier integrals.
- Acquire skills for the application of Numerical methods to the solution of Mechanical engineering problems.

3 - Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should maintain proficiency level at:

- a1- Recognize the fundamental concepts of Laplace transforms, Inverse Laplace Transforms, and Laplace transform for derivatives.
- a2- Define Shifted Laplace transform, unit – step functions, unit impulses, Dirac delta-function, Fourier series, Fourier integrals, and Fourier Transforms.
- a3- Explain Laplace transforms, Fourier series, Fourier integrals, and Fourier transforms, with convergence for the solution of initial values problems.
- a4- State the difference between approximate solutions, interpolate solution, numerical solutions, and exact solutions.
- a5- Outlines, Euler methods, and Rung -Kutta methods for the numerical solutions of Initial value problems, and Least squares method, and interpolation by Lagrange polynomials for tabulated and explicit functions.

b- Intellectual skills:

By the end of this course the student should maintain proficiency level at:

- b1- Recognizing methods of calculating Laplace transforms of algebraic and transcendental functions, Periodic functions, derivatives, unit-step functions, unit impulses, and Dirac delta functions.
- b2- Use Laplace Transforms, Inverse Laplace Transforms, Fourier series, Fourier Integrals, and Fourier Transforms for the solution of initial values problems.
- b3- Use Fourier series, Fourier integrals, an Fourier Transform to Approximate functions.
- b4- Apply Laplace and Inverse Laplace transform, Fourier Transforms, and Rung -Kutta, Euler, and modified Euler, for the solution of initial value problems related to mechanical Engineering
- b5- Approximate and interpolate functions by using Least squares methods, and interpolation by Lagrange polynomials at the intellectual level required of this course.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

Weeks	Topics	Lect.	Tut.	Total
1,2	Laplace Transforms. Definition. Properties and theorems. Inverse Laplace transforms.	6	4	10
3,4	Calculating of Laplace transforms of algebraic and transcendental functions, Periodic functions, derivatives, unit-step functions, unit impulses, and Dirac delta functions.	6	4	10
5,6	Calculating of Inverse Laplace Transforms. Solution of Initial value problems	6	4	10
7, 8	Integral equations by Laplace transform, Fourier series. Periodic and non-periodic Functions.	6	4	10
9,10	Series of odd and even functions. Half intervals Fourier Series Convergence Theorem.	6	4	10
11,12	Fourier Integrals and Fourier Transforms. Definitions and properties of Fourier integrals and transforms. Finite Fourier transforms. Applications.	6	4	10
13,14	Numerical solution of Initial Value problems. Euler, Modified Euler, and Runge Kutta methods. Applications.	6	4	10
15	Least Squares methods. Interpolation.	3	2	5
Total		45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- ILOS Teaching & Assessment Method:

See Appendix, table [4]

8- Weighting of Assessment

- Final exam:40%
- Year work: 50%
 - First Midterm Exam.....20%
 - Second Midterm Exam..... 20%
 - Quiz Exam5%
 - Assignments5%
 - Performance10%
- Total.....100%

9- List of references:

1. Text Book:

Dennis G. Zill Warren S. Wright, "Advanced Engineering Mathematics" Fifth Edition, JONES & BARTLETT LEARNING. 1994.

2. Recommended Readings:

Erwin Kreyszig. "Advanced Engineering Mathematics", 10 editions, John Wiley & Sons, INC, 2010.

Earl W. Swokowski, "Calculus with Analytic geometry, Prindle, Weber & Schmidt

Peter V. O'Neil, "Advanced Engineering Mathematics", Thomson.

- Course notes, Handouts.

- Periodicals, Web sites:

- www.wolframalpha.com
- www.sosmath.com, www.math.hmc.edu,
- www.tutorial.math.lamar.edu,
- www.web.mit.edu

Facilities required for teaching and learning:

- Main university Library
- Lectures using whiteboard.
- Problems discussion sessions.

Course coordinator:

Prof. Dr. Emil Sobhy Shoukralla

Head of Department:

Prof. Dr. Yehia Hossam El Din Hendawy

Date:

November 2017

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

		Program ILOs				
		A01	B01	B03	B04	B05
		Concepts and theories of mathematics including differential and integral calculus, complex variable analysis, P.D. equations, algebra, analytical geometry, vector analysis, probability & statistics, and numerical analysis.	Apply basic mathematics and physics knowledge to solve physical and engineering problems.	Select appropriate solutions for engineering problems based on analytical thinking.	Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.	Solve engineering problems, often on the basis of limited and possibly contradicting information.
Course ILOs	a1	•				
	a2	•				
	a3	•				
	a4	•				
	a5	•				
	b1		•			
	b2		•			
	b3		•			
	b4		•	•	•	•
	b5		•	•	•	•

Table [2]: Course Content/ILO Matrix

Topics	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
Laplace Transforms. Definition. Properties and theorems. Inverse Laplace transforms.	●					●				
Calculating of Laplace transforms of algebraic and transcendental functions, Periodic functions, derivatives, unit-step functions, unit impulses, and Dirac delta functions.	●	●				●				
Calculating of Inverse Laplace Transforms. Solution of Initial value problems and integral equations by Laplace transforms.		●				●	●		●	
Fourier series. Periodic and non-periodic Functions. Series of odd and even functions. Half intervals Fortier Series Convergence Theorem.			●	●			●	●	●	
Fourier Integrals and Fourier Transforms. Definitions and properties of Fourier integrals and transforms. Finite Fourier transforms. Applications.				●		●	●	●	●	
Numerical solution of nonlinear equations, Newton's method. Secant method.					●	●	●	●		
Numerical solution of Initial Value problems. Euler, Modified Euler, and Runge Kutta methods.						●	●		●	
Least Squares methods. Interpolation.						●				●

Table [3]: Learning Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
Interactive Lecturing	●	●			●	●	●	●	●	●
Discussion	●		●	●	●	●	●		●	
Problem solving	●	●			●	●	●	●	●	●

Table [4]: Assessment Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
Assignments	●	●	●	●	●	●	●	●	●	●
First Midterm Exam	●	●	●	●		●	●	●	●	●
Second Midterm Exam					●					●
Final Exam	●	●	●		●	●	●	●	●	



جامعة المستقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology

Department of Mechanical Engineering

Fall 2017

Course Specifications

MTH 311: Complex variables and Special functions

Program (s) on which the course is given	B.Sc. in Mechatronics Engineering
Major or minor element of Program:	(Not Applicable)
Department offering the Program	Mechanical Engineering
Department offering the course:	Engineering Mathematics and Physics
Academic year/Semester:	Level 3 - 5 th Semester
Date of specification approval:	November 2017

A- Basic Information

Title: Complex variables and Special functions **Code:** MTH 311

Credit Hours: 3 Cr. Hrs.

Lectures: 3 Hrs.

Tutorial: 2 Hrs.

Total: 5 Hrs.

Prerequisite: MTH 212: Transformations and Numerical Analysis (Credit Hours: 3 Cr. Hrs.)

B- Professional Information

1- Catalog Course Description:

Power Series solutions of ordinary Differential equations. Solutions about Ordinary Points, Solutions about Singular Points. Frobenius theorem. Special functions, Partial differential equations, heat and wave equations. Laplace equation in Rectangular and Polar coordinates, D’lambert solution, Numerical solutions of Partial differential equations. Functions of complex variables, Cauchy-Riemann Equations, Complex integrals, Laurent series, Evaluation of real integrals by residues. Conformal mappings.

2- Overall aims of the course:

The overall aims of the course are

- Demonstrate a conscious understanding of the concepts of special functions and complex analysis.
- Develop students’ mathematical skills for the methods of solution of partial differential equations.
- Acquire skills for the application of special functions and complex analysis to solve electrical engineering problems

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Explain the Power Series solutions of ordinary Differential Solutions using Frobenius theorem.
- a2. Identifying Partial differential equations, their types and methods of solutions.
- a3. Define Gamma, Beta, and Bessel functions, and Legendre Polynomials as solutions of partial differential equations.
- a4. Demonstrate Elementary complex functions, Cauchy-Riemann Equations, Complex integrals, Laurent series, and the evaluation of real integrals by residues.
- a5. Describe conformal mappings for Mechanical engineering applications.

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Apply Special functions, power series solutions to solve Mechanical engineering problems.
- b2. Apply numerical solutions of P.D.E to solve problems related to heat, wave, and Laplace equations.
- b3. Solving improper integrals converted to Gamma and Beta functions.
- b4. Applying Cauchy-Riemann Equations, Laurent series, and residues theorem for the solution of complex engineering problems.
- b5. Creating conformal mapping procedures for the solution of complex functions problems.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

week	Topics	Lect.	Tut.	Total
1	Power Series solutions of ordinary Differential equations.	3	2	5
2	Frobenius Theorem	3	2	5
3	Special functions , Gamma , Beta , Bessel functions	3	2	5
4	Legendre Polynomial	3	2	5
5	Partial differential equations, Definitions and Classification of equations,	3	2	5
6	Separable Partial differential equations, heat equation, Wave equation	3	2	5

7	D’lambert solution of wave equation	3	2	5
8	Laplace equation in Rectangular and Polar coordinates	3	2	5
9 & 10	Numerical solutions of Partial differential equations, Finite difference method	6	4	10
11	Functions of complex variables, Elementary complex functions	3	2	5
12	Cauchy-Riemann Equations	3	2	5
13	Complex integrals, Laurent series	3	2	5
14	Evaluation of real integrals by residues	3	2	5
15	Conformal mappings	3	2	5
Total		45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- ILOs Teaching & Assessment Method:

See Appendix, table [4]

8-Weighting of Assessments

- Final exam:.....40%
 - year work:.....50%
 - First Mid Term Exam.....20%
 - Second Mid Term Exam20%
 - Quiz Exam5%
 - Assignments5%
 - Participation..... 10%
-
- Total.....100%

9-List of references:

1. Text Book:

- Dennis G. Zill Warren S. Wright, "Advanced Engineering Mathematics” Fifth Edition, JONES &BARTLETT LEARNING.1994.

2. Recommended Readings:

- Erwin Kreyszig. "Advanced Engineering Mathematics", 10th edition, John Wiley& Sons, INC, 2010.
- Robert T. Smith, Roland B Minton. Calculus: Early Transcendental Functions. 4th. edition. McGraw – HILL International Edition, 2012.

10-Facilities required for teaching and learning:

- **Library services**
- **Recently published books**
- **Student Advice and Information Center**
- **Computer workstations**
- **Internet web connection**
- **Smart Board**

Course coordinator:

Prof. Dr. Emil Sobhy Shoukralla

Head of Department:

Prof. Dr. Yehia Hossam El Din Hendawy

Date:

November 2017

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

		Program ILOs		
		A01	B01	B03
		Concepts and theories of mathematics including differential and integral calculus, complex variable analysis, P.D. equations, algebra, analytical geometry, vector analysis, probability & statistics, and numerical analysis.	Apply basic mathematics and physics knowledge to solve physical and engineering problems.	Select appropriate solutions for engineering problems based on analytical thinking.
Course ILOs	a1	•		
	a2	•		
	a3	•		
	a4	•		
	a5	•		
	b1		•	
	b2			•
	b3			•
	b4		•	
	b5		•	•

Table [2]: Course Content/ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
Power Series solutions of ordinary Differential equations.	■									
Frobenius Theorem	■									
Special functions , Gamma , Beta , Bessel functions			■			■		■		
Legendre Polynomial			■			■		■		
Partial differential equations, Definitions and Classification of equations,		■								
Separable Partial differential equations, heat equation, Wave equation		■	■				■	■		
D’lambert solution of wave equation		■					■			
Laplace equation in Rectangular and Polar coordinates		■								
Numerical solutions of Partial differential equations, Finite difference method		■					■			
Functions of complex variables, Elementary complex functions				■					■	
Cauchy-Riemann Equations				■					■	
Complex integrals, Laurent series				■					■	
Evaluation of real integrals by residues				■					■	
Conformal mappings					■					■

Table [3]: Learning Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
Interactive Lecturing	■	■	■	■	■	■	■	■	■	■
Discussion	■		■	■	■	■	■	■	■	■
Problem solving						■	■	■	■	■

Table [4]: Assessment Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
First Midterm Exam				■	■				■	■
Second Midterm Exam		■	■			■		■		
Final Exam	■	■	■	■		■	■	■	■	



جامعة المستقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology Department of Mechanical Engineering

Spring 2018

Course Specifications

MTH 312: Probability and Statistics

Program (s) on which the course is given	B.Sc. in Mechatronics Engineering
Major or minor element of Program:	(Not Applicable)
Department offering the Program	Mechanical Engineering
Department offering the course:	Engineering Mathematics and Physics
Academic year/semester:	Level 3 – 6 th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Probability and Statistics	Code: MTH 312
Credit Hours: 3Cr. Hrs.	
Lectures: 3Hrs.	
Tutorial: <u>2 Hrs.</u>	
Total: 5 Hrs./week	
Prerequisite: MTH 311 :Complex variable and special functions (MATH 5) (credit hours 3)	

B- Professional Information

1- Catalog Course Description:

Descriptive statistics and data analysis, Introduction to probability theory, conditional probability, Bayes theorem, Random variables and probability distribution, Discrete and continuous random variables, Mathematical expectation of random variables and some special expectation, Some discrete probability distribution (Binomial and poisson). Some continuous distribution (Normal distribution, t- distribution), Introduction to estimation and tests of hypothesis. Correlation analysis, applied statistics.

2- Overall aims of the course:

This course aims to develop the students' confidence and skills in dealing with mathematical expressions of statistical Science, to improve their understanding of the concepts of statistical studies and to perform descriptive and basic inferential statistical studies. The course gives the students the ability to understand the inference techniques for the inferential statistical studies within the areas of interest.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Recognize the fundamental features of the probability theory, and other statistical topics.
- a2. Distinguish the meaning of conditional probability and its application.
- a3. Describe random variables, discrete and continuous distributions.
- a4. Define samples and population measures (point and interval estimate).

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Summarize Statistical concepts essential and necessary for applications in Mechanical engineering problems.
- b2. Think logically and creatively.
- b3. Analyze the appropriate method for the solutions of statistical engineering problems using convenient methods.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

Week	Topics	Lect.	Tut.	Total
1,2	Descriptive statistics and data analysis. Definitions and concepts.	6	4	10
3,4	Probability Introduction to probability theory, conditional probability, Bayes theorem	6	4	10
5,6	Random variables and probability distribution: Discrete and continuous random variables	6	4	10
7,8	Mathematical expectation of random variables and some special expectation.	6	4	10
9,10	Some discrete probability distribution (Binomial and Poisson).	6	4	10
11,12	Some continuous distribution (Normal distribution).	6	4	10
13,14	Introduction to the estimation and tests of hypothesis.	6	4	10
15	Correlation analysis.	3	2	5
	Total	45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- ILOS Teaching & Assessment Methods:

See Appendix, table [4]

8- Weighting of assessments

- Final exam:.....40%
 - Year work:.....50%
 - First Exam.....20%
 - Second Exam.....20%
 - Assignments.....5%
 - Quizzes.....5%
 - Participation.....10%
-
- Total.....100%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

9- List of references:

1-Text book:

- Allan G. Bluman, ‘Elementary Statistics’: A Step-by-Step Approach, 9th ed. McGraw-Hill. 2014.

2-Recommended Readings:

- Ronald E. Walpole, Raymond H. Myers, and Sharon L. Myers. “Probability & Statistics for Engineers & Scientists’, 9th ed., Pearson Education, Inc. 2012.
- Douglas C. Montgomery, George C. Ringer. “Applied Statistics and Probability for Engineers”, 6th Edition. John Wiley & Sons, Inc. 2013.
- Periodicals, Web sites:
 - www.stattrek.com
 - www.statistics.com
 - www.sosmath.com
 - www.math.hmc.edu
 - www.tutorial.math.lamar.edu
 - www.web.mit.edu

10- Facilities required for teaching and learning:

- White board
- Data show
- Central University Library

Course coordinator:
Head of Department:
Date:

Prof. Dr. Emil Shoukralla
Prof. Dr. Yehia Hossam El Din Hendawy
November 2017

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

		Program ILOs		
		A01	B01	B03
		Concepts and theories of mathematics including differential and integral calculus, complex variable analysis, P.D. equations, algebra, analytical geometry, vector analysis, probability & statistics, and numerical analysis.	Apply basic mathematics and physics knowledge to solve physical and engineering problems.	Select appropriate solutions for engineering problems based on analytical thinking.
Course ILOs	a1			
	a2			
	a3			
	a4			
	b1			
	b2			
	b3			

Table [2]: Course Content/ILO Matrix

Topic	a1	a2	a3	a4	b1	b2	b3
Descriptive statistics and data analysis. Definitions and concepts.	■						
Probability Introduction to probability theory, conditional probability, Bayes theorem	■	■				■	
Random variables and probability distribution: Discrete and continuous random variables	■		■			■	
Mathematical expectation of random variables and some special expectation.		■	■			■	
Some discrete probability distribution (Binomial and Poisson).			■		■	■	
Some continuous distribution (Normal distribution).			■		■	■	■
Introduction to the estimation and tests of hypothesis.				■	■	■	■
Correlation analysis.				■	■	■	■

Table [3]: Learning Method/ILO Matrix

Topic	a1	a2	a3	a4	b1	b2	b3
Interactive Lecturing	■	■	■	■	■	■	■
Discussion	■		■	■	■	■	■
Problem solving					■	■	■

Table [4]: Assessment Method/ILO Matrix

Topic	a1	a2	a3	a4	b1	b2	b3
First Midterm Exam	■	■	■		■	■	
Second Midterm Exam	■	■	■	■			■
Final Exam	■	■	■	■	■	■	■



FUTURE
UNIVERSITY IN EGYPT

جامعة المستقبل



Specialization Requirements



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

CMP 456: Design of Real-Time Embedded Systems

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Design of Real-Time Embedded Systems	Code: CMP 456
Credit Hrs:	3	Lecture: 2 Tutorial /Lab: 1
Prerequisite:	ELE 410: Introduction to Microprocessors	

B- Professional Information

1-Catalog Course Description:

Introduction to bus architectures and programming; Device and system firmware; Arduino and I/O architectures; Memory architectures; Interrupt service routines; Real-time clocks/timers; Real-time debugging techniques and tools; Development and testing techniques; Students will be introduced to the full embedded system design process including: analysis, design (using extended finite state machine specification), interfacing, programming, hardware assembly, integration and system testing.

2-Overall aims of the course:

- 1) Demonstrate knowledge of the disciplinary foundation of embedded systems as well as insight into current research and development work.
- 2) Demonstrate the ability to identify, formulate and deal with issues independently and creatively.
- 3) Attain the ability to model, simulate, and integrate technological solutions to design an embedded system.
- 4) Identify the need for further knowledge and development of skills. This is shown in laboratory and project assignments which require gathering of information and critical evaluation.

3-Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Apply basic applied and engineering science.
- a2. Identify principles of microcontroller implementation and programming for various fields of mechanical engineering and, in particular, mechatronics engineering discipline.
- a3. Develop conceptual and design details of microcontroller-controlled projects for mechatronics applications.

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Develop and implement computer programs for engineering applications including programming of microprocessor based units.
- b2. Analyze and design electrical and electronics including logic circuits, and microprocessor based mechatronics systems
- b3. Define microcontroller design problems in mechanical engineering and evaluate designs, processes, and performance and propose improvements.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Write programs for the Arduino microcontroller platform and use measuring instruments and laboratory equipment to design experiments, collect, analyze and interpret results.
- c2. Apply gained hardware and software skills to create and design embedded applications in mechatronics and its applications.
- c3. Use the basic organizational and project management skills.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Collaborate effectively within multidisciplinary team
- d2. Search for information and engage in life-long self-learning discipline through self-learning assignments.
- d3. Refer to relevant literatures in project report.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lecture	Tutorial/Lab
1	Introduction to embedded processors and C programming.	2	1
2	Arduino embedded system design platform, Arduino basic circuit diagrams	4	2
3	Timers, debugging, and pulse width modulation (PWM), analog input	4	2
4	Communication protocols (UART, SPI, I2C), interrupts, and MatLab support for Arduino	4	2
5	Embedded algorithms and feedback control	4	2
6	Sensors and actuators	4	2
7	Embedded systems applications.	4	0
8	Final design project.	4	2
9	Midterm Exams	0	2
Total		30	15

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools	Assessment Method	Time Schedule	%
Project Proposal	Oral Presentation	Week 5	10
First Midterm	Written Exam	Week 6	15
Second Midterm	Written Exam	Week 11	15
Participation and Assessments	Follow up during tutorial /lab work, and written quizzes	Weekly	10
Project	Implementation and oral presentation in addition to written report.	Week 15	10
Final Exam	Written	As per schedule	40
Total			100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:

David J. Russell, *Introduction to Embedded Systems: Using ANSI C and the Arduino Development Environment*, Morgan & Claypool Publishers, USA, 2010

2. Lecture notes and videos on the course *Moodle* page, FUE website.

3. Recommended Readings:

Massimo Banzi, *Getting Started with Arduino*, O'Reilly books, 2011.

Edward Lee and Sanjit Seshia, *Introduction to Embedded Systems, A Cyber-Physical Systems Approach*, LeeSeshia.org, 2011

9-Facilities required for teaching and learning:

- White board
- Data show for presentations
- Lab equipped with function generators, oscilloscopes, Micro-controller development boards. Computers and working benches with the necessary tools.

Course coordinator: Prof. Yehia Hendawy.

Head of Department: Prof. Yehia Hendawy.

Date: November - 2017

Course Instructor:

CMP 456: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs												
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3	
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	X												
A09	Principles of design including elements design, process and/or a system related to Mechatronics.			X		X			X					
A17	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.	X								X				
A18	Fundamentals of microprocessor architecture and microprocessor based control units and their software and interfaces.		X						X					
A19	Fundamentals of electrical, electronic, and digital instrumentation and transducers.					X								
B02	Develop and implement computer programs for engineering applications including programming of microprocessor based units.			X	X				X					
B16	Develop and apply the necessary software for controlling and interfacing of mechatronics systems.		X		X	X			X					
C01	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyse and interpret results.								X	X				
C13	Prepare and present technical reports.									X	X			
D1	Collaborate effectively within multidisciplinary team								X					
D7	Search for information and engage in life-long self-learning discipline	X		X									X	
D9	Refer to relevant literatures													X

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs													
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3		
1	Introduction to embedded processors and C programming.		X		X										
2	Arduino embedded system design platform, Arduino basic circuit diagrams						X		X						
3	Timers, debugging, and pulse width modulation (PWM), analog input					X				X					
4	Communication protocols (UART, SPI, I2C), interrupts, and MatLab support for Arduino				X					X					
5	Embedded algorithms and feedback control		X			X									
6	Sensors and actuators				X					X					
7	Embedded systems applications.	X		X							X			X	
8	Final design project.	X		X	X	X						X	X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs												
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3	
1	Interactive Lecturing	X	X		X		X	X						
2	Problem solving		X		X									
3	Discussion		X		X		X		X					
4	Experiential learning				X	X		X						
5	Project			X				X	X	X	X	X	X	X
6	Research	X								X				X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs									Σ				
		a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3	%	
1	Assignments	X	X		X	X		X							5
2	Participation (Lecture, Tutorial/Lab)			X		X	X		X						5
3	Oral & Practical exams			X			X	X	X	X	X	X	X	X	20
4	Written Exams (Quizes + Midterms + Final).	X	X			X		X	X						70
5	Over all %														100



FUTURE
UNIVERSITY IN EGYPT
جامعة المستقبل

Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

ELE 366: Digital Systems

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Three / Sixth Semester
Date of specification approval:	November 2017

A- Basic Information

Title:	Digital Systems	Code:	ELE 366
Credit Hrs:	3	Lecture:	2
		Tutorial /Lab:	2
Prerequisite:	PHY 132: Electricity and Magnetism		

B- Professional Information

1- Catalogue Course Description:

Number systems; Codes and coding; Logic gates; Minimization techniques applied to design of logic systems; Combinational circuits; Latches, flip-flops, registers and counters; Synchronous sequential circuit design; State machines; Memory and I/O logic elements; Discussion of microprocessors; Analog/digital and digital/analog converters.

2- Overall aims of the course:

- 1) Demonstrate knowledge of the basic understanding of logic gates and digital circuits.
- 2) Gain the ability to build mechatronics solutions using digital system components such as MUXs, Decoders, PLAs, Counters, etc.
- 3) Demonstrate the ability to analyze, minimize and synthesize combinational and synchronous sequential logic circuits via applying hardware and software skills through mini design projects.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Identify basic applied and engineering science.
- a2. Apply principles of digital logic and its implementation in various fields of mechanical engineering and some other engineering disciplines.

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Define digital circuit and logical design problems in mechanical engineering and evaluate designs, processes, and performance and propose improvements.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Design combinational circuits using digital logic circuits.
- c2. Apply gained design skills to solve applications in mechanical and mechatronics applications.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Collaborate effectively within multidisciplinary team

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

#	Topics	Lecture	Tutorial/Lab
1	Digital Systems and Binary Numbers	2	2
2	Boolean Algebra and Logic Gates	3	3
3	Simplification of Boolean Functions: The Karnaugh Map Method	4	4
4	Combinational Circuits	4	4
5	Latches and Flip-Flops	2	2
6	Synchronous Sequential Devices	4	4
7	Registers and Counters	4	4
8	Memory and Programmable Logic	3	3
9	Design Project Presentation	4	2
10	Midterm Tests	0	2
Total		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools	Assessment Method	Time Schedule	%
First Midterm	Written Exam	Week 6	20
Second Midterm	Written Exam	Week 11	20
Participation and Assessments	Follow up during tutorial /lab work, and written quizzes	Weekly	10
Project	Design and implementation of a digital system application.	Week 14	10
Final Exam	Written	As per schedule	40
Total			100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
M.M. Mano and M.D. Ciletti, *Digital Design*, Pearson International, Prentice Hall, New Jersey, USA, 2013
2. Lecture notes and videos on the course *Moodle* page, FUE website.
3. Recommended Readings:
C.H. Roth, Jr. and L.L. Kinney, *Fundamentals of Logic Design*, Cengage Learning, Stamford CT, USA, 2014.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Prof. Yehia Hendawy.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

ELE 366: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs					
		a1	a2	b1	c1	c2	d1
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	X					
A09	Principles of design including elements design, process and/or a system related to Mechatronics.				X	X	
A17	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.	X	X	X			
A19	Fundamentals of electrical, electronic, and digital instrumentation and transducers.	X		X	X		
C01	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyse and interpret results.		X			X	
C13	Prepare and present technical reports.						X
D1	Collaborate effectively within multidisciplinary team						X
D7	Search for information and engage in life-long self-learning discipline	X					X

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs								
		a1	a2	b1	c1	c2	d1			
1	Digital Systems and Binary Numbers	X	X							
2	Boolean Algebra and Logic Gates	X		X						
3	Simplification of Boolean Functions			X						
4	The Karnaugh Map Method		X	X						
5	Combinational Circuits			X				X		
6	Latches and Flip-Flops						X	X		
7	Synchronous Sequential Devices						X	X		
8	Registers and Counters						X			
9	Memory and Programmable Logic			X						
10	Design Project	X	X	X	X	X	X	X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs					
		a1	a2	b1	c1	c2	d1
1	Interactive Lecturing	X	X	X	X	X	
2	Problem solving		X	X	X		
3	Discussion		X			X	X
4	Experiential learning			X	X		
5	Project				X	X	X
6	Research	X					X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs						Σ %
		a1	a2	b1	c1	c2	d1	
1	Assignments	X	X	X	X			5
2	Participation (Lecture, Tutorial/Lab)		X	X		X		5
3	Oral & Practical exams	X	X	X	X	X	X	20
4	Written Exams (Quizes + Midterms + Final)	X	X	X	X	X		70
5	Over all %							100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
ELE 410: Introduction to Microprocessors

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Introduction to Microprocessors	Code:	ELE 410
Credit Hrs:	3	Lect.:	2
		Tut./Lab:	2
Prerequisite:	ELE 366: Digital Systems.		

B- Professional Information

1- Catalog Course Description.

Microprocessor system design; 8051 architecture and organization; Instruction set; Addressing modes; stack and branching; Interrupts and exceptions; Microprocessor support circuits and peripheral interfacing; Assembly programming; C language programming; Applications include data collection and control of pneumatic, hydraulic and machine systems.

2-Overall aims of the course.

Upon completing this course the student will have learned, the following:-

- The characteristics of a microprocessors, and its applications.
- The relationship between hardware and software and how they work together to accomplish a task.
- Identify the major component of a microcontroller-based systems, describe the steps involving in assembling, linking, and executing a program.
- Write programs in assembly and “C” languages to perform given tasks and run them.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Discuss issues about the microprocessor performance.
- a2. List the main syntax of assembly and “C” languages.
- a3. Outline fundamentals in computing, including hardware and operating systems.
- a4. Discuss issues of reliability.
- a5. Identify and demonstrate usage of tools, practices and methodologies used in the specification, design implementation and critical evaluation of computer software systems.
- a6. Outline current and underlying technologies that support computer processing and inter-computer communication.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Design microprocessor programs in assembly and “C” languages to perform a given task.
- b2. Debug microprocessor programs written in assembly or “C” languages to perform a given task.
- b3. Modify microprocessor programs written in assembly or “C” languages to upgrade a given process.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Implement programs using the assembly and “C” languages.
- c2. Use the assembly language to control the different computer units.
- c3. Use the assembly language to write drivers for different computer accessories.
- c4. Identify risks or safety aspects that may be involved in the operation of computing equipment within a given context.
- c5. Operate computing equipment efficiently, taking into account its logical and physical properties.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work in stressful environment and within constraints.
- d2. Demonstrate efficient IT capabilities.
- d3. Manage tasks and resources.
- d4. Communicate effectively.
- d5. Manage one's own learning and development, including time management and organizational skills.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lecture	Tut.	Lab
1	Introduction to microprocessors and embedded processors.	2	2	0
2	The 8051 microcontroller overview and programming model and architecture.	4	4	0
3	The 8051 Assembly language programming and addressing modes.	6	6	0
4	Arithmetic, logical, and jump instructions.	4	4	0
5	I/O parallel port programming.	4	4	0
6	The 8051 C programming.	4	4	0
7	Timer, serial port, and interrupt programming in Assembly and C.	4	4	0
8	Design projects.	4	2	0
Total		32	30	0

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes	1 st	Reports, follow up during tut. /lab work, & written exam.	Weekly	15
	2 nd		Weekly	15
Final Exam		Written		40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
The 8051 Micro-controller and Embedded Systems using Assembly and C, Muhammad Ali, Pearson, Latest.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: **Prof Yehia Hendawy Hossamel-din.**
Head of Department: **Prof Yehia Hendawy Hossamel-din.**
Date: **November - 2017**
Course Instructor: **Prof . Abdel Monem Seif**

ELE 410: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs											Course ILOs								
	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2	d3	d4	d5	
A13	X			X	X	X														
A18		X	X																	
B15							X													
B16							X	X												
B17							X	X	X											
B18							X	X	X											
C14										X	X	X	X	X						
D2															X					
D3																		X		
D4																X				
D6																	X	X		X

Table [2] : Course Content/ ILOs Matrix

No.	Topics	Course ILOs																			
		a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2	d3	d4	d5	
1	Introduction to microprocessors and embedded processors.	X																			
2	The 8051 microcontroller overview and programming model and architecture.	X		X		X															
3	The 8051 Assembly language programming and addressing modes.	X					X		X												
4	Arithmetic, logical, and jump instructions.					X		X	X		X						X				
5	I/O parallel port programming.					X		X	X												
6	The 8051 C programming.		X				X	X	X		X						X				
7	Timer, serial port, and interrupt programming in Assembly and C.	X			X		X	X	X		X	X					X	X			
8	Design projects.				X					X								X	X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

No.	Method	Course ILOs																			
		a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2	d3	d4	d5	
1	Interactive Lecturing	X	X	X	X	X	X	X	X	X											
2	Discussion	X	X	X	X	X	X	X	X												
3	Experiential learning									X	X	X	X	X							
4	Project															X	X	X	X	X	X
5	Research	X																			

Table [4]: Assessment method / ILOs Matrix

No.	Method	Course ILOs															Σ	%				
		a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	c4	c5	d1			d2	d3	d4	d5
1	Assignments	X	X	X	X	X	X	X	X	X												
2	Participation (L, T, &Lab)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
3	Oral& Practical exams	X	X	X	X	X	X	X	X	X	X	X	X	X	X							
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X	X												
5	Over all %																					100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017

Course Specifications

EPR 442 : Actuators and Power Electronics

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Actuators and Power Electronics	Code:	EPR 442		
Credit Hrs:	3	Lect.	2	Tuto/Lab:	2
Prerequisite:	EPR 340 : Electrical Machines				

B- Professional Information

1 – Catalog Course Description

Analog signal conditioning, Digital signal conditioning, Sensors, Signal conversion methods, Power electronics, Actuators and Final control elements

2 – Overall aims of course

To be familiar with the different sensors, signal conversion methods, actuators and final control elements and the design of process control and instrumentation systems used in industrial process including analogue and digital signal conditions.

3 – Intended learning outcomes of course (ILOs)

By the Completion of this course, student should be able to:

a- Knowledge and Understanding:

- a1- Design analog and digital signal conditioning circuits
- a2- Sensors:
 - Understand requirements for application of measurement and instrumentation sensors (Temperature sensors, Mechanical sensors, Optical sensors).
 - Design the application of an RTD temperature sensor to specific problems in temperature measurement.

- Design the application of a thermistor to specific temperature measurement problems.
 - Design the application of a thermocouple to specific temperature measurement problems.
 - Develop the design of a system to measure temperature using a solid state temperature sensor.
 - Describe three types of sensors for the measurement of displacement, location, or position.
 - Design the application of a strain gauge for the measurement of strain and stress.
 - Describe the operating principle of an accelerometer
 - Explain the operating principles of different pressure sensors
 - Describe the operating mechanisms of different flow sensors
 - Compare between photoconductive, photovoltaic, and photodetector sensors.
 - Describe how optical fiber sensors work for different type of measurement
 - Design the application of optical techniques to process control measurement application
- a3- Signal Conversion:
- Explain different types of signal conversion
 - Explain the basic principles of the pneumatic nozzle/flapper system
 - Define the basic operation of the power electronic: SCR, GTO, and TRIAC
 - Explain why BJT switching results in less power dissipation than simple amplification
 - Provide descriptions of the power MOSFET and IGBT
- a4- Actuators:
- Select the suitable electrical actuators: Solenoid, DC motors, AC motors, Stepping motors
 - Explain the operation of a pneumatic valve stem positioning actuator
 - Explain the operation of hydraulic actuators
- a5- Select the suitable final control element and describe the difference between three control valve types

b- Intellectual skills

- b1- Interpreting and Analyzing
- b2- Classifying and Summarizing
- b3- Comparing and contrasting
- b4- Storing, manipulating, and retrieving information
- b5- Creative thinking
- b6- Problem Solving

c- Professional and practical skills

- c1- Engineering skills.
- c2- Ability to diagnose.
- c3- Ability to identify the problem.

d- General and transferable skills

- d1- Brainstorming inside the class in replying to the questions
- d2- Act through a teamwork in preparing a report on design problem using technological tools.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

No.	Topics	No. of hours		
		Lecture	Tutorial	Total
1	Analog Signal Conditioning	1	1	2
2	Digital Signal Conditioning	1	1	2
3	Thermal Sensors	3	3	6
4	Displacement, Location or Position Sensors	1	1	2
5	Strain Sensors	1	1	2
6	Motion Sensors	1	1	2
7	Pressure Sensors	1	1	2
8	Flow Sensors	2	2	2
9	Optical Sensors	3	3	6
10	Fiber Optic Sensors	2	2	4
11	Electrical and Pneumatic Signal Conversion	2	2	4
12	Switching Devices: SCR, GTO, TRIAC, DIAC	2	2	4
13	Controlling Devices: BJT, MOSFET, IGBT	2	2	4
14	Electrical Actuators	2	2	4
15	Pneumatic Actuators	2	2	2
16	Hydraulic Actuators	2	2	2
17	Final Control Elements	2	2	2
TOTAL		30	30	60

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	6 th - 7 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes	1 st	Reports, follow up during tutorial work, & written exam.	Weekly	10
	2 nd		Weekly	10
Project	Practical & oral Project Exam		Proposal: 7 th week	10
			Delivery: 13 th week	
Final Exam		Written	14 th - 16 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

- 8.1- Course Notes (in MS Power Point or PDF format)
- 8.2- Essential Books (Text Books)
Process Control Instrumentation Technology, Curtis D. Johnson, 8th edition or higher, 2006, Prentice Hall.
- 8.3- Recommended Books
 - Industrial Process Sensors, David M. Scott, 1st edition, 2008 CRC Press
 - Condensed Handbook of Measurement and Control, N. E. Battikha, 3rd Edition, 2007 ISA–The Instrumentation, Systems and Automation Society
 - Fundamental of Industrial Instrumentation and Process Control, William C. Dunn, 1st edition, 2005 McGraw-Hill
- 8.4- Periodicals, Web Sites, ... etc
- 8.5- Any web site on control systems

9-Facilities required for teaching and learning:

- Computer Facilities
- Data Show
- Table
- Electric Connections (power cable, data cable)
- Mat LAB Package
- Special Lab experiments to help and enhance the understanding of the subject.

Course coordinator: Prof. M.Adelatif
Head of Department: Prof. Yehia Hendawy
Date: Nov. 2017
Course Instructor: Prof. Abdel Monem Abdel Hamid Ahmed Seif

EPR 442 : Appendix

Table [1]: Course ILOs / Program ILOs Matrix

	Program ILOs	Course ILOs																
		a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	d1	d2	
A02	Concepts and theories of basic science including physics, mechanics and chemistry		✓	✓	✓	✓												
A09	Principles of design including elements design, process and/or a system related to mechatronics	✓	✓	✓	✓	✓	✓			✓							✓	✓
A11	Quality assurance systems, codes of practice and standards health and safety requirements and environmental issues		✓	✓	✓	✓				✓								
A13	Current engineering technologies as related to Mechatronics. including modern techniques in sensors, actuators, control units and their interfaces		✓	✓	✓	✓							✓	✓				
A17	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuit analysis, electronic components, logic circuit design, and digital circuits,	✓		✓	✓							✓						
B04	Think in a creative and innovative way in problem solving and design	✓		✓	✓					✓			✓	✓			✓	
B06	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuit analysis, electronic components, logic circuit design, and digital circuits,	✓		✓								✓						
B13	Create systematic and methodic approaches when dealing with new and advanced technology									✓		✓						
B16	Identify at an appropriate level the design, production, interfacing & software needs of different parts of Mechatronics systems.	✓	✓	✓	✓	✓							✓	✓				
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to mechatronics	✓		✓	✓	✓				✓							✓	✓
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs									✓			✓	✓			✓	✓

Program ILOs	Course ILOs															
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	d1	d2
C11	√		√				√							√		
C12												√	√			
D01																√
D03																√
D09															√	√

Table [2] : Course Content/ ILOs Matrix

Topics	Course ILOs																
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	d1	d2	
1	√					√					√			√	√	√	
2	√					√					√			√	√	√	
3		√					√	√			√	√		√	√	√	
4		√					√	√			√	√		√	√	√	
5		√					√	√			√	√		√	√	√	
6		√					√	√			√	√		√	√	√	
7		√					√	√			√	√		√	√	√	
8		√					√	√			√	√		√	√	√	
9		√					√	√			√	√		√	√	√	
10		√					√	√			√	√		√	√	√	
11			√				√	√			√	√		√	√	√	
12			√				√	√			√	√		√	√	√	
13			√				√	√			√	√		√	√	√	
14				√			√	√			√	√		√	√	√	
15				√			√	√			√	√		√	√	√	
16				√			√	√			√	√		√	√	√	
17					√		√	√	√		√	√		√	√	√	

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs															
		a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	d1	d2
1	Interactive Lecturing	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2	Problem Solving	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3	Discussion	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
4	Experiential learning																
5	Project																
6	Research						√	√	√	√	√	√	√	√	√	√	√

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs																	Σ
		a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	d1	d2	%	
1	Assignments	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	5	
2	Participation (L, T, &Lab)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	5	
3	Oral& Practical exams	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	10	
4	Written Exams (QZs + MIDTERMS).	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	40	
4	Written Exams (FINAL).	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	40	
5	Over all %																	100	



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MAN 350: Industrial Automation

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Industrial Automation (CAD/CAM)	Code:	MAN 350
Credit Hrs:	2	Lect.:	2
		Tut. /Lab:	1
Prerequisite:	MAN221,CMP132		

B- Professional Information

1-Catalog Course Description.

The course aims to acquire the essential knowledge and understanding for the common CNC machines programming and using CAD/CAM packages.

2-Overall aims of the course.

The course aims to acquire the essential knowledge and understanding for the common CNC machines programming and using CAD/CAM packages:

- Basics of CAD,
- Basic of CAM,
- G-Code programming,
- Computer assisted part programming.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Demonstrate the basic concepts and theories of how CAD works.
- a2. Classify the different CAD modeling features.
- a3. Identify the principles of G-Code part programming
- a4. Collect data to understand how CNC machines are working

- a5. Use basic Science and engineering fundamentals in mechanical parts process planning

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Use analytical thought in choosing 3D features to construct CAD model
- b2. Select suitable parameters for machining operation (Milling and Drilling)
- b3. Select suitable G-code programming parameter to operate CNC machine
- b4. Solve profiling or slotting problems for any given mechanical part

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Apply solutions for mathematical transformation in CAD modeling
- c2. Select the 3D feature to create any mechanical CAD model
- c3. Create or part programming for mechanical parts
- c4. Apply analytical methods for milling operations

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Communicate effectively.
- d2. Effectively manage tasks, time, and resources.
- d3. Acquire entrepreneurial skills.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Total
1	Introduction	2	1	3
2	Basics of CAD	2	1	3
3	Main types of CNC machines	4	1	5
4	G-code programming	2	1	3
5	G-code programming for milling	4	1	5
6	G-code programming for drilling	2	1	3
7	Cycles in G-codes	4	1	5
8	Computer assisted part programming	4	1	5
9	CAD transformation	2	1	3
10	Boundary representation	2	1	3
11	Constructive solid geometry	2	1	3
12	Boolean operation with CAD modeling	2	1	3
Total		30	15	45

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	30
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
 CAD/CAM: Principles and Applications.
 Tata McGraw-Hill Education, 2004
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:

9-Facilities required for teaching and learning:

- SolidWorks Lab
- Data Show

Course coordinator: Dr. Hassan.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MAN 350: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs															
	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3
A09	X															
		X	X													
A13																
A21				X	X											
B01								X	X							
B02							X									
B04						X										
B06								X								
B10						X		X	X							
B14								X	X							
B15								X	X							
B16							X									
B18						X		X								
C04										X						
C05											X					
C13												X	X			
D02														X		
D06															X	X
D07																

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs																
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4	
1	Introduction	X																
2	Basics of CAD		X				X	X		X								
3	Main types of CNC machines			X	X		X	X		X					X			
4	G-code programming					X			X									
5	Computer assisted part programming											X	X					
6	CAD transformation											X	X	X				
7	Constructive solid geometry			X							X		X			X		X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs																
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	C4	d1	d2	d3	
1	Interactive Lecturing	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
2	Problem Solving						X	X	X	X	X			X				
3	Discussion	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
4	Experiential learning																	
5	Project											X	X					
6	Research		X	X	X	X									X	X		X

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs															Σ		
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3		d4	%
1	Assignments	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	5
2	Participation (L, T, &Lab)						X	X	X	X	X	X	X	X	X	X	X	X	5
3	Oral& Practical exams											X	X	X	X	X	X	X	10
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	80
5	Over all %	5	5	5	5	5	15	15	15	15	3	6	1	1	1	1	2	100	



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MAN 515: Electromechanical Design

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Five
Date of specification approval:	November 2017

A- Basic Information

Title:	Electromechanical Design	Code:	MAN 515				
Credit Hrs:	3	L:	2	T:	1.5	P:	0.5
Prerequisite:	MAN 441:Mechanical Design 2 EPR 266 : Electrical Circuits						

B- Professional Information

1-Catalog Course Description.

Design of mechanical motion transmission systems: gearing, couplings, belts and lead-screws, Sensing and measurement of mechanical motion, Sensor selection, Electromechanical actuator selection and specification, sequential controller design, Digital I/O, Case studies.

2-Overall aims of the course.

- Introduce the integration of Mechanical and Electrical System as a building block of “Mechatronics Systems”
- Enrich the student’s knowledge in construction, analysis, and design of electromechanical systems.
- Train students to design, build, and test an elementary Electromechanical Sub-system.

3-Intended learning outcomes of course (ILOs).

a. Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Describe the main steps for design of electromechanical systems.
- a2. Identify the different Electrical components of the Electromechanical Systems.
- a3. Identify the different Mechanical components of the Electromechanical Systems.
- a4. Describe the function of different transmission mechanisms used in electromechanical systems.
- a5. Describe the different motion profiles used in designing electromechanical systems.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Select the suitable mechanical & Electrical components needed for an Electromechanical System.
- b2. Develop the needed computer programs for design and control of electromechanical systems.
- b3. Evaluate the performance of Electromechanical Systems and their components through carrying out the necessary checking calculations.
- b4. Analyze the different motion profiles used in designing the electromechanical systems.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Use the available software for design and control of electromechanical systems.
- c2. Use the suitable hardware components and software for implementing a given simple electromechanical system.
- c3. Prepare a technical presentation report for a given task.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work in stressful environment and within constrain.
- d2. Work inside a team (Team work project).
- d3. Effectively manage tasks, time, and resources.
- d4. Search for information and engage in life-long self-learning discipline through self-learning assignments.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lecture	Tutorial	Lab
1	Introduction – Design principles.	2	0	
2	Basic building blocks (Electrical components): AC/ DC Motors – Stepper motors – H drive-PWM – Stepper motors drive and control- Linear Motors- speed torque curves – Motor selection.	10	8	
3	Basic building blocks (Mechanical components): Gear heads- multi gear ratio gear boxes (ICE/Auto) – Rotary motion/Direct drive- Rotary motion/Gearhead Drive - Rotary motion/Belt& Pulley Drive - Linear motion/Lead (Power)Screw Drive-Linear motion/ Belt& Pulley drive - Linear motion/Rack and Pinion drive- Linear motion/Roll feed drive- Linear motion/ Linear motor drive. Use of available software for design.	12	6	
4	System analysis – Position- Velocity- Acceleration- Jerk- Velocity Profile: Trapezoid – Cosine – Parabolic.	6	2	
5	Lab experiments: Hydraulic & Pneumatic – Motor speed & position control- Stepper motor/load control- DC motor/Load control-	0	0	8
6	Project follow -up.	0	0	4
7	Midterm Exams	0	2	0
Total		30	18	12

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tutorial /lab work, & written exam.	Weekly	20
Project.	Practical & oral Project Exam		Proposal: 3 rd week	10
			Delivery: 12 th week	
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
 - Frederick G. Moritz, “Electromechanical Motion Systems Design and Simulation”, John Wiley & Sons, Ltd, 2014
 - Alciatore, David G.& Hstand, Michael B.; “Introduction to Mechatronics and Measurement System”, McGraw Hill, Latest editions.
 - Richard G. Budynas & J. Keith Nisbett; “Shigley’s Mechanical Engineering Design”; Mc Graw Hill; latest edition
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
 - Bolton, William; “Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering”; Prentice Hall, Latest editions.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations
- Lab equipped with function generators, oscilloscopes, Data acquisition cards, Computers, and working benches with the necessary tools (welding, drilling, etc...)

Course coordinator: Prof. Yehia Hendawy
Head of Department: Prof. Yehia Hendawy
Date: Nov. 2017
Course Instructor: Prof. Yehia Hendawy

MAN 515: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs																
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4	
A09	Principles of design including elements design, process and/or a system related to Mechatronics.	X																
A13	Current engineering technologies as related to Mechatronics including modern techniques in sensors, actuators, control units and their interfaces.		X															
A21	Fundamentals of problem identification, formulation and solution in the inter-disciplinary fields of Mechatronics				X													
B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems.								X									
B02	Develop and implement computer programs for engineering applications including programming of microprocessor based units.									X								
B04	Think in a creative and innovative way in problem solving and design.						X											
B06	Assess and evaluate the characteristics and performance of components, systems and processes related to Mechatronics including mechanical systems, sensors, interfacing, controllers, and actuators.									X								
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.							X										
B14	Analyze and design Mechanical systems considering modern techniques including modern CAD tools..																	
B15	Analyze and design electrical and electronics including logic circuits, and microprocessor based systems.																	
B16	Develop and apply the necessary software for controlling and interfacing of mechatronics systems.									X								
B18	Identify at an appropriate level the design, production, interfacing and software needs of different parts of Mechatronics systems.						X											
C04	Professionally merge the engineering knowledge, and feedback to improve design, products and/or services of Mechatronics systems.												X					
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs.													X				
C13	Prepare and present technical reports.														X			
D02	Work in stressful environment and within constraints														X			
D06	Effectively manage tasks, time and resources																X	X
D07	Search for information and engage in life-long self-learning discipline																	X

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs																
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4	
1	Introduction – Design principles.	X																
2	Basic building blocks (Electrical components): AC/DC Motors – Stepper motors – H drive-PWM – Stepper motors drive and control- Linear Motors- speed torque curves – Motor selection.		X				X	X			X						X	
3	Basic building blocks (Mechanical components): Gear heads- multi gear ratio gear boxes (ICE/Auto) – Rotary motion/Direct drive- Rotary motion/Gearhead Drive - Rotary motion/Belt& Pulley Drive - Linear motion/Lead (Power)Screw Drive- Linear motion/ Belt& Pulley drive - Linear motion/ Rack and Pinion drive- Linear motion/Roll feed drive- Linear motion/ Linear motor drive. Use of available software for design.			X	X		X	X			X						X	
4	System analysis – Position- Velocity- Acceleration- Jerk- Velocity Profile: Trapezoid – Cosine – Parabolic.					X												
5	Lab experiments: Hydraulic & Pneumatic – Motor speed & position control- Stepper motor/load control- DC motor/Load control-											X	X					
6	Project follow -up.											X	X	X	X	X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs															
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4
1	Interactive Lecturing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	Problem solving						X	X	X	X	X	X	X	X	X	X	X
3	Discussion	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	Experiential learning																
5	Project																
6	Research		X	X	X	X							X	X	X	X	X

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs																Σ
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4	
1	Assignments	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	5
2	Participation (L, T, &Lab)						X	X	X	X	X	X	X	X	X	X	X	5
3	Oral& Practical exams																	10
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	80
5	Over all %	4.4	4.4	4.4	4.4	4.4	16.5	16.5	16.5	16.5	2	6	1	1	0.5	0.5	1	100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MKT 411: Mechatronics

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Mechatronics	Code:	MKT 441				
Credit Hrs:	3	L:	2	T:	1.5	P:	0.5
Prerequisite:	ELE 216: Basic electronic circuits. EPR 266: Electric circuits.						

B- Professional Information

1-Catalog Course Description.

Mechatronics system configuration; Modeling of mechanical translational and rotational systems; Mechanisms systems; Mechanical and electrical actuators; Pneumatic and hydraulic systems; Sensors and encoders; Data acquisition and signal conditioning; Computer-aided drawing (CAD) and interpretation of 3-D technical drawings; Mini project to design, model, implement, and test a mechatronics system.

2-Overall aims of the course.

- Introduce Mechatronics specialization in general and the concept of Multidisciplinary and synergistic integration of different engineering areas with emphasis on Parallel design concept.
- Enrich the student's basic knowledge about interfacing and data acquisition in Mechatronics Systems.
- Train students to design, simulate, build, and test an elementary Mechatronics Subsystem.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Define Mechatronics systems, sensors, actuators, signal conditioning, and control units.
- a2. List the different arrangements of the operational amplifier circuits for different purposes.
- a3. Explain how to properly sample a signal for digital processing,
- a4. Describe the analogue to digital (A/D) and digital to analogue (D/A) conversion process.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Analyse the different arrangements of operational amplifiers considering ideal and real models.
- b2. Calculate the proper sampling frequency and the resolution for digital processing.
- b3. Select the proper data acquisition card to solve a given signal processing task.
- b4. Analyse the results of simulation models for a simple mechanical, electrical, and electromechanical systems.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Analyse lab experimental results of sampling a signal with different sampling frequencies.
- c2. Use the suitable hardware components and software for drafting and implementing a given simple mechatronics system.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work in stressful environment and within constraints through assignments and course project
- d2. Effectively manage tasks, time, and resources.
- d3. Search for information and engage in life-long self-learning discipline through self-learning assignments.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lecture	Tut.	Lab
1	Introduction: Course outlines & Information - Mechatronics – Mechatronics Engineer- Mechatronics system design approach-	2	0	0
2	Mechatronics system – Sensors-Actuators -Control unit- Signal Conditioning.	6	2	
3	Analog Signal Processing Using Operational Amplifiers: Ideal model for Operational Amplifier (Different arrangements – Sample & Hold circuit-Comparator), Real OP Amp: Important Parameters from Data Sheets.	6	6	0
4	Data Acquisition: Quantization Theory- A/D Converters- D/A Converters- Virtual Instrumentation - Data Acquisition and Control.	10	8	0
5	Modelling of Mechatronics systems: Hard & Soft Models- Model validation and verification- Modelling of Mechanical, Electrical, and Electromechanical Systems. Simulation using MATLAB/SIMULINK	6	0	2
6	Lab Experiments: Use of a CAD software for PCB Design & Application- Basic circuits of amplifiers - Signal sampling using DAQ - Simulation of a simple Mechatronics System.	0	0	6
7	Project follow -up.	0	0	4
8	Midterm Exams	0	2	0
Total		30	18	12

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	20
Project.		Practical & oral Project Exam	Proposal: 3 rd week	10
			Delivery: 12 th week	
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Alciatore, David G.& Hstand, Michael B.; “Introduction to Mechatronics and Measurement System”, McGraw Hill, Latest editions.
2. Lecture notes on the course moodle page, FUE website.
3. Recommended Readings:
Bolton, William; “Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering”; Prentice Hall, Latest editions.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations
- Lab equipped with function generators, oscilloscopes, Data acquisition cards, Computers, and working benches with the necessary tools (welding, drilling, etc...)

Course coordinator: Prof. Yehia Hendawy

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Prof. Yehia Hendawy

MKT 411: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs															
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	d1	d2	d3			
A13	Current engineering technologies as related to Mechatronics, including modern techniques in sensors, actuators, control units and their interfaces	X															
A17	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuit analysis, electronic components, logic circuit design, and digital circuits,		X	X	X												
B6	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuit analysis, electronic components, logic circuit design, and digital circuits,					X											
B12	Analyze results of numerical models and assess their limitations.									X							
B18	Identify at an appropriate level the design, production, interfacing & software needs of different parts of Mechatronics systems.						X				X						
B19	Create solutions to mechatronics systems especially to manufacturing, maintenance and interfacing problems in a creative way, taking account of the different constraints.						X				X						
C1	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyse and interpret results.										X						
C7	Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.										X						
D2	Work in stressful environment and within constraints													X			
D6	Effectively manage tasks, time, and resources															X	
D7	Search for information and engage in life-long learning.																X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs														
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	d1	d2	d3		
1	Introduction: Course outlines & Information - Mechatronics – Mechatronics Engineer-Mechatronics system design approach	X														
2	Mechatronics system – Sensors- Actuators -Control unit- Signal Conditioning	X														
3	Analog Signal Processing Using Operational Amplifiers: Ideal model for Operational Amplifier (Different arrangements – Sample & Hold circuit- Comparator), Real OP Amp: Important Parameters from Data Sheets		X			X						X				
4	Data Acquisition: Quantization Theory- A/D Converters- D/A Converters- Virtual Instrumentation -Data Acquisition and Control.			X	X		X				X		X			X
5	Modelling of Mechatronics systems: Hard & Soft Models- Model validation and verification- Modelling of Mechanical, Electrical, and Electromechanical									X			X			
6	Lab Experiments: Use of a CAD software for PCB Design & Application- Basic circuits of amplifiers - Signal sampling using DAQ - Simulation of a simple Mechatronics System											X				
8	Project follow -up													X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs												
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	d1	d2	d3
1	Interactive Lecturing	X	X	X	X	X	X	X	X		X			
2	Problem solving					X	X	X	X		X			
3	Discussion	X	X	X	X	X	X	X	X		X			
4	Experiential learning									X	X			
5	Project										X	X	X	X
6	Research	X			X									

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs												Σ	
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	d1	d2		d3
1	Assignments	X	X	X	X	X	X	X	X	X					5
2	Participation (L, T, &Lab)				X	X	X	X	X	X					5
3	Oral& Practical exams										X	X	X	X	10
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X						80
5	Over all %	5.56	5.56	5.56	5.56	16.55	16.55	16.55	16.55	1.56	7	1	1	1	100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MKT412: Mechatronics System Design

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Mechatronics System Design	Code:	MKT412
Credit Hrs:	3	Lect.:	2
		Tut. /Lab:	2
Prerequisite:	MKT:411		

B- Professional Information

1-Catalog Course Description

Introduction to Mechatronics system design; VDI design guideline for mechatronics system design; Basic control logic; Controller design for mechatronics systems using logic controllers, microcontrollers, PC-based controller, and PLCs; Embedded micro-processor system and control; Design of sensors and power transmission systems; Two projects to design a prototype mechatronic device.

2-Overall aims of the course

- Introduce mechatronic system design methodology and evaluation.
- Comparison for mechatronics design elements including computing, sensors and actuators.
- Train students to design and evaluate complete Mechatronics systems.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Define Mechatronics design procedure.
- a2. List the different types of computing devices, actuation systems and sensing elements.
- a3. Explain the design rules of man-machine interface design.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Calculate suitable motor size for mechatronics system.
- b2. Select the proper computing device, sensors and actuators for a mechatronics system among several alternatives.
- b3. Design a user interface for a mechatronic system to satisfy user requirements.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Analyse lab experimental results for running project and program arduino or other microcontroller.
- c2. Prepare and present a technical report for course project.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work in stressful environment and within constraints through assignments and course project
- d2. Communicate effectively through presentation and discussion of the course project.
- d3. Effectively manage tasks, time, and resources.
- d4. Search for information and engage in life-long self-learning discipline through self-learning assignments

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

	Topics	Lec.	Tut.	Total
1	Introduction: Mechatronics system design procedure	2	2	4
2	Critical thinking and system evaluation	4	2	6
3	Computing devices, types of computing devices, comparison	8	6	14
4	Actuation types, how to select type, and size the actuator.	10	8	18
5	Sensor types and rules for comparison and selection.	4	2	6
6	Design rules of user interface for systems	0	4	4
7	Project proposal	2	4	64
8	Project follow -up.	0	2	2
Total		30	30	60

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm		Written Exam	5 th - 6 th week	15
Assignments, Participation, & Quizzes	1 st	Reports, follow up during tut. /lab work, & written exam.	Weekly	15
	2 nd		Weekly	10
Project.		Practical & oral Project Exam	Proposal: 3 rd week	20
			Delivery: 12 th week	
Final Exam		Written	According to Plan	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Bolton, William; “Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering”; Prentice Hall.
2. Recommended Readings:
Alciatore, David G.& Hstand, Michael B.; “Introduction to Mechatronics and Measurement System”, McGraw Hill.
3. Related web sites.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations
- Lab equipped with function generators, oscilloscopes, single board computers, Computers, and working benches with the necessary tools

Course coordinator: Prof.M Abdellatif.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MKT412: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs												
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3	d4	
A13	Current engineering technologies as related to Mechatronics including modern techniques in sensors, actuators, control units and their interfaces.	X	X	X										
A21	Fundamentals of problem identification, formulation and solution in the inter-disciplinary fields of Mechatronics		X		X									
A22	The principles of sustainable design and development			X										
B03	Select appropriate solutions for engineering problems based on analytical thinking.					X								
B06	Assess and evaluate the characteristics and performance of components, systems and processes related to Mechatronics including mechanical systems, sensors, interfacing, controllers, and actuators.				X	X								
B16	Develop and apply the necessary software for controlling and interfacing of mechatronics systems.						X							
B18	Identify at an appropriate level the design, production, interfacing and software needs of different parts of Mechatronics systems.					X								
B19	Create solutions to mechatronics systems especially to manufacturing, maintenance and interfacing problems in a creative way, taking account of industrial and commercial constraints.						X			X				
C04	Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services of Mechatronics systems and components.	X												
C05	Create and/or re-design a process, component or system, and carry out specialized engineering design.				X	X				X				
C13	Prepare and present technical reports.								X					
D2	Work in stressful environment and within constraints									X				
D3	Communicate effectively										X			
D6	Effectively manage tasks, time, and resources												X	
D7	Search for information and engage in life-long learning.													X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs											
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3	d4
1	Introduction: Mechatronics system design procedure	X											
2	Critical thinking and system evaluation	X				X							
3	Computing devices, types of computing devices, comparison		X			X							
4	Actuation types, how to select type, and size the actuator.				X	X							X
5	Sensor types and rules for comparison and selection.					X							X
6	Design rules of user interface for systems			X			X		X				
7	Project proposal							X					
8	Project follow -up.									X	X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

	Method	Course ILOs											
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3	d4
1	Interactive Lecturing	X	X	X	X	X	X	X					
2	Problem solving				X	X	X	X					
3	Discussion	X	X	X									
4	Experiential learning							X					
5	Assignment		X	X	X	X	X		X		X	X	X
6	Project							X	X	X	X	X	X
7	Research							X					X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs												Σ %	
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3	d4		
1	Assignments reports		X	X	X	X	X	X					X	X	5
2	Participation (L, T &Lab)	X	X	X	X	X	X	X							5
3	Oral& Practical exams								X				X		30
4	Written Exams (QZ + MIDTERMS + FINALS).	X	X	X	X	X	X	X							60
5	Over all %														100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MKT 440: Programmable Logic Controllers (PLCs)

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Programmable Logic Con- trollers (PLCs)	Code:	MKT 440				
Credit Hrs:	2	L:	2	T:	0	P:	1
Prerequisite:	ELE 216						

B- Professional Information

1-Catalog Course Description.

Basic Programmable logic controllers (PLCs) functions and programming; Relay and ladder logic; PLC programming and interfacing; PLC installation practices and troubleshooting techniques; Strategies to identify and localize PLC hardware generated problems; PLC Safety Procedures; PLCs in mechatronics systems; Mini design projects.

2-Overall aims of the course.

- Introduce the Programmable logic controllers (PLCs) as an industrial option for a microprocessor based control unit.
- Introduce the necessary hardware and software for editing debugging, and executing a PLC control program.
- Train students to design, build, and test a PLC program code for controlling an automated system.

3-Intended learning outcomes of course (ILOs).

a. Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Describe the function of the main parts of a typical PLC.
- a2. Describe the different types of PLC peripherals.
- a3. Interpret the basic PLC programming instructions.
- a4. Describe the main steps for commissioning, maintenance, and troubleshooting of a PLC controlled system.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Develop PLC programs based on logic gate functions.
- b2. Convert relay ladder schematics to ladder logic programs.
- b3. Develop PLC programs directly from a narrative description.
- b4. Apply combinations of counters and timers to PLC programs.
- b5. Create PLC programs involving data manipulations, math and sequencer instructions.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Install the PLC editor Software to a specific PC.
- c2. Apply safety rules in preparing and execution of PLC control systems.
- c3. Download the designed ladder logic program to the corresponding PLC and execute it.
- c4. Present the results of Experiments of control using PLC.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work in stressful environment and within constrain.
- d2. Communicate effectively.
- d3. Effectively manage tasks, time, and resources.
- d4. Search for information and engage in life-long self-learning discipline through self-learning assignments.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lecture	Lab
1	Introduction	2	
2	PLC H.W. components	2	
3	Basics of PLC Programming	2	
4	Programming Timers	4	
5	Programming Counters	4	
6	Programming Control Instruction	3	
7	Data Manipulation Instructions.	3	
8	Math Instructions	2	
9	Sequencer & Shift register Instruction	3	
10	PLC Commissioning, maintenance, & Trouble shooting.	2	
11	Labs: Safety and common symbols- Familiarization with PLCs – Installation and configuration of the PLC S.W. - Online Operations & Monitoring I/O Data Files – Relay instruction- Timer Instructions – Counter Instructions- Comparison Instruction – Move Instructions – Sequencer instructions – PLC Application (Traffic lights) – Troubleshooting. – Project follow up.	0	15
12	Midterm + Quizzes Exams	3	
Total		30	15

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tutorial /lab work, & written exam.	Weekly	20
Project.	Practical & oral Project Exam		Proposal: 3 rd week	10
			Delivery: 12 th week	
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
 - Frederick Frank D. Petruzella, “Programmable Logic Controllers “; McGraw-Hill; Latest edition
2. Lecture notes on the course Moodle page, FUE website.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations
- Lab equipped with PLC trainers, Computers, and working benches with the necessary tools.

Course coordinator: **Prof. Yehia Hendawy.**
Head of Department: **Prof. Yehia Hendawy.**
Date: **November - 2017**
Course Instructor:

MKT 440: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs																	
		a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	C3	C4	d1	d2	d3	d4	
A13	Current engineering technologies as related to Mechatronics including modern techniques in sensors, actuators, control units and their interfaces.	X	X																
A18	Fundamentals of microprocessor architecture and microprocessor based control units and their software and interfaces.	X	X																
A21	Fundamentals of problem identification, formulation and solution in the inter-disciplinary fields of Mechatronics			X															
B03	Select appropriate solutions for engineering problems based on analytical thinking.							X											
B15	Analyze and design electrical and electronics including logic circuits, digital circuits, and computer and microprocessor based systems.				X	X													
B16	Develop and apply the necessary software for controlling and interfacing of mechatronics systems.							X	X	X									
C1	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyse and interpret results.										X		X	X					
C7	Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.												X	X					
C09	Apply safe systems at work and observe the appropriate steps to manage risks.											X							
C13	Prepare and present technical reports.													X					
D2	Work in stressful environment and within constraints														X				
D3	Communicate effectively															X			
D6	Effectively manage tasks, time, and resources																X		
D7	Search for information and engage in life-long self-learning discipline																		X

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs																	
		a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	C3	C4	d1	d2	d3	d4	
1	Introduction	X	X																
2	PLC H.W. components	X	X																
3	Basics of PLC Programming			X		X		X											
4	Programming Timers			X		X		X											
5	Programming Counters			X		X		X											
6	Programming Control Instruction			X		X		X		X									
7	Data Manipulation Instructions.			X		X		X		X									
8	Math Instructions			X		X		X		X									
9	Sequencer & Shift register Instruction			X		X		X		X									
10	PLC Commissioning, maintenance, & Trouble shooting.				X														
11	Labs: Safety and common symbols- Familiarization with PLCs – Installation and configuration of the PLC S.W. - Online Operations & Monitoring I/O Data Files – Relay instruction- Timer Instructions – Counter Instructions- Comparison Instruction – Move Instructions – Sequencer instructions – PLC Application (Traffic lights) – Troubleshooting. . .										X	X	X	X					
12	Project													X	X	X	X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs																
		a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	C3	C4	d1	d2	d3	d4
1	Interactive Lecturing	X	X	X	X													
2	Problem solving					X	X	X	X									
3	Discussion	X	X	X	X	X	X	X	X									
4	Experiential learning									X	X	X	X					
5	Project														X	X	X	X
6	Research														X	X	X	X

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs																Σ	%
		a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	C3	C4	d1	d2	d3		
1	Assignments	X	X	X	X	X	X	X	X	X									
2	Participation (L, T, &Lab)				X	X	X	X	X	X	X	X	X						
3	Oral& Practical exams										X	X	X	X	X	X	X	X	
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X	X									
5	Over all %																100	100	



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MKT 471: Robot Mechanics

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Robot Mechanics	Code:	MKT 471		
Credit Hrs:	3	Lect.:	2	Tut. /Lab:	2
Prerequisite:	MAN 311, Mechanical Mechanisms				

B- Professional Information

1-Catalog Course Description.

Robotics overview and applications; Robot sensors and actuators, Robotic technology and systems; Kinematic Modeling: Spatial Representations and Transformations; DH and Homogenous transformations; Forward and inverse Kinematics; Jacobian for velocities and static analysis; Problem solving using up to date standard S/W robotics tools (Matlab); implementing the right industrial robotics system for a plant.

2-Overall aims of the course.

At the end of this course, students should be able to:

1. Analyze rigid motion with coordinate transform.
2. Derive robot manipulator kinematics, and use DH convention.
3. Solve simple inverse kinematics problems.
4. Solve robot motion planning problems.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Define robot terminology and taxonomy.
- a2. Explain the Denavit-Hartenberg, DH convention for axis transformation and building table.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Analyse the forward kinematics of robot chain and build homogeneous transformation matrices.
- b2. Derive inverse kinematics of serial robot chains.
- b3. Compute the trajectory of robot end effector.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Use the suitable software for analysis of robot kinematics.
- c2. Select right robot type for a motion application need.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Manage tasks, time, and resources.
- d2. Search for information and engage in life-long self-learning discipline through self-learning assignments.
- d3. Collaborate effectively within multidisciplinary team.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

	Topics	Lec.	Tut.	Total
1	Introduction	4	0	2
2	Rigid motion	4	2	6
3	Forwards kinematics	4	6	14
4	Inverse kinematics	4	6	18
5	Jacobian matrix and singularity	4	4	6
6	Trajectory and path planning	4	4	4
7	Project discussion	2	4	4
8	Project presentation	2	2	2
Total		28	28	56

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	20
Project.		Practical & oral Project Exam	Proposal: 3 rd week	10
			Delivery: 12 th week	
Final Exam		Written	Examination Period	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

Textbook

Robot Dynamics and Control, Mark W. Spong ,

References

1. Bruno Siciliano, Robotics, Modeling, Planning and Control.Springer 2009.
2. Craig, John J, R. Introduction to Robotics: Mechanics and Control, Pearson Education International, 2005, 3rd Edition.
3. Saeed B. Niku, Introduction to Robotics, Prentice Hall, 2001.
4. K.S. Fu, R.C. Gonzalez, and C.S.G. Lee, *Robotics: Control, Sensing, Vision and Intelligence*, McGraw-Hill, 1987
5. H.Asada and J. Slotine, *Robot Analysis and Control*, John Wiley & Sons New York, 1986, 3rd Edition.
6. Fu, K.S., Gonzalez, R.C., and Lee, C.S.G. Robotics: Control, Sensing, Vision, and Intelligence, McGraw Hill, 1986.
7. Megahed, S.M., Robotics: Principles of Robot Modelling and Simulation, John Wiley, 1993.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Prof. M.Abdlatif

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Prof. M.Abdlatif

MKT 471: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs												
		a1	a2	b1	b2	b3	c1	c2	d1	d2	d3			
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	X			X		X							
A10	Methodologies of solving engineering problems, data collection and interpretation.		X	x	X		X	x						
B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems.		X	X	X			x						
B13	Create systematic and methodic approaches when dealing with new and advanced technology.			X	X			X						
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.				X			x	X	x				
C13	Prepare and present technical reports.							x		X				
D01	Collaborate effectively within multidisciplinary team							x				x		
D03	Communicate effectively							x						x
D07	Search for information and engage in life-long self-learning discipline											x		

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs											
		a1	a2	b1	b2	b3	c1	c2	d1	d2	d3		
1	Introduction	X											
2	Rigid motion	x	x										
3	Forward kinematics		X	X			x	x	x				x
4	D-H convention		x								x		
5	Inverse kinematics				x								
6	Jacobian matrix						x	X			x		x
7	Computing inverse kinematics							X					
8	Trajectory planning					X		x	X			x	

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs											
		a1	a2	b1	b2	b3	c1	c2	d1	d2	d3		
1	Interactive Lecturing	X	X	X	X	X		X					
2	Problem solving			X	X	X		X					
3	Discussion	X	X	X	X	X	X	X					
4	Project							X	X	X	X	X	X
5	Research	X				X							

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs										Σ				
		a1	a2	b1	b2	b3	c1	c2	d1	d2	d3	%				
1	Assignments	X	X	X	X	X	X								5	
2	Participation (L, T, &Lab)			X	X	X	X								5	
3	Oral& Practical exams															
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X			X	X					10	
5	Over all %	5.56	5.56	16.55	16.55	16.55	16.55	1.56	7	1	1	1	1	1	100	



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MKT 472 : Robot Control

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Robot Control	Code:	472		
Credit Hrs:	3	Lect.:	2	Tut. /Lab:	2
Prerequisite:	MKT 471 : Robot Mechanics				

B- Professional Information

1-Catalog Course Description.

Path and trajectory planning; Manipulator dynamics; Independent joint control; Force control; Geometric nonlinear control; Computer vision; Visual servo control; Fuzzy control; Robot control system design; Problem solving using up-to-date standard S/W robotics tools (MATLAB®).

2-Overall aims of the course.

This course aims to:

- Introduce different methods for path planning for robot manipulators.
- Explain different methods for controlling robot manipulators, including Fuzzy Logic Control.
- Enrich the student's knowledge about control of manipulators.
- Train students to design, simulate, build, and test a robot manipulator.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Define different terms used in classic and Fuzzy Logic Control.
- a2. List different methods for path planning of manipulators.

- a3. Explain Different methods for control robot manipulators.
- a4. Describe manipulator dynamics and computer vision.

b- Intellectual skills.

- b1. Analyse manipulators' dynamics.
- b2. Calculate parameters for a smooth trajectory, and optimum parameters for classic and fuzzy controllers of manipulators.
- b3. Select suitable parameters for robot controllers.
- b4. Analyse the results of different controllers for manipulators.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Analyse lab experimental results of control manipulators with different control methods.
- c2. Use the suitable hardware components and software for drafting and implementing a simple manipulator.
- c3. Apply knowledge of mathematics, science, information technology, design and engineering practice integrally to identify, formulate and solve engineering and field problems related to Robot manipulators.
- c4. Prepare and present technical reports.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Search for information and engage in life-long self-learning.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1	Path and trajectory planning	4	4	2
2	Manipulator dynamics; Independent joint control	4	2	2
3	Force control	4	2	2
4	Geometric nonlinear control	4	2	2
5	Computer vision; Visual servo control	6	2	2
6	Fuzzy control	4	2	2
7	Robot control system design	4	2	2
Total		30	16	14

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	20
Project.		Practical & oral Project Exam	Proposal: 3 rd week	10
			Delivery: 12 th week	
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
John J. Craig, "Introduction to Robotics. Mechanics and Control", Addison Wesley, 2nd Edition.
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
S. B. Niku, "Introduction to Robotics, analysis, control, applications". John Wiley and Son, 2nd edition

9-Facilities required for teaching and learning:

- White board
- Data show
- Lab equipped Computers, and working benches with the necessary tools (welding, drilling, etc...)

Course coordinator: Prof. M Abdellatif.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MKT 472 : Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs																
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	c4	d1				
A02	Concepts and theories of basic science including physics, mechanics and chemistry	X	X															
A20	Principles, theories, and techniques of classical and modern control systems			X	X													
B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems					X												
B17	Apply different theories and techniques to solve problems of classical and modern control systems									X								
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics													X	X			
C13	Prepare and present technical reports																X	
D07	Search for information and engage in life-long self-learning discipline																	X

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs																	
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	c4	d1					
1	Path and trajectory planning		X					X											
2	Manipulator dynamics; Independent joint control	X		X	X	X			X										
3	Force control			X							X								
4	Geometric nonlinear control	X		X						X									



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MKT500: Graduation Project I

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Five
Date of specification approval:	November 2017

A- Basic Information

Title:	Graduation project I	Code:	MKT 500		
Credit Hrs:	2	Lect.:	0	Tut. /Lab:	4
Prerequisite:	Departmental Approval, Senior Standing				

B- Professional Information

1-Catalog Course Description

Conceptual Design: Students follow systematic design approach, apply project planning and scheduling techniques, devise analytical, computational and/or experimental solutions, and design and build their own test-rig. Students attend technical seminars and learn to interact with speakers and at the end of the semester; they are required to present a seminar on the project status, progress and future work.

2-Overall aims of the course.

- Introduce critical thinking and scientific methodology in problem solving.
- Focusing on problem objective, make wide review of previous art, evaluate and compare previous solutions.
- Train students to design and simulate a new Mechatronics system.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Knowledge of the details and practices of critical thinking and brain storming.

- a2. Define and defend the society need of project idea based on search and statistics locally and internationally.
- a3. Apply the mechatronics design approach and elements to the design of new project system.
- a4. Know different previous and possible solutions to solve the project needs.
- a5. Describe the control algorithm for the operation of new mechatronics project.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Analyse the different computing devices and architectures.
- b2. Calculate the suitable motor size in terms of speed and torque for a given application.
- b3. Select the proper actuators and sensors in the project.
- b4. Analyse the results of simulation models for the project mechanical, electrical, and control systems.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Use the suitable hardware components and software for implementing a mechatronics system.
- c2. Make decision for component or process selection based on rich information from searching the internet.
- c3. Ability to program computing device such as arduino or Rasberry Pi for mechatronics project.
- c4. Prepare a technical presentation report for a given task.
- c5. Prepare technical report and poster describing project details.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work in stressful environment and within constraints of time and resources.
- d2. Work inside a team.
- d3. Effectively manage tasks, time, and resources.
- d4. Search for information and engage in life-long self-learning discipline through answering the list of questions arising during brain storming sessions.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1	Critical thinking and brain storming practices	0	4	0
2	Mechatronics design process	0	4	0
3	Defining the need of society to project	0	8	0
4	Feasibility study of the product from project	0	8	0
5	Literature survey of previous work (brain storming)	0	8	0
6	Alternative solution evaluation	0	8	0
7	Communication skill fundamentals (Report preparation)	0	8	0
8	Preparation of presentation and poster design	0	8	0
9	Rehearsal on presentation skills	0	4	0
Total			60	

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Progress Report	5 th - 6 th week	10
	2 nd	Progress Report	10 th -11 th week	10
Participation and presentations		Reports, follow up during	Weekly	15
Oral Exam		Presentations and questions with exam committee	16-17 th week	25
Final Exam		Written Report	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

- Text Book:
MIT Guide for Science and Engineering Communication, Zimmerman and Paradise, MIT press. Second edition.
- Lecture notes on the course Moodle page, FUE website.
- Recommended Readings:
Critical Thinking and Innovation
Mechatronics Handbook.

9-Facilities required for teaching and learning:

- White board
- Data show for presentation
- Workshop for mechanical operations
- Workshop for electronics project circuit building and testing, including digital multi-meter, oscilloscope and electronics components and motors, arduino or raspberry boards, micro controllers.

Course coordinator: Prof. M.Abdelrashid

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Prof. M.Abdlatif

MKT 500: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs																		
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	c4	c5	d1	d2	d3	d4	
A03	Techniques of engineering graphical representations including computer aided drafting.		X											X						
A04	Topics related to humanitarian interests, moral issues, respect for diversity and general knowledge from other disciplines.	X																		
A05	Basics of information and communication technology (ICT).	X												X						
A06	Basics of English technical language.		X		X									X						
A07	Fundamentals of technical report writing considering one of the standard format.													X						
A08	Characteristics of engineering materials including material structure and properties.						X													
A09	Principles of design including elements design, process and/or a system related to Mechatronics.			X			X							X						
A11	Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.		X								X									
A13	Current engineering technologies as related to Mechatronics including modern techniques in sensors, actuators, control units and their interfaces.		X							X				X						
A14	Professional ethics and impacts of engineering solutions on society and environment		X								X									
A15	The contemporary engineering topics.	X																		
A21	Fundamentals of problem identification, formulation and solution in the inter-disciplinary fields of Mechatronics		X								X									
A22	The principles of sustainable design and development		X																X	
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.				X						X								X	

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs																		
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	c4	c5	d1	d2	d3	d4	
1	Interactive Lecturing	X	X																	
2	Problem solving	X	X	X		X	X	X	X							X				
3	Discussion (Brain storming)	X	X	X	X		X	X												
4	Experiential learning				X					X		X	X	X	X		X			
5	Project		X		X		X				X	X		X				X		X
6	Collaborative Research	X			X			X	X	X	X	X	X	X	X					X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs															Σ				
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	c4	c5	d1		d2	d3	d4	
1	Reports	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	25
2	Technical contribution and Participation				X		X		X			X	X								25
3	Oral Presentation	X	X			X		X					X				X				25
4	Discussion	X			X			X			X	X					X		X		25
5	Over all %	5	5	5	5	4	5	5	5	5	5	5	15	11	5	5	5	5	5	5	100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MKT 501: Graduation project II

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Five
Date of specification approval:	November 2017

A- Basic Information

Title:	Graduation Project II	Code:	MKT501
Credit Hrs:	4	Lect.:	0
		Tut. /Lab:	4
Prerequisite:	MKT500		

B- Professional Information

1-Catalog Course Description

Capstone Design: Participating students continue the work on the topic selected in MKT 500. Students are required to present their findings at the end of the project in the form of a seminar as well as a written formal report. Capstone Projects are intended to be intensive, active learning projects, requiring significant effort in the planning and implementation, as well as preparation of a substantial final written work product. Students should utilize faculty resources and seek consultations from faculty expertise to get a clear answer about what the project will entail and how it will be implemented.

2-Overall aims of the course

- Build and test the mechatronics project designed in MKT500 course.
- Learn how to write technical report summarizing their results.
- Learn how to make presentation for technical work and make a poster.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding

By the end of this course the student should be able to:

- a1. Apply the mechatronics design approach and elements to the design of new project system.
- a2. Know different previous solutions to solve the project needs.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Select the proper actuators and sensors in the project.
- b2. Analyse the results of experiments based on evaluation metrics.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Ability to program computing device such as arduino, Rasberry Pi, or other computing device for mechatronics project.
- c2. Prepare a technical presentation report for a given task.
- c3. Prepare technical report and poster describing project details.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work in stressful environment and within constraints of time and resources.
- d2. Work inside a team.
- d3. Search for information and engage in life-long self-learning discipline.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1	Alternative solution evaluation	0	4	0
2	Decision for a solution	0	4	0
3	Implementing the selected solution	0	8	0
4	Troubleshooting and modifications	0	8	0
5	Assembly and testing for device / system / process	0	8	0
6	Experimentation/ evaluation/ comparison	0	8	0
7	Communication skill fundamentals (Report preparation)	0	8	0
8	Preparation of presentation and poster design	0	8	0
9	Rehearsal on presentation skills	0	4	0
Total			60	

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Progress Report	5 th - 6 th week	10
	2 nd	Progress Report	10 th -11 th week	10
Participation and presentations		Reports, follow up during	Weekly	15
Oral Exam		Presentations and questions with exam committee	16-17 th week	25
Final Exam		Written Report	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
MIT Guide for Science and Engineering Communication, Zimmerman and Paradise, MIT press. Second edition.
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
Critical Thinking and Innovation
Mechatronics Handbook.

9-Facilities required for teaching and learning:

- White board
- Data show for presentation
- Workshop for mechanical operations
- Workshop for electronics project circuit building and testing, including digital multi-meter, oscilloscope and electronics components and motors, arduino or raspberry boards, micro controllers.

Course coordinator: Prof. Mahmoud Abdel Rashid.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MKT 501: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs										
		a1	a2	b1	b2	c1	c2	c3	d1	d2	d3	
A06	Basics of English technical language.						X	X				
A07	Fundamentals of technical report writing considering one of the standard format.							X				
A14	Professional ethics and impacts of engineering solutions on society and environment								X	X		
A15	The contemporary engineering topics.	X	X									
A22	The principles of sustainable design and development		X						X			X
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.			X		X						
B11	Incorporate economic, societal, environmental dimensions and risk management in design.	X	X									
B13	Create systematic and methodic approaches when dealing with new and advanced technology.			X		X						
B18	Identify at an appropriate level the design, production, interfacing and software needs of different parts of Mechatronics systems.	X			X	X						
B19	Create solutions to mechatronics systems especially to manufacturing, maintenance and interfacing problems in a creative way, taking account of industrial and commercial constraints.			X		X						X
C02	Construct engineering graphics to visualize various engineering applications including computer aided drafting.	X					X	X				
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.	X										
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs.	X		X							X	
C16	Apply the principles of sustainable design and development;	X										
D01	Collaborate effectively within multidisciplinary team						X	X	X	X		
D02	Work in stressful environment and within constraints								X			
D03	Communicate effectively						X	X		X		
D04	Demonstrate efficient IT capabilities						X	X				X
D05	Lead and motivate individuals								X	X		
D06	Effectively manage tasks, time, and resources								X			
D07	Search for information and engage in life-long self-learning discipline		X									X
D08	Acquire entrepreneurial skills	X	X									X
D09	Refer to relevant literatures		X					X				

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs											
		a1	a2	b1	b2	c1	c2	c3	d1	d2	d3		
1	Alternative solution evaluation	X											
2	Decision for a solution			X	X								
3	Implementing the selected solution			X	X	X							
4	Troubleshooting and modifications	X				X							X
5	Assembly and testing for device / system / process			X	X				X				
6	Experimentation/ evaluation/ comparison				X	X							
7	Communication skill fundamentals (Report preparation)								X	X			
8	Preparation of presentation and poster design								X	X			
9	Rehearsal on presentation skills								X	X			

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs											
		a1	a2	b1	b2	c1	c2	c3	d1	d2	d3		
1	Interactive Lecturing	X					X	X					
2	Problem solving	X				X	X	X					X
3	Discussion (Brain storming)	X	X	X		X	X	X					
4	Experiential learning					X	X	X					X
5	Project		X		X		X	X					
6	Collaborative Research		X				X	X					X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs										Σ		
		a1	a2	b1	b2	c1	c2	c3	d1	d2	d3			
1	Reports		X		X	X		X				X		25
2	Technical contribution and Participation	X	X	X	X	X						X		25
3	Oral Presentation							X						25
4	Discussion	X		X	X	X						X		25
5	Over all %													100



Fall 2017

Course Specifications

MPR 355: Thermal Power Systems

Program at which the course is given:	Mechatronics engineering Program
Major or minor element of program:	N.A.
Department offering the course:	Mechanical engineering department
Academic year/ Level :	3rd level / Fifth term
Date of specification approval :	Nov. 2017

A- Basic Information

Title: Thermal Power Systems	Code: MPR 355
Credit Hours: 3	Lectures: 2
Tutorials: 2	Total:4
Prerequisite Course(s): Thermodynamics MPR 251	
Instructor: Prof. Dr. Mohamed Rafat Okelah	
	E-mail: mraafat@fue.edu.eg, drrafat2@yahoo.com

B- Professional Information

1. Catalogue Description:

Basic characteristics, analysis and performance of different types of engines and thermal power systems, including: steam power, combined cycles, petrol engines, diesel engines, gas turbines and jet engines. Latest developments in automotive engines technology.

2. Overall aims of course:

By the end of the course the students will be able to:

- 1) Understand fundamentals of Thermal Power Systems
- 2) Apply the fundamental principles of Thermodynamics and Fluid Mechanics
- 3) Explore the fundamental principles of Heat Engines through analysis and experimentation
- 4) Develop skills for analyzing engines data and working in teams
- 5) Share ideas and work in a team.

3. Intended learning outcomes (ILOs)

a- Knowledge and understanding:

- a1. Identify principles in the field of design of fluid flow, thermodynamics, gas dynamics, turbo- machinery, heat transfer engineering and fundamentals of thermal and fluid processes
- a2. Describe conceptual and detailed design of fluid power systems.
- a3. Explain the constraints which mechanical power engineers have to judge to reach at an optimum solution for thermal power systems.
- a4. Describe basic types of internal combustion engines and vapor power plants.

b- Intellectual Skills:

- b1. Derive different solution alternatives for the engineering problems in thermal power systems, and evaluate different power losses.
- b2. Analyze the performance of the basic types of internal combustion engines and vapor power plants.
- b3. Demonstrate creative thinking.

c- Professional and practical skills:

- c1. Classify different types of internal combustion engines based on different criteria.
- c2. Connect engine performance to design parameters, fuels and environmental conditions.

d- General and transferable skills:

- d1. Write reports in accordance with the standard scientific guidelines.
- d2. Use digital libraries and/or Learning systems and demonstrate efficient IT capabilities.

4. Course contents:

No	Topic	Lecture	Tutorial	Labs	Total
1	Revision of Basic Principles of Thermodynamics (Definitions, Concepts, Fluid Properties Fundamental Laws)	4	4		8
2	Ideal Air and Gas Power Cycles(Otto Cycle – Petrol Engine)	2	2		4
3	Ideal Air and Gas Power Cycles(Diesel Engine, Brayton Cycles-Gas Turbine)	4	4		8
4	Vapor Power Cycles (Basic Rankine and Superheat Cycles) + Mid-term Examination 1	4	4		8
5	Improving Efficiency of Vapor Power Cycles (Reheat, Regeneration and Co-generation)	2	2		4
6	Improving Efficiency of Vapor Power Cycles (Combined and Binary Cycles)	2	2		4
7	Actual Cycles, Reheat, Regeneration	4	4		8
8	Gas Turbines and Jet Propulsion Systems (Jet Propulsion, Modifications to Turbojet Engines, Ramjets) + Mid-term Examination 2	4	4		8
9	Operating Characteristics of Reciprocating Engines(Engine Parameters, Efficiencies, Emissions and Noise)	4	4		8
Total		30	30		60

5. Teaching and learning methods

- 5.1- Interactive Lecture
- 5.2- Problem based learning
- 5.3- Discussion
- 5.4- Experimental learning
- 5.5- Project based learning
- 5.6- Search

6. Assessment schedule:

Assessment method	No	Description	Week No	Weight (%)
General Performance	1	Participation + Reports	Week 14	10
1st -Mid-term evaluation	2	Written Exam + Assignments + Quizzes	Week 6	25
2 nd -Mid-term evaluation	3	Written Exam + Assignments + Quizzes	Week 11	25
Final examination	5	Written Exam	Week 16	40
				100 %

7. List of references:

7.1 Essential references (textbooks)

- 1- "Thermodynamics an Engineering Approach", Seven Edition, By: Yunus Cengel and Michael A. Boles, Mc Graw Hill
- 2- "Engineering Fundamentals of the Internal Combustion Engin", Second Edition, By: Willard W. Pulkrabek, Pearson Prentice Hall

7.2 Recommended books (references)

8. Facilities required for teaching and learning Computers

- Teaching Aids (Presentation board and data show)

Course coordinator: Prof. Mohammed Raafat Okeilah

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Prof. Mohammed Raafat Okeilah

Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

		Course ILOs												
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2		
Program ILOs Course ILOs														
A01	Concepts and theories of mathematics including differential and integral calculus, algebra, analytical geometry, probability and statistics, and numerical analysis.	✓	✓											
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	✓	✓											
A10	Methodologies of solving engineering problems, data collection and interpretation			✓										
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design vibration analysis, fluid and fluid power control, in addition to energy systems.			✓	✓									
B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems.					✓								
B02	Select appropriate solutions for engineering problems based on analytical thinking.							✓						
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.							✓						
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.									✓				
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.									✓				
C13	Prepare and present technical reports.									✓				
C14	Compete, in-depth, in at least one engineering discipline, namely: mechanics, electronics or interfacing and software;										✓			
D3	Communicate effectively											✓		
D6	Effectively manage tasks, time, and resources												✓	
D7	Search for information and engage in life-long self-learning discipline													✓

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs												
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2		
1	Revision of Basic Principles of Thermodynamics (Definitions, Concepts, Fluid Properties Fundamental Laws)	✓	✓											
2	Ideal Air and Gas Power Cycles(Otto Cycle – Petrol Engine)			✓	✓									
3	Ideal Air and Gas Power Cycles(Diesel Engine, Brayton Cycles-Gas Turbine)			✓	✓							✓		
4	Vapor Power Cycles (Basic Rankine and Superheat Cycles) + Mid-term Examination 1			✓	✓							✓		
5	Improving Efficiency of Vapor Power Cycles (Reheat, Regeneration and Co-generation)		✓			✓						✓		
6	Improving Efficiency of Vapor Power Cycles (Combined and Binary Cycles)		✓			✓						✓		
7	Actual Cycles, Reheat, Regeneration												✓	
8	Gas Turbines and Jet Propulsion Systems (Jet Propulsion, Modifications to Turbojet Engines, Ramjets) + Mid-term Examination 2				✓	✓						✓		✓
9	Operating Characteristics of Reciprocating Engines(Engine Parameters, Efficiencies, Emissions and Noise)				✓	✓								✓

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs												
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2		
1	Interactive Lecture	✓	✓	✓	✓	✓	✓							
2	Problem based learning					✓	✓	✓				✓		✓
3	Discussion			✓				✓				✓		✓
4	Experimental learning											✓		✓
5	Project based learning			✓				✓				✓		✓
6	Research							✓	✓			✓		✓

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs												Σ
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2		
1	Assignments and Search Reports	✓	✓	✓	✓	✓	✓						✓	
2	Participation (L, T, &Lab)			✓	✓	✓								
3	Oral& Practical exams					✓				✓				
4	Written Exams (QZs + MIDTERMS + FINAL).			✓	✓	✓								
5	Over all %													100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MPR 456: Heat Transfer

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Heat Transfer	Code:	MPR 456
Credit Hrs: 3	Lect.: 2	Tut. /Lab:	2
Prerequisite:MPR251			

B- Professional Information

1-Catalog Course Description.

Mechanisms of heat transfer, steady and transient conduction, forced and natural convection, radiation. Thermal resistance characteristics of materials, thermal networks and heat generation. Types and analysis of heat exchangers.

2-Overall aims of the course.

By the end of the course the students will be able to:

- Demonstrate knowledge of heat transfer definitions and terminology, including heat flux, thermal conductivity and heat transfer coefficients.
- Acquire the fundamentals of heat exchangers including their different types and their operating performance.
- Demonstrate knowledge of conduction and equivalent resistance formulae, convection and the use of overall heat transfer coefficient,
- Perform experiments related to heat and mass transfer, analyze the results and present them in a professional report.
- Share ideas and work in a team in an efficient and effective manner.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Identify heat transfer definitions and terminology.
- a2. Explain principles of heat transfer by conduction.
- a3. Describe the mechanism of heat transfer by convection.
- a4. Describe the mechanism of heat transfer by radiation.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Predict temperature distribution in composite solid walls.
- b2. Predict temperature distribution and heat transfer from fins.
- b3. Compute heat transfer coefficient for natural and forced convection.
- b4. Analyze performance of heat exchangers.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Design of heat exchangers.
- c2. Validate heat transfer equations through lab experiments.
- c3. Solve equations of unsteady heat transfer processes.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Write reports in accordance with standard scientific guide lines.
- d2. Work efficiently within a team.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1	Mechanisms of heat transfer	6	6	
2	Steady and transient conduction	8	6	
3	Natural convection.	2	2	2
4	Forced convection	2	2	2
5	Radiation heat transfer.	2	2	
6	Thermal resistance characteristics of materials.	4	2	
7	Types and analysis of heat exchangers	6	4	2
Total		30	24	6

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	20
	2 nd	Written Exam	10 th -11 th week	20
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	20
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
2. **Fundamentals of Thermal-Fluid Sciences, Yunus A. Cengel et. al., Third Edition, McGraw-Hill, New York, USA, 2017.**
3. Lecture notes on the course Moodle page, FUE website.
4. Recommended Readings:
Heat and Mass Transfer: A Practical Approach. , Yunus A. Cengel3rd. New York: McGraw-Hill, 2007.

9-Facilities required for teaching and learning:

- Thermo-fluid Lab.
- Lecture hall equipped by board and projector
- MOODLE Code.
- Text book.

Course coordinator: Prof. Mahmoud Abdel Rashid.

Head of Department: Prof. Yehia Hendawy.

Date: November - 2017

MPR 456: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs												
	a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1	d2
A01	X	X	X	X									
B01					X		X						
B03					X	X		X					
C01									X				
C03										X	X		
D3												X	X
D7												X	

Table [2] : Course Content/ ILOs Matrix

#	Topics													
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1	d2
1	Mechanisms of heat transfer	X	X	X	X									
2	Steady and transient conduction		X			X	X					X		
3	Natural convection.			X			X	X						
4	Forced convection			X				X			X			
5	Radiation heat transfer.				X									
6	Thermal resistance characteristics of materials.	X	X	X	X									
7	Types and analysis of heat exchangers							X	X				X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method													
		a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	
1	Interactive Lecturing	X	X	X	X	X	X	X						
2	Experiential learning											X	X	
3	Problem solving	X	X	X	X	X	X	X	X	X	X	X	X	X

Table [4]: Assessment method / ILOs Matrix

Method	a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	d1	d2
	1 Written exams : Quiz1	X	X	X	X								X
2 Laboratory reports : Conduction report										X			X
3 Written exams : Quiz2		X	X	X	X								
4 Laboratory reports : Convection report										X	X	X	X
5 Written exams : Quiz3					X	X	X	X					
6 Laboratory reports : Heat exchangers report									X	X	X	X	X
8 Oral exams : Oral exam	X		X	X	X	X	X	X					
9 Final exam : Final exam	X	X	X	X	X	X	X	X			X		



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MPR 459: Fluid systems control

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Fluid systems control	Code:	MPR 459
Credit Hrs:	3	Lect.:	2
Prerequisite:	MPR 252 :Fluid Mechanics	Tut. /Lab:	2

B- Professional Information

1-Catalog Course Description.

Basic characteristics, analysis and design of hydraulic and pneumatic Systems; Control devices; Directional, pressure and flow control valves; Motion control: pneumatic, hydraulic and electro-mechanical actuation systems; Pneumatic and hydraulic motors; Pneumatics and electro-pneumatics circuits; Fans and compressors; Power transmission and power amplification Sequence diagram; Applied circuits for direct and indirect control.

2-Overall aims of the course.

This course aims to:

- Enrich the student's basic theoretical knowledge about the pneumatic and hydraulic control systems.
- Train students to build a sequential control system based on pneumatic and hydraulic components.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By completing this course successfully, the student will be able to:

- a1. Describe different components of pneumatic and hydraulic systems.
- a2. Select the appropriate components for a specific control operation.
- a3. Explain the sequence of operations according to the sequence diagram.
- a4. Identify different electro-pneumatic components.

b- Intellectual skills.

By completing this course successfully, the student will be able to:

- b1. Evaluate the performance of different types of pump used in hydraulic systems.
- b2. Analyze various sequential control circuits according to the sequence diagram using the available software.
- b3. Develop the ladder diagram of the PLC for a certain application.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Construct the hydraulic and pneumatic circuits for a certain application.
- c2. Analyze the motion of the actuating cylinders during the experiments of sequential control applications.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work coherently and successfully as a part of a team in assignments.
- d2. Write reports in accordance with the standard scientific guidelines.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

No	Topics	Lec.	Tut	Lab
1	Introduction to hydraulics and pneumatics: essential components for both circuits	2	1	1
2	Actuating cylinders	2	0	0
3	Directional valves	6	2	1
4	Pressure control valves	3	0	1
5	Flow control valves	3	0	1
6	Memory and delay circuits	2	2	2
7	Sequence diagram	3	2	0
8	Applications to mechanical circuits	12	4	5
9	Electro-pneumatics	3	0	0
10	Applications to mechanical and electrical circuits	9	4	4
Total		45	15	15

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Practical Exam	10 th -11 th week	15
Assignments, Participation		Progress marks for Tutorial	Weekly	10
		Progress marks for Lab experiments	Weekly	10
Quizzes		Written and practical	Twice a term	10
Final Exam		Written	16 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

- Text Book:
Andrew Parr “*Hydraulics and Pneumatics A technician's and engineer's guide*”, Butterworth-Heinemann, Second editions, 2006.
- Lecture notes on the course.
- Recommended Readings:
Bolton, W; “*Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering*”, Pearson; 6 edition, 2016.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations.
- Pneumatic and hydraulic Lab.

Course coordinator: Prof. Yehia Hendawy

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Prof. Abdelaziz Morgan

MPR 459: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs											
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2	
A9	Principles of Design including elements design, process and/or a system related to Mechatronics.		X										
A13	Current engineering technologies as related to Mechatronics, including modern techniques in sensors, actuators, control units and their interfaces.	X											
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design vibration analysis, fluid and fluid power control, in addition to energy systems.			X	X								
B6	Assess and evaluate the characteristics and performance of components, systems and processes related to Mechatronics including mechanical systems, sensors, interfacing, controllers and actuators.					X	X						
B18	Identify at an appropriate level the design, production, interfacing & software needs of different parts of Mechatronics systems.							X					
C1	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyse and interpret results.									X			
C7	Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.								X				
D2	Work in stressful environment and within constraints											X	
D6	Effectively manage tasks, time, and resources.												X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs												
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2		
1	Introduction to hydraulics and pneumatics: essential components for both circuits	X												
2	Pumps and compressors					X								
3	Actuating cylinders	X												
4	Directional valves	X	X											
5	Pressure control valves	X												
6	Flow control valves	X	X											
7	Memory and delay circuits													
8	Sequence diagram			X					X					
9	Applications to mechanical circuits			X					X		X		X	X
10	Electro-pneumatics				X									
11	Applications to mechanical and electrical circuits									X	X	X	X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs											
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2	
1	Interactive Lecturing	X	X	X	X	X	X	X	X	X			
2	Problem solving	X	X			X	X	X	X	X			
3	Experiential learning		X		X		X		X	X	X	X	X

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs												Σ	%	
		a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2				
1	Assignments	X	X			X	X	X	X	X						10
2	Participation (L, T, &Lab)		X				X	X	X	X	X		X			5
3	Practical exams								X	X	X			X		5
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X	X	X					80
5	Over all %	8	5	5	3	5	40	15	10	5	1	3				100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MPR 555: Energy Conversion Systems

Program on which the course is given:	Mechatronics Engineering program
Major or minor element of programmes:	N.A.
Department offering the programme:	Mechanical Engineering Department
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Five
Date of specification approval:	November 2017

A- Basic Information

Title:	Energy Conversion	Code:	MPR 555
Credit Hrs:	3	Lect.: 2	Tut. /Lab: 2
Prerequisite:	Code : MPR 355		
Instructor:	Prof. Dr. Mohamed Rafat Okelah E-mail: mraafat@fue.edu.eg, drarafat2@yahoo.com		

B- Professional Information

1-Catalog Course Description.

Mechanical energy conversion systems: types characteristics and analysis. Conventional and renewable energy systems, nuclear power, solar power generation, wind power, fuel cells. Performance of power plants. Latest developments and future potential.

2-Overall aims of the course.

By the end of the course the students will be able to:

- 1) Understand energy resources, crises and future.
- 2) Apply fundamentals principles of Mechanical energy generation systems.
- 3) Develop skills for analyzing energy conversion systems.
- 4) Explore the fundamentals of energy conversion using Renewable sources.
- 5) Share ideas and search for novel ideas and solutions.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Identify basic parameters and engineering principles governing energy conversion processes.
- a2. Recognize performance concerns of mechanical components, in the field of power producing systems.
- a3. Identify principles in the field of fluid flow, thermodynamics, gas dynamics, turbo- machinery, heat transfer engineering and fundamentals of thermal and fluid processes.
- a4. Describe most success full and promising conventional and renewable energy conversion systems.
- a5. Demonstrate knowledge of basic components of conventional energy conversion systems and related engineering contemporary issues.
- a6. Identify engineering economy, legislation, business and management techniques and practices appropriate to energy conversion systems.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Evaluate designs, processes, and performance of energy conversion systems and propose improvements.
- b2. Derive different solution alternatives for the engineering problems of conventional and renewable energy systems, analyze, interpret data and evaluate the power losses in these systems.
- b3. Analyze the performance of the basic types of thermal power systems, hydraulic systems and renewable power systems. Analyze the solution alternatives and choose the optimum one.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Use laboratory, workshop equipment and field devices competently and safely.
- c2. Analyze the record data in the laboratory.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Collaborate effectively within multidisciplinary team.
- d2. Share ideas, communicate effectively and work in stressful environment and within constraints.
- d3. Share and motivate individuals and work with others according to the rules of the professional Ethics.
- d4. Use digital libraries and/or Learning systems and demonstrate efficient IT capabilities.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

No.	Topics	Lec.	Tut	Lab	Total
1	Introduction and course outlines	2	2		4
2	Conventional energy conversion systems-I	4	4		8
3	Nuclear energy conversion systems	2	2		4
4	Hydro energy conversion systems-IV : +Mid-term Examination	4	4		8
5	Renewable energy conversion systems-I : Wind Turbines	2	2		4
6	Renewable energy conversion systems-II : Tidal & Wave	2	2		4
7	Renewable energy conversion-III : OTEC and Geothermal	2	2		4
8	Solar thermal-non concentrating systems	2	4		6
9	Solar thermal-concentrating systems	2	4		6
10	Solar Photovoltaic energy conversion	2	2		4
11	Term Research presentation	2			2
12	Energy storage systems, Bio mass and fuel cells	4	2		6
Total		30	30	0	60

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools	Assessment Method	Time Schedule	%
1 st Midterm Exam	Written Exam	5 th - 6 th week	15
Assignments and Participation.	Reports, follow up during tut. /lab work.	Weekly	10
Quizzes	Follow up during the course & written exam.	3 rd week 13 th week	5 5
Report & Presentation	Oral + Discussion	12 th week	15
Performance	Activities, participation and discipline	15 th week	10
Final Exam	Written	16 th - 17 th week.	40
Total			100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Energy Conversion, D.Yogi Goswami and Frank Kreith, CRC press, 2008
2. Lecture notes on the course Moodle page, FUE website.

9-Facilities required for teaching and learning:

Teaching Aids (Presentation board and data show)

Course coordinator: Prof. Mohamed Rafat Okelah
Head of Department: Prof. Yehia Hendawy
Date: November 2017
Course Instructor:

Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs															
		a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	d1	d2	d3	d4	
A01	Concepts and theories of mathematics including differential and integral calculus, algebra, analytical geometry, probability and statistics, and numerical analysis.	✓															
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	✓															
A07	Fundamentals of technical report writing considering one of the standard format.		✓														
A10	Methodologies of solving engineering problems, data collection and interpretation			✓		✓											
B03	Select appropriate solutions for engineering problems based on analytical thinking.							✓									
B04	Think in a creative and innovative way in problem solving and design.								✓								
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.									✓							
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.									✓							
B11	Incorporate economic, societal, environmental dimensions and risk management in design.									✓							
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.											✓					
C13	Prepare and present technical reports.											✓					
C14	Compete, in-depth, in at least one engineering discipline, namely: mechanics, electronics or interfacing and software;											✓					
C15	Utilize practical systems approach for design and performance evaluation;											✓					
D3	Communicate effectively													✓			
D6	Effectively manage tasks, time, and resources												✓				✓
D7	Search for information and engage in life-long self-learning discipline																✓
D9	Refer to relevant literatures													✓			✓

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs															
		a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	d1	d2	d3	d4	
1	Introduction and course outlines	✓	✓														
2	Conventional energy conversion systems-I		✓	✓			✓	✓									
3	Nuclear energy conversion systems				✓	✓									✓		
4	Hydro energy conversion systems-IV : +Mid-term Examination			✓		✓		✓	✓	✓		✓		✓			
5	Renewable energy conversion systems-I : Wind Turbines			✓		✓		✓	✓	✓		✓		✓			
6	Renewable energy conversion systems-II : Tidal & Wave			✓		✓			✓					✓			
7	Renewable energy conversion-III : OTEC and Geothermal		✓		✓			✓		✓							
8	Solar thermal-non concentrating systems		✓		✓			✓		✓							
9	Solar thermal-concentrating systems		✓		✓			✓		✓							
10	Solar Photovoltaic energy conversion			✓									✓				
11	Term Research presentation						✓						✓			✓	
12	Energy storage systems, Bio mass and fuel cells						✓				✓						✓

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs															
		a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	d1	d2	d3	d4	
1	Interactive Lecture	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Problem based learning			✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	Discussion										✓			✓			
4	Experimental learning																✓
5	Project based learning									✓	✓	✓	✓	✓	✓	✓	✓
6	Search				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs													Σ			
		a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	d1	d2		d3	d4	
1	Assignments			✓	✓	✓	✓					✓	✓				✓	
2	Participation (L, T, &Lab)			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	Oral& Practical exams																	
4	Written Exams (QZs + MIDTERMS + FINAL).	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	Over all %																	100



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Department Electives



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MAN 547: Reverse Engineering in Mechanical Design

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Five
Date of specification approval:	November 2017

A- Basic Information

Title:	Reverse Engineering in Mechanical Design	Code:	MAN 547		
Credit Hrs:	2	Lect.:	2	Tut. /Lab:	1
Prerequisite:	MAN 341				

B- Professional Information

1-Catalog Course Description

Effect of reversing engineering in mechanical design, Reversed engineering Process, Contact and non-contact 3-D scanning, Procedure for geometric modeling, Fitting of standard and free form surfaces, Identification of other design parameters, Transfer of geometric data to CAD/CAM systems.

2-Overall aims of the course.

- Develop the ability to select the correct techniques for reverse engineering a part.
- Develop the ability to select the correct method to rapid prototype a part.
- Enrich the understanding of the different techniques for each of the reverse engineering phases.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course, the student should be able to:

- a1.Explain the reasoning behind reverse engineering.
- a2.Differentiate between reverse engineering and rapid prototyping.
- a3.Explain the physics behind contact and non-contact scanners.

- a4. Describe the different phases of a reverse engineering process
- a5. Identify the different hardware and software required for reverse engineering
- a6. Identify the current technologies and materials used for rapid prototyping.

b- Intellectual skills.

By the end of this course, the student should be able to:

- b1. Solve a reverse engineering problem of a part or assembly based on limited information.
- b2. Divide the reverse engineering problem of any product into several process steps.
- b3. Select the appropriate technique for each reverse engineering process of any product.
- b4. Select the proper rapid prototyping method for any product.

c- Professional and practical skills:

By the end of this course, the student should be able to:

- c1. Generate the point cloud of a physical part.
- c2. Utilize computer aided drafting software to develop the digitized drawing of a physical product from a generated point cloud.
- c3. Select the proper reverse engineering process flow for different products
- c4. Prepare and present a project technical report.

d- General and transferable skills:

By the end of this course, the student should be able to:

- d1. Work in a group project
- d2. Submit on time assignments and project.
- d3. Conduct appropriately course project presentation using power point.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut
1	Introduction to Reverse Engineering	2	2
2	Spline Interpolation Linear Quadratic Cubic	2	2

3	Methodologies and Techniques for Reverse Engineering Computer-aided Reverse Engineering Computer Vision and Reverse Engineering Structured-light Range Imaging Scanner Pipeline	4	4
4	Reverse Engineering-Hardware and Software Introduction Reverse Engineering Hardware Reverse Engineering Software	4	4
5	Introduction to Rapid Prototyping The Basic Process Current Techniques and Materials Applications	4	4
6	Relationship between reverse engineering and rapid prototyping Introduction The adaptive slicing approach for cloud data modelling Planar Polygon curve construction for a layer Determination of adaptive layer thickness Application Examples	4	4
7	Reverse Engineering in the Automotive Industry Reverse engineering-Workflow for automotive body design Reverse Engineering for better quality Convergence of digital and physical worlds	2	2
8	Reverse Engineering in the Aerospace Industry RE in aerospace-A work in progress Reducing costs of hard tooling Digitizing a NASA space vehicle	2	2
9	Project Follow up	0	4
10	Midterm Exams	4	0
11	Project Presentations	2	2
Total hours		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Submitted Assignments, and in class Quizzes	Biweekly	10
Attendance and class participation		Lecture and tutorial attendance and class participation	Weekly	10
Project		Presentation & Technical Report	Proposal: 4 th week	10
			Due date: 14 th week	
Final Exam		Written	Examination Period	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
2. Raja V., and Fernandes, K.J., “Reverse Engineering: An Industrial Approach”, Springer-Verlag, latest edition.
3. Lecture notes on the course Moodle page, FUE website.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Dr. Badran.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MAN 547: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

#	Program ILO	Course ILOs																	
		a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	
A02	Concepts and theories of basic science including physics, mechanics and chemistry.			x		x													
A09	Principles of design including elements design, process and/or a system related to Mechatronics.			x															
A10	Methodologies of solving engineering problems, data collection and interpretation	x	x		x		x												
A15	The contemporary engineering topics.	x	x		x	x													
B03	Select appropriate solutions for engineering problems based on analytical thinking.						x	x	x	x									
B04	Think in a creative and innovative way in problem solving and design.						x	x	x	x									
B08	Solve engineering problems, often on the basis of limited and possibly contradicting information.						x				x								
C02	Construct engineering graphics to visualize various engineering applications including computer aided drafting.											x							
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs.										x	x	x						
C13	Prepare and present technical reports														x				
C15	Utilize practical systems approach for design and performance evaluation;										x	x	x						
D2	Work in stressful environment and within constraints															x	x	x	
D3	Communicate effectively															x			x
D4	Demonstrate efficient IT capabilities																		x
D6	Effectively manage tasks, time, and resources															x	x	x	

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs																		
		a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3		
1	Introduction to Reverse Engineering	x	X		x															
2	Spline Interpolation				X															
3	Methodologies and Techniques for Reverse Engineering				x															
4	Reverse Engineering-Hardware and Software			X	X	X														
5	Introduction to Rapid Prototyping					X														
6	Relationship between reverse engineering and rapid prototyping	X	X			X														
7	Reverse Engineering in the Automotive Industry	X	X		X	X														
8	Reverse Engineering in the Aerospace Industry	X	X		X	X														
10	Project Follow up							X	X	X	X	X	X	X	X	X	X	X	X	
11	Project Presentations																			x

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs																		
		a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3		
1	Interactive Lecturing	x	x	x	x	x														
2	Problem solving	x	x	x	x	x				x	x									
3	Project							x	x	x	x	x			x					x
4	Research							x	x	x	x	x			x					x

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs																			
		a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3			
1	Assignments			X	X		X														X
2	Attendance and Class Participation	X	X	X	X	X															
3	Written exams and quizzes	X	X	X	X	X		x	X	X	X				X						
4	Project Report							X	X	X	X	x	x	X	X	x	x	X	X		X
5	Project Presentation																				x

Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

Program ILOs Course ILOs		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3
A09	Principles of design including elements design, process and/or a system related to Mechatronics.	X															
A13	Current engineering technologies as related to Mechatronics including modern techniques in sensors, actuators, control units and their interfaces.		X														
A21	Fundamentals of problem identification, formulation and solution in the inter-disciplinary fields of Mechatronics				X												
B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems.								X								
B02	Develop and implement computer programs for engineering applications including programming of microprocessor based units.							X									
B04	Think in a creative and innovative way in problem solving and design.						X										
B06	Assess and evaluate the characteristics and performance of components, systems and processes related to Mechatronics including mechanical systems, sensors, interfacing, controllers, and actuators.								X								
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.						X			X							
B14	Analyze and design Mechanical systems considering modern techniques including modern CAD tools..									X							
B15	Analyze and design electrical and electronics including logic circuits, and microprocessor based systems.									X							
B16	Develop and apply the necessary software for controlling and interfacing of mechatronics systems.							X									
B18	Identify at an appropriate level the design, production, interfacing and software needs of different parts of Mechatronics systems.						X			X							
C04	Professionally merge the engineering knowledge, and feedback to improve design, products and/or services of Mechatronics systems.										X						
C05	Create and/or re-design a process, component or system, and carry out specialized engineering designs.											X					
C13	Prepare and present technical reports.												X				
D02	Work in stressful environment and within constraints													X			
D06	Effectively manage tasks, time and resources																X
D07	Search for information and engage in life-long self-learning discipline																X

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs																
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4	
1	Introduction	X																
2	Basics of CAD assembly and simulation		X				X	X			X							
3	Kinematics parameter			X	X										X			
4	Kinematics analysis using graphical and analytical methods						X											
5	Engineering simulation packages					X												
6	Mathematical simulation packages										X	X						
7	Validate Mathematical simulation with conventional methods			X								X	X	X			X	X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs																
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	C4	d1	d2	d3	
1	Interactive Lecturing	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
2	Problem solving						X	X	X	X	X			X				
3	Discussion	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
4	Experiential learning												X	X				
5	Project												X	X			X	X
6	Research		X	X	X	X												

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs															Σ		
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3		d4	%
1	Assignments	X	X	X	X	X	X	X	X	X	X	X	X						5
2	Participation (L, T, &Lab)						X	X	X	X	X	X	X						5
3	Oral& Practical exams												X	X	X	X	X	X	10
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	80
5	Over all %	5	5	5	5	5	15	15	15	15	3	6	1	1	1	1	2	100	



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017

Course Specifications
MAN 570: Mechanism CAD

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	December 2016

A- Basic Information

Title:	Mechanism CAD	Code:	MAN570		
Credit Hrs:	2	Lect.:	2	Tut. /Lab:	1
Prerequisite:	Code : name				

B- Professional Information

1-Catalog Course Description.

The course aims to acquire the essential knowledge and understanding of planner mechanism and its kinematic analysis using computer simulation software and validate the results with conventional analytical and graphical methods

2-Overall aims of the course.

The course aims to acquire the essential knowledge and understanding for the common CNC machines programming and using CAD/CAM packages:

- Basics of planner mechanisms,
- Graphical method for kinematic analysis,
- Analytical method for kinematic analysis,
- Simulation software.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course, the student should be able to:

- a1. Demonstrate the basic elements of planner mechanisms
- a2. Classify the different joints and kinematic pairs.
- a3. Identify the degrees of freedom and the category of common mechanisms

- a4. Collect data to simplify and manually analyses planner mechanisms
- a5. Use basic Science and simulation packages to analyses planner mechanisms

b- Intellectual skills.

By the end of this course, the student should be able to:

- b1. Use analytical methods to find kinematic parameters of mechanisms
- b2. Select suitable graphical approach to find kinematic parameters of mechanisms
- b3. Use simulation packages to solve planner mechanisms
- b4. Solve planner mechanisms in all possible configurations

c- Professional and practical skills:

By the end of this course, the student should be able to:

- c1. Apply graphical and analytical solutions for any planner mechanisms
- c2. Select suitable method to solve mechanisms and find kinematic parameters
- c3. Create assembly on simulation packages to run mechanisms
- c4. Apply analyses using commercial software

d- General and transferable skills:

By the end of this course, the student should be able to:

- d1. Communicate effectively.
- d2. Effectively manage tasks, time, and resources.
- d3. Acquire entrepreneurial skills.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1	Introduction	1	0	0
2	Basics of CAD assembly and simulation	1	1	0
3	Main types of kinematic pairs	2	0	0
4	Kinematics parameter definitions	1	2	0
5	Kinematics analysis using graphical methods	2	2	0
6	Kinematics analysis using analytical methods	1	1	0
7	Basics of CAD assembly	1	1	0
8	Defining kinematic pairs on SW	2	2	0
9	Engineering simulation packages	1	1	0

10	Validate SW with conventional methods	1	1	1
11	Mathematical simulation packages	1	1	2
12	Validate Mathematical simulation with conventional methods	1	1	2
Total		15	13	5

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	
	2 nd	Written Exam	10 th -11 th week	
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	
Final Exam		Written	16 th - 17 th week.	
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
GeoGebra manual and SolidWorks handbook
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
-----.

9-Facilities required for teaching and learning:

- SolidWorks Lab
- Data Show
- -----

Course coordinator: Prof. Yehia Hendawy.
Head of Department: Prof. Yehia Hendawy.
Date: Nov - 2017



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MKT 505: Sensors and Signal Conditioning

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Five
Date of specification approval:	Nov. 2017

A- Basic Information

Title:	Sensors and Signal Conditioning	Code:	MKT 505
Credit Hrs:	2	Lecture:	2
Prerequisite:	EPR 266	Tutorial /Lab:	1

B- Professional Information

1- Catalogue Course Description:

Analog Signal Conditioning, Digital Signal Conditioning, Temperature Sensors. Mechanical Sensors, Optical Sensors, Ultrasonic Sensors, Fiber Optic Sensors.

2- Overall aims of the course:

- Introduce sensors and transducers as main elements in Mechatronics systems.
- Enrich the student's basic knowledge about signal conditioning units to prepare signals to be suitable for next stage.
- Train students to calibrate, select, and use sensors in Mechatronics, systems.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Define sensors and transducers.

- a2. Explain the principals of different sensors including: position, speed, acceleration, force, flow, and thermal sensors.
- a3. Explain the principals of analog signal conditioning using operational amplifier circuits.
- a4. Describe the function of the different types of A/D & D/A converters.
- a5. Discuss the modern trends in sensors(fiber optics, mems and smart sensors.)

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Select suitable sensors based on function, performance characteristics, cost, and availability.
- b2. Select the suitable A/D and D/A converters.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Use sensors and signal conditioning in mechatronics systems.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Collaborate effectively within multidisciplinary team
- d2. Effectively manage tasks, time, and resources.
- d3. Search for information and engage in life-long self-learning discipline through self-learning assignments

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

#	Topics	Lecture	Tutorial/Lab
1	Introduction	2	1
2	Position & speed measurements	2	1
3	Stress and strain measurements	2	1
4	Temperature measurements	2	1
5	Vibration and Acceleration Measurement	2	1
6	Pressure and flow Measurements	2	1
7	Semiconductor sensors and Microelec- tromechanical devices.	4	2
8	Analog interfacing	5	3
9	Data Acquisition Systems	5	2
10	New trends.	4	2
Total		30	15

For the relationship between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Par- ticipation, & Quiz- zes		Reports, follow up during tut. /lab work, & written exam.	Weekly	20
Course Project		Follow up and Oral exam	Proposal 3 rd week	10
			Final exam 12 th week	
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:

- Alciatore, David G.& Hstand, Michael B.; “Introduction to Mechatronics and Measurement System”, McGraw Hill, Latest editions.
- Bolton, William; “Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering”; Prentice Hall, Latest editions

2. Lecture notes and videos on the course **Moodle** page, FUE website.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations
- Lab with sensors kits.

Course coordinator: Prof. Yehia Hendawy
Head of Department: Prof. Yehia Hendawy
Date: November - 2017

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs													
		a1	a2	a3	a4	a5	b1	b2	c1	d1	d2	d3			
A13	Current engineering technologies as related to Mechatronics including modern techniques in sensors, actuators, control units and their interfaces.	X													
A15	The contemporary engineering topics.					X									
A17	Basic science and engineering fundamentals in electrical and electronics including DC/AC circuits, electronic components, and logic circuits.			X	X										
A19	Fundamentals of electrical, electronic, and digital instrumentation and transducers.		X												
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.						X	X							
B16	Develop and apply the necessary software for controlling and interfacing of mechatronics systems.							X							
C14	Compete, in-depth, in at least one engineering discipline, namely: mechanics, electronics or interfacing and software;								X						
C15	Utilize practical systems approach for design and performance evaluation;								X						
D1	Collaborate effectively within multidisciplinary team									X					
D6	Effectively manage tasks, time, and resources											X			
D7	Search for information and engage in life-long self-learning discipline														X

Table [2] : Course Content/ ILOs Matrix

	Topics	Course ILOs													
		a1	a2	a3	a4	a5	b1	b2	c1	d1	d2	d3			
1	Introduction	X													
2	Position & speed measurements		X								X				
3	Stress and strain measurements		X								X				
4	Temperature measurements		X								X				
5	Vibration and Acceleration Measurement		X								X				
6	Pressure and flow Measurements		X								X				
7	Semiconductor sensors and Microelectromechanical devices.			X	X						X				
8	Analog interfacing			X	X						X				
9	Data Acquisition Systems				X						X				
10	New trends.									X					X
11	Course Project												X	X	

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs											
		a1	a2	a3	a4	a5	b1	b2	c1	d1	d2	d3	
1	Interactive Lecturing	X	X	X	X	X	X	X					
2	Brain Storming	X	X	X	X	X	X	X					
3	Discussion	X	X	X	X	X	X	X					
4	Experiential learning							X					
5	Project								X	X			X
6	Research	X	X	X	X	X	X	X					X

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs												Σ	
		a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	d1	d2		d3
1	Assignments	X	X	X	X	X	X	X	X	X	X	X	X	X	5
2	Participation (L, T, &Lab)	X	X	X	X	X	X	X	X	X	X	X	X	X	5
3	Oral& Practical exams									X	X	X	X	X	10
4	Written Exams (QZs + MIDTERMS + FINAL).	X	X	X	X	X	X	X							80
5	Over all %														100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018

Course Specifications

MKT 506 Micro Processor- Based Instrumentation

Program (s) on which the course is given:	Mechatronics Program
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Mechanical Engineering Department
Department offering the course:	Mechanical Engineering Department
Academic Level/Semester:	Level Five – 2 nd semester
Date of specification approval:	Nov. 2017

Catalogue Course Description:

Instruments and Instrumentation Systems (Instruments, Instrumentation of Large Systems, Automation). Digital Basic Instruments (Digital counters, A/D & D/A converters. Digital measuring instruments: digital multi-meters and frequency meters). Microprocessor-Based Instrumentation: (Hardware Architecture, Instruction set and programming, Peripheral Interfacing, Applications in Electro-Mechanical Systems (Case Studies), Networks and Communications in Instrumentation Systems.

Prerequisite Course: ELE 410: Introduction to Microprocessors
MPR 321: Measurements and Measuring Instruments

Course Instructor:

A- Basic Information

Title: Micro Processor- Based Instrumentation	Code: MKT 506
Credit Hours: 2 Hrs.	Lectures: 2 Hrs.
Tutorial/Lab: 1 Hrs.	Total: 3 Hrs.

B- Professional Information

1- Overall aims of the course:

- ✓ To be familiar with the difference between Instruments and Instrumentation Systems
- ✓ Develop the students' knowledge about Digital instruments.

- ✓ Develop students' practical skills for designing and building up a complete application circuit including microprocessors.
- ✓ To be familiar with the Networks and Communications used for data acquisition in Instrumentation Systems.

2- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Explain digital counters, frequency meters and digital multi-meters,
- a2. Outline the different components of Instrumentation Systems.
- a3. Recall the hardware and software requirements in dealing with microprocessor-based instrumentation.
- a4. Select the suitable interfaces for each application.
- a5. Select the suitable networks and communications.

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Prepare a technical report for lab experiments.
- b2. Apply different techniques to solve instrumentation problems.
- b3. Design digital measurement systems applying appropriate knowledge and principles.
- b4. Select appropriate solutions for engineering problems based on analytical thinking.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Build experiments, and interpret their results using digital measuring instruments and relevant laboratory equipment.
- c2. Apply gained hardware and software skills to the design in diverse mechatronics applications
- c3. Follow up safety requirements at lab.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Collaborate effectively within multidisciplinary team.
- d2. Demonstrate efficient IT capabilities.
- d3. Work coherently and successfully as a part of a team in the Lab and assignments.
- d4. Effectively manage tasks, time, and resources during the project and lab experiments.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

3- Course Contents:

Period	Topic	Lecture (hours)	Tutorial (hours)	Total (hours)
Week 1	Instruments and Instrumentation Systems	2	1	3
Week 2	Digital Basics	2	1	3
Week 3	Digital Counters	2	1	3
Week 4	Digital Multi-meters	2	1	3
Week 5	Microprocessor-Based Instrumentation: Hardware Architecture	2	1	3
Week 6	Microprocessor-Based Instrumentation: Instruction set	2	1	3
Week 7	Microprocessor-Based Instrumentation: Peripheral Interfacing,	2	1	3
Week 8	Applications in Electro-Mechanical Systems (Case Studies)	2	1	3
Week 9	Applications in Electro-Mechanical Systems (Case Studies)	2	1	3
Week 10	Applications in Electro-Mechanical Systems (Case Studies)	2	1	3
Week 11	Applications in Electro-Mechanical Systems (Case Studies)	2	1	3
Week 12	Networks and Communications in Instrumentation Systems	2	1	3
Week 13	Networks and Communications in Instrumentation Systems	2	1	3
Week 14	Networks and Communications in Instrumentation Systems	2	1	3
Week 15	Networks and Communications in Instrumentation Systems	2	1	3
Total		30	15	45

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Learning/Teaching Methods:

- 4.1- Lectures.
- 4.2- Tutorials.
- 4.3- E-Learning Program.

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

5- Assessment

- Final exam:40%
- Semester work:
 - Mid-Term exams30%
 - In Class Quizzes10%
 - Participations10%
 - Lab Experiments & Project10%

Total **100%**

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references:

- 1) Course Notes (in MS Power Point or PDF format)
- 2) Essential Book (Text Book)
 - “Electronic Instrumentation & Measurements”, David A. Bell, - PHI, 2nd Edition, 2003.

7- Facilities required for teaching and learning:

- 1) White board.
- 2) Data show for presentations.
- 3) Electrical Engineering Library.

Course coordinator: **Dr. Mohamed Abdellatif**
Head of Department: **Dr. Yehia Hendawy**
Date: **Nov. 2017**

Appendix

Table [1]: Course ILOs / Program ILOs Matrix

	Program ILOs	Course ILOs																	
		Knowledge & Understanding					Intellectual Skills					Professional & Practical Skills			General and Transferable Skills				
		a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4		
A05	Basics of information and communication technology (ICT).				√	√													
A18	Fundamentals of microprocessor architecture and microprocessor based control units and their software and interfaces.			√															
A19	Fundamentals of electrical, electronic, and digital instrumentation and transducers.	√																	
A21	Fundamentals of problem identification, formulation and solution in the inter-disciplinary fields of Mechatronics		√																
B02	Develop and implement computer programs for engineering applications including programming of microprocessor based units.						√	√	√	√									
B09	Select and appraise appropriate ICT tools to a variety of engineering problems.						√	√	√	√									
B13	Create systematic and methodic approaches when dealing with new and advanced technology						√	√	√	√									
B15	Analyze and design electrical and electronics including logic circuits, and microprocessor based systems.						√	√	√	√									
B18	Identify at an appropriate level the design, production, interfacing and software needs of different parts of Mechatronics systems.						√	√	√	√									
C01	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.										√	√	√						
C03	Apply knowledge of mathematics, science, information										√	√	√						

Program ILOs	Course ILOs																
	Knowledge & Understanding					Intellectual Skills				Professional & Practical Skills			General and Transferable Skills				
	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4	
	technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to mechatronics																
C05											√	√					
C07											√	√	√				
D01													√				
D02														√			
D03																	√
D06																	√

Table (2): Course Contents/Course ILOs Matrix

Topic	Course ILOs															
	Knowledge & Understanding					Intellectual Skills				Professional & Practical Skills			General and Transferable Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4
Instruments and Instrumentation Systems		√														
Digital Basics	√															
Digital Counters	√															
Digital Multi-meters	√			√		√		√		√	√	√	√	√		√
Microprocessor-Based Instrumentation: Hardware Architecture			√													
Microprocessor-Based Instrumentation: Instruction set			√													
Microprocessor-Based Instrumentation: Peripheral Interfacing, Applications in Electro-Mechanical Systems (Case Studies)		√			√	√				√	√	√	√	√	√	√
Networks and Communications in Instrumentation Systems		√		√	√			√	√	√	√	√	√	√	√	√

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs															
	Knowledge & Understanding					Intellectual Skills				Professional & Practical Skills			General and Transferable Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4
Interactive Lecturing	√	√	√	√	√											
Problem solving						√	√	√	√							
Experiential learning										√	√	√	√	√	√	√

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding					Intellectual Skills				Professional & Practical Skills			General and Transferable Skills			
Learning/Teaching Method	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4
Written Exams	√	√	√	√	√	√	√	√	√							
Discussion and Participation										√	√	√	√	√	√	√
Report										√	√	√	√	√	√	√
Relative weight %	40%					40%				10%			10%			

Table [4]: Assessment method / ILOs Matrix

MKT 507: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs													
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3			
A02	Concepts and theories of basic science including physics, mechanics and chemistry.	x	x												
A09	Principles of design including elements design, process and/or a system related to Mechatronics.		x												
A13	Current engineering technologies as related to Mechatronics including modern techniques in sensors, actuators, control units and their interfaces.	x	x	x											
A15	The contemporary engineering topics.	x	x	x											
A16	Basic science and engineering fundamentals in mechanics including engineering mechanics, mechanical design vibration analysis, fluid and fluid power control, in addition to energy systems.				x										
B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems.				x	x									
B05	Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.						x								
B06	Assess and evaluate the characteristics and performance of components, systems and processes related to Mechatronics including mechanical systems, sensors, interfacing, controllers, and actuators.				x		x								
B13	Create systematic and methodic approaches when dealing with new and advanced technology.				x	x									
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.							x							
C13	Prepare and present technical reports.								x						
D2	Work in stressful environment and within constraints										x			x	
D3	Communicate effectively													x	
D6	Effectively manage tasks, time, and resources											x		x	
D9	Refer to relevant literatures											x			

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs												
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3		
1	Overview of MEMS and Microsystems	x												
2	Working Principles of Microsystems	x												
3	Engineering Science for Microsystems Design and Manufacturing		x		x									
4	Engineering Mechanics for Microsystem Design		x		x									
5	Scaling Law in Miniaturization		x		x									
6	Materials for MEMS and Microsystems		x		x									
7	Microsystems Fabrication Processes			x	x									
8	Overview of MicroManufacturing			x	x									
9	Assembly, Packaging, and Testing of Microsystems				x									
10	Project follow up and discussions						x	x	x	x	x	x	x	x

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs												
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3		
1	Interactive Lecturing	x	x	x	x	x								
2	Problem solving				x	x								
3	Project						x	x	x	x	x	x	x	x

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs									Σ				
		a1	a2	a3	b1	b2	b3	c1	c2	d1		d2	d3		
1	Attendance and Class Participation	x	x	x										x	10
2	Written exams	x	x	x	x	x									70
3	Project Report and Discussion						x	x	x	x	x	x	x	x	20



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017

Course Specifications

MKT 507: Introduction to Micro Electro Mechanical Systems

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level 5
Date of specification approval:	November 2017

A- Basic Information

Title:	Introduction to MEMS	Code:	MKT 507
Credit Hrs:	2	Lect.:	2
		Tut. /Lab:	1
Prerequisite:	MAN 441		

B- Professional Information

1-Catalog Course Description

Overview of micro-systems, common micro-systems and their working principles, mechanical modeling and simulation of MEMS, scaling laws in miniaturization, material for MEMS and micro-systems, mechanical design of micro devices, mechanical packaging of micro devices, overview on micro-systems fabrication processes.

2-Overall aims of the course.

- Enrich the student's understanding of the Micro Systems and their working principles
- Develop the student's ability to apply the different design principles on different micro devices.
- Enrich the students understanding of micro-systems fabrication processes.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course, the student should be able to:

- a1. Understand the different working principles of the common microsystems.
- a2. Comprehend the different factors and principles associated with the design of a microsystem.
- a3. Understand the different fabrication processes involved in MEMS fabrication.

b- Intellectual skills.

By the end of this course, the student should be able to:

- b1. Analyse the forces and design principles on different MEMS devices.
- b2. Apply the different fabrication process on several MEMS sensors and actuators.
- b3. Analyse the different working principles and fabrication processes on a specific device from literature in term project

c- Professional and practical skills:

By the end of this course, the student should be able to:

- c1. Review literature to analyze different working principles and fabrication processes on a specific device in term project
- c2. Present a technical report on a specific MEMS sensor or an actuator.

d- General and transferable skills:

By the end of this course, the student should be able to:

- d1. Review different sources of literature for term project.
- d2. Submit on time assignments and project.
- d3. Present the project in a technical report and power point presentation.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut
1	Course Outline Overview of MEMS and Microsystems	2	2
2	Working Principles of Microsystems	4	4
3	Engineering Science for Microsystems Design and Manufacturing	2	2
4	Engineering Mechanics for Microsystem Design	4	4
5	Scaling Law in Miniaturization	2	2
6	Materials for MEMS and Microsystems	2	2
7	Microsystems Fabrication Processes	4	4
8	Overview of MicroManufacturing	2	2

10	Assembly, Packaging, and Testing of Microsystems	2	2
11	Project follow up and discussions		4
12	Midterm Exams	4	0
13	Project submission and oral discussion	2	2
Total hours		30	30

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Attendance and class participation		Lecture and tutorial attendance and class participation	Weekly	10
Project		Discussion & Technical Report	Due date: 14 th week	20
Final Exam		Written	Examination Period	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
Hsu, Tai-Ran. "MEMS and Microsystems: Design, Manufacture, and Nanoscale Engineering" . John Wiley & Sons Inc., latest edition
2. Lecture notes on the course Moodle page, FUE website.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Dr. M.Badran

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Dr. M.Badran

MKT 510: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs													
		a1	a2	a3	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3	
A09	Principles of design including elements design, process and/or a system related to Mechatronics.	X													
A10	Methodologies of solving engineering problems, data collection and interpretation.		X												
A15	The contemporary engineering topics.			X											
A16	Basic science and eng fundamentals in mechanics including eng mechanics, mechanical design, vibration analysis.	X													
A22	The principles of sustainable design and development.			X											
B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems.				X										
B03	Select appropriate solutions for eng. problems based on analytical thinking.					X									
B06	Asses and evaluate the characteristics of components, systems and processes related to Mechatronics including mech. systems, sensors, controllers, and actuators.						X								
B07	Investigate failure of components, and systems.									X					
B12	Analyse and asses models of vibrating systems.					X									
B16	Develop and apply software for system analysis.						X								
C01	Use computational facilities and lab. equipment to design experiments, analyse and interpret results.							X							
C02	Construct engineering graphics.										X				
C04	Professionally merge engineering knowledge.							X							
C07	Use a wide range of analytical tools, tech., and equip.								X						
C09	Apply safe systems and manage risks at work.							X							
C13	Prepare and present technical reports.									X					
D2	Work in stressful environment and within constraints.											X			
D3	Communicate effectively.												X		
D7	Search for information and engage in life-long self-learning discipline.														X

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs														
		a1	a2	a3	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3		
1	Introduction to vibration as a machine condition monitoring	X														
2	Vibration analysis of damped and undamped, single and multi-degree of freedom systems.	X			X									X		
3	Vibration transmission, isolation, foundation design, and vibration control techniques.		X		X			X		X				X		X
4	Characteristics of vibration signals, frequency analysis.			X		X		X						X		X
5	Vibration measurement and spectrum analysis.							X		X			X			X
6	Vibration as a machine condition monitoring and fault diagnosis.						X				X			X		X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs														
		a1	a2	a3	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3		
1	Interactive Lecturing	X	X	X	X	X	X		X							
2	Problem solving				X	X	X		X							
3	Discussion	X	X	X	X	X	X	X	X	X						
4	Experiential learning							X	X	X	X					
5	Term Paper											X	X			X
6	Research	X	X	X			X			X						

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs										Σ %					
		a1	a2	a3	b1	b2	b3	c1	c2	c3	c4		d1	d2	d3		
1	Assignments	X	X	X	X	X	X	X									5
2	Participation (L, T, & Lab)				X	X	X	X									5
3	Term Paper Presentation														X		10
4	Written Exams (QZs + MIDTERMS + FINAL)	X	X	X	X	X	X										80
	Over all %	6	6	6	19	19	19	5	5	5	4	2	2	2	2	2	100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MKT 510: Vibration Principles and Monitoring

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Five
Date of specification approval:	November 2017

A- Basic Information

Title:	Vibration Principles and Monitoring	Code:	MKT 510		
Credit Hrs:	2	Lect.:	2	Tut. /Lab:	1
Prerequisite:	MEC 221: Dynamics of Rigid Bodies (Mechanics 3)				

B- Professional Information

1-Catalog Course Description.

Introduction to Vibration Principles, Fault detection techniques, Vibration as a Fault detection and diagnosis technique, Vibration Measurements and analysis, use of Vibration as a machinery condition monitoring.

2-Overall aims of the course.

- Gain a through introduction to mechanical vibration of single and multi-degree of freedom systems.
- Enrich the student's knowledge about techniques of machinery vibration control.
- Introduce the processes of monitoring operating conditions of industrial machinery and its relevance to fault detection and diagnosis.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Identify fundamentals of vibration analysis and control of mechanical systems.
- a2. Describe vibration isolation techniques for mechanical systems

a3. Explain machinery vibration monitoring, and mechanical systems fault diagnosis.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Develop mathematical models for dynamic systems.
- b2. Analyse vibration response of single and multi-degree of freedom systems
- b3. Relate vibration response analysis to machine condition monitoring and fault diagnosis and use available software packages.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Perform experimental measurement for vibration isolation and control considering the safety precautions.
- c2. Analyse recorded data of vibration testing.
- c3. Prepare technical report for vibration control experimental work.
- c4. Construct response curves of tested vibration control systems.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work in stressful environment and within constraints through assignments and term papers.
- d2. Communicate effectively through technical reports and representations.
- d3. Search for information and engage in life-long self-learning discipline through self-study tasks.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec	Tut	Lab
1	Introduction to vibration as a machine condition monitoring	2	0	0
2	Vibration analysis of damped and undamped, single and multi-degree of freedom systems.	8	4	0
3	Vibration transmission, isolation, foundation design, and vibration control techniques.	6	3	0
4	Characteristics of vibration signals, frequency analysis.	4	2	0
5	Vibration measurement and spectrum analysis.	4	0	3
6	Vibration as a machine condition monitoring and fault diagnosis.	6	3	0
Total		30	12	3

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	20
Term Paper (Self-Study)		Technical Report and Oral Presentation.	Proposal: 3 rd week	10
			Delivery: 12 th week	
Final Exam		Written	16 th - 17 th week	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
 - "Machinery Vibration Analysis and Predictive Maintenance", By: Cornelius Scheffer, and Paresh Girdhar, Elsevier ISBN: 978-0-7506-6275-8) (2004).
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
 - "Engineering Vibration" By: Daniel J. Inman, 3rd ed., Prentice-Hall Inc., (ISBN: 0132281732) (2002).
 - "Vibration Condition Monitoring of Machines) By: J.S. Rao, CRC Press, (ISBN: 0849309379) (2000)

9-Facilities required for teaching and learning:

- Smart White Board.
- Data Show for Presentations.
- Lab equipped with Active Suspension System, **function generators, data acquisition cards, and computers.**

Course coordinator: Prof. Abuelela Mohamed Abuelela Abuelnaga

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Prof. Abuelela Mohamed Abuelela Abuelnaga

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	Course ILOs								
		a1	a2	b1	c1	d1	d2	d3		
A13	Current engineering technologies as related to Mechatronics including modern techniques in sensors, actuators, control units and their interfaces.	x	x							
B05	Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.			x						
B06	Assess and evaluate the characteristics and performance of components, systems and processes related to Mechatronics including mechanical systems, sensors, interfacing, controllers, and actuators.			x						
C03	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to identify, formulate and solve engineering and field problems related to Mechatronics.				x					
D03	Communicate effectively					x				x
D07	Search for information and engage in life-long self-learning discipline									x

Table [2] : Course Content/ ILOs Matrix

No.	Topics	Course ILOs								
		a1	a2	b1	c1	d1	d2	d3		
1	Introduction	x	x	x						
2	Components and generations		x	x						
3	First generation		x	x	x	x	x	x		
4	Second generation		x	x	x					
5	Third generation	x	x			x	x	x	x	
6	Interface physical and virtual world		x							
7	Case studies			x						

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs						
		a1	a2	b1	c1	d1	d2	d3
1	Interactive Lecturing	x	x	x	x			
2	Problem solving/ Experiential learning			x	x			
3	Discussion	x	x	x	x			
4	Project				x	x	x	x
5	Research	x			x	x	x	x

Table [4]: Assessment method / ILOs Matrix

	Method	Course ILOs						Σ	%
		a1	a2	b1	c1	d1	d2		
1	Assignments	x	x	x	x				10
2	Participation (L, T, &Lab)			x	x				20
3	Oral& Practical exams/ project			x	x	x	x	x	10
4	Written Exams (QZs + MIDTERMS + FINAL).	x	x	x					60
5	Over all %								100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MKT 590 Smart Systems

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	December 2016

A- Basic Information

Title:	Smart Systems	Code:	MKT 590		
Credit Hrs:	2	Lect.:	2	Tut. /Lab:	1
Prerequisite:	None				

B- Professional Information

1- Catalog Course Description.

Introducing the concept of smart systems incorporating functions of sensing, actuation, and control in order to describe and analyze a situation, and make decisions. Generations of smart systems: First-generation: object recognition devices, driver status monitoring, and multifunctional devices for minimally invasive surgery. Second-generation: active miniaturized artificial organs like cochlear implants or artificial pancreas, advanced energy management systems, and environmental sensor networks. Third generation, that combines technical “intelligence” and cognitive functions so that they can provide an interface between the virtual and the physical world.

2-Overall aims of the course.

At the end of this course, students should be able to:

1. Describe and analyze smart system components and generations.
2. Define and recommend the specification for sensors and actuators for smart system.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Define the components of smart systems.
- a2. State the three generations of smart systems.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Select the suitable components for smart systems regarding type of sensors and actuators.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Select the sensor and actuator model from making company website.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Manage tasks, time, and resources.
- d2. Search for information and engage in life-long self-learning discipline through self-learning assignments.
- d3. Collaborate effectively within multidisciplinary team.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Tot
1	Introduction	4	2	
2	Components and generations	4	3	
3	First generation	4	2	
4	Second generation	4	2	
5	Third generation	4	2	
6	Interface physical and virtual world	4	2	
7	Case studies	6	2	
Total		30	15	45

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Exam	5 th - 6 th week	15
	2 nd	Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	10
Project.		Practical & oral Project Exam	13 th week	20
Final Exam		Written	Examination Period	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

Textbook

Instructor notes

References

Online resources.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Prof. Mohamed Abdellatif

Head of Department: Prof. Yehia Hindawy

Date: Nov., 2017



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MKT 599 Special Topics in Mechatronics

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Special Topics in Mecha-	Code:	MKT 599
	tronics		
Credit Hrs:	2	Lect.:	2
		Tut. /Lab:	2
Prerequisite:	(Measurements, PLC, Mechanism, Mechatronics, Robotics)		

B- Professional Information

1-Catalog Course Description.

Selected topics that meet student interests and reflects recent trends in one of the fields of mechatronics engineering.

This offering uses the Amatrol training system. Using system approach to let the student get familiar and have hands on with real mechatronics process. The process have 7 modules each of different task. Student will be able to operate and trouble-shoot the system.

2-Overall aims of the course.

At the end of this course, students should be able to:

1. Describe, analyze and operate the mechatronics training Amatrol.
2. Define the specification for sensors in each module.
3. Define the specification for actuators in each module
4. Understanding the PLC control program for each module and interaction.
5. Operation of the robot arm, SCADA interfaces and teach pendant.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Define the amatrol stations.
- a2. State the process in all steps.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Understands the control of process and sensors and actuators.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Operate the different stations.
- c2. Operate the robot arm.
- c3. Understand how to troubleshoot problems.
- c4. Understand the process of replacing defective item.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Manage tasks, time, and resources.
- d2. Search for information and engage in life-long self-learning discipline through self-learning assignments.
- d3. Collaborate effectively within multidisciplinary team.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

No.	Topics	Lec.	Tut	Lab	Total
1	Introduction	2		2	
2	Stations and overview	2		2	
3	Interfacing	2		2	
4	Sensors and identification	2		2	
5	Operation of modules and safety	2		2	
6	PLC control of stations	2		2	
7	Identifying the ladder control of stations	2		2	
8	Robot arm and its control	2		2	
9	Robot arm structure and sensors	2		2	
10	Torqueing and storage stations	4		4	
11	Indexing station	2		2	
12	Project discussion	4		4	
13	Project Presentation	2		2	
		30		30	60

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Exam	5 th - 6 th week	15
	2 nd	Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	10
Project.		Practical & oral Project Exam	13 th week	20
Final Exam		Written	Examination Period	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

Textbook

Notes and Amatrol catalogue

References

Online resources.

9-Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: Prof. Mohamed Abdellatif
 Head of Department : Prof. Yehia Hendawy
 Date: Nov., 2017
 Course instructor: Prof. Mohamed Abdellatif



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechanical Program

Spring 2018
Course Specifications
MPR 466: Heating, Ventilation and Air Conditioning

Programme(s) on which the course is given:	B.Sc. in Mechanical Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title:	Heating, Ventilation and Air Conditioning	Code:	MPR 466
Credit Hrs:	3	Lect.:	2
		Tut. /Lab:	1
Prerequisite:	MPR 456, MPR251		

B- Professional Information

1-Catalog Course Description.

Properties of Moist Air, Psychrometry of Air-Conditioning Processes, Design Conditions, Heat Transfer through Building Structures, Load Calculations and, Applied Psychrometrics, Design of Air Conditioning Apparatus, Fans.

2-Overall aims of the course.

- Understand fundamentals of Heating, ventilation and Air Conditioning
- Apply the fundamental principles of Heating, ventilation and Air Conditioning
- Explore the fundamental principles of Heating, ventilation and Air Conditioning through experimentation
- Develop skills for analyzing experimental data and working in teams
- Share ideas and work in a team.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- Define the basic concepts of Heating, ventilation and Air Conditioning
- Understand the properties of the Moist Air
- Understand the Psychrometry of Air-Conditioning Processes
- Understand the Design Conditions
- Understand Load Calculations and Applied Psychrometric

b- Intellectual skills.

By the end of this course the student should be able to:

- Ability to define and solve problems related to properties of the Moist Air.
- Ability to define and solve problems related to Psychrometry of Air-Conditioning Processes.
- Ability to define and solve problems of Design Conditions
- Ability to define and solve problems of Load Calculations and Applied Psychrometric

c- General and transferable skills:

By the end of this course the student should be able to:

- Ability to work in a team.
- Ability to share ideas and communicate with others
- Ability to deal with others according to the rules of the professional ethics

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1	Properties of Moist Air	2	2	
2	Psychrometry of Air-Conditioning Processes	4	2	
3	Design Conditions	4	2	
4	Heat Transfer through Building Structures	4	2	
5	Load Calculations and Applied Psychrometrics	6	3	
6	Design of Air Conditioning Apparatus	6	2	
7	Fans	4	2	
	Total	30	15	

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	25
	2 nd	Written Exam	10 th -11 th week	25
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	10
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book: Refrigeration and Air Conditioning
by C Arora
2. Lecture notes
3. Recommended Readings:
Refrigeration and Air Conditioning
S.C. Arora, S. Domkundwar, 2000

9-Facilities required for teaching and learning:

Data Show

Course coordinator: Dr. M. Karali.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	c4	c5	d1	d2
A01	Basic sciences including classical and solid state physics, mechanics and chemistry.	●	●		●			●	●	●							
A04	Topics from other engineering disciplines including engineering graphics, civil engineering, production technology, thermodynamics and fluid mechanics.	●	●	●	●	●		●	●	●	●						
B01	Think in a creative and innovative way in problem solving and design.						●	●	●	●	●						
B04	Write a technical report on a project or an assignment.											●					
C04	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments, collect data, analysis and interpret results.					●	●	●	●	●	●	●		●			
C07	Follow up safety requirements at work and observe the appropriate steps to manage risks.											●	●				
C10	Edit and present technical report.											●			●		
D01	Collaborate effectively within multidisciplinary team.											●		●	●	●	
D05	Lead and motivate individuals.											●		●	●		●
D06	Effectively manage tasks, time, and resources.											●		●	●		
D09	Refer to relevant literatures.	●															

Table [2]: Course contents / ILOs

Topic	Course ILOs														
	Knowledge and Understanding					Intellectual Skills			Practical Skills					General Skills	
	a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2
Properties of Moist Air	●	●	●	●		●	●		●						
Psychrometry of Air-Conditioning Processes	●	●	●	●		●	●		●						
Design Conditions			●			●			●						
Heat Transfer through Building Structures			●	●	●	●		●	●						
Load Calculations and Applied Psychrometrics					●	●			●						
Design of Air Conditioning Apparatus			●			●	●		●						
Fans			●			●		●	●						

Table (3): Learning-Teaching Method / Course ILOs Matrix

Topic	Course ILOs														
	Knowledge and Understanding					Intellectual Skills			Practical Skills					General Skills	
	a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2
Interactive Lecturing	●	●	●	●	●	●	●	●	●						
Problem solving						●	●	●	●						
Experiential learning									●	●	●	●	●		
Research activity														●	●

Table (4): Assessment Method / Course ILOs Matrix

Topic	Course ILOs														
	Knowledge and Understanding					Intellectual Skills			Practical Skills					General Skills	
	a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2
Written Exams	●	●	●	●	●	●	●	●	●						
Lab Reports, Research activity and Oral Exam									●	●	●	●	●	●	●
Relative weight %	40%					40%			10%					10%	

MPR 561: Appendix
Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs												
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3		
A10	Methodologies of solving engineering problems, data collection and interpretation.	X												
A11	Quality assurance systems, codes of practice and standers, health and safety requirements.		X											
A12	Business and management principles relevant to engineering.	X												
A15	The contemporary engineering topics.		X											
B07	Investigate the failure of components, systems, and processes.				X									
B10	Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.				X									
B11	Incorporate economic, social, environmental dimensions and risk management in design.					X								
B19	Create solutions to mechatronics systems.						X							
C04	Professionally merge the engineering knowledge.							X						
C09	Apply safe systems at work.							X						
C11	Apply quality assurance procedures.							X						
C12	Exchange knowledge and skills.								X					
C13	Prepare and present technical reports.								X					
C16	Apply the principles of sustainable design.							X	X					
D02	Work in stressful environment and within constraints.									X				
D03	Communicate effectively.										X			
D06	Effectively manage tasks, time, and resources.											X		
D07	Search for information and engage in life-long self-learning discipline.												X	

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs											
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3	
1	Introduction to Plant Engineering and Maintenance.	X											
2	Types of Maintenance and Strategies.	X	X	X	X								
3	Maintenance Organizations.	X			X			X					
4	Quality and Safety in Maintenance.				X	X		X	X	X	X		
5	Maintenance Materials Control.		X	X	X	X	X	X	X	X	X	X	
6	Maintenance Costing.		X	X	X	X	X	X	X	X	X	X	
7	Computerized Maintenance Management Systems (CMMS).						X	X		X	X	X	

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs											
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3	
1	Interactive Lecturing	X	X	X	X	X	X	X	X				
2	Problem solving				X	X	X	X					
3	Discussion	X	X	X	X	X	X	X	X				
4	Term Paper							X	X	X	X	X	
5	Research	X	X	X	X	X	X						

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs											Σ		
		a1	a2	a3	b1	b2	b3	c1	c2	d1	d2	d3		%	
1	Assignments	X	X	X	X	X	X	X							5
2	Participation (L&T)				X	X	X	X							5
3	Term Paper Presentation											X			20
4	Written Exams (QZs+MID-TERMS+FINAL)	X	X	X	X	X	X								70
	Over all %	6	6	6	19	19	19	5	5	5	5	5	5		100



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Spring 2018
Course Specifications
MPR 561: Plant Engineering and Maintenance

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level Five
Date of specification approval:	November 2017

A- Basic Information

Title:	Plant Engineering and Maintenance	Code:	MPR 561		
Credit Hrs:	2	Lect.:	2	Tut. /Lab:	1
Prerequisite:	MAN 341: Mechanical Design (1)				

B- Professional Information

1-Catalog Course Description.

Plant engineering, Utilities, Energy and power systems, Material handling and storage, Environmental control, Waste disposal, Pollution control, Industrial maintenance, Corrective and predictive maintenance, Spare parts inventory control.

2-Overall aims of the course.

- Introduce fundamentals and concepts of Modern Plant Engineering and Maintenance.
- Enrich the student's knowledge about different maintenance management systems.
- Search for Modern Maintenance topics through Self-Learning.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Identify different elements of modern Plant Engineering and Maintenance Management and Control.

- a2. Describe the relation between Maintenance and other Plant Engineering activities.
- a3. Explain the different Maintenance Management Systems encounter in modern industry.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Distinguish between different Maintenance Management Systems.
- b2. Examine the suitability of Modern Maintenance Systems for different fields of industrial applications.
- b3. Select the proper Computer Maintenance Management System (CMMS) for a given industrial application.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Analyse characteristics of the different Modern Maintenance Management Systems.
- c2. Prepare and Present technical reports on Modern Maintenance.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Work in stressful environment and within constrains through assignments and term papers.
- d2. Communicate effectively through technical reports and representations.
- d3. Search for information and engage in life-long self-learning discipline through self-study tasks.

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1	Introduction to Plant Engineering and Maintenance.	2	1	
2	Types of Maintenance and Strategies.	4	2	
3	Maintenance Organizations.	6	3	
4	Quality and Safety in Maintenance.	6	3	
5	Maintenance Materials Control.	4	2	
6	Maintenance Costing.	4	2	
7	Computerized Maintenance Management Systems (CMMS).	4	2	
Total		30	15	

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports follow up during tut. , & written exam.	Weekly	10
Term Paper (Self-Study)		Technical Report and Oral Presentation.	Proposal: 3 rd week	20
			Delivery: 12 th &13 th week	
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

1. Text Book:
"Engineering Maintenance: A Modern Approach" By B. S. Dhillon, CRC Press, 2002.
2. Lecture notes on the course Moodle page, FUE website.
3. Recommended Readings:
-----.

9-Facilities required for teaching and learning:

- Smart White Board.
- Data Show for Presentations.

Course coordinator: Prof. Abo El-Ela Abo El-Naga.
Head of Department: Prof. Yehia Hendawy.
Date: November - 2017
Course Instructor:

MPR 563: Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs Course ILOs	Course ILOs													
		a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	d1	d2	
A01	Concepts and theories of mathematics including differential and integral calculus, algebra, analytical geometry, probability and statistics, and numerical analysis.	X													
A02	Concepts and theories of basic science including physics, mechanics and chemistry		X												
A07	Fundamentals of technical report writing considering one of the standard format.			X		X									
B01	Apply basic mathematics and physics knowledge to solve physical and engineering problems						X								
B03	Select appropriate solutions for engineering problems based on analytical thinking.							X							
C13	Prepare and present technical reports.								X		X				
D3	Communicate effectively												X		X

Table [2] : Course Content/ ILOs Matrix

#	Topics	Course ILOs													
		a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	d1	d2	
1	Classification of sources and effects of pollutants.	X												X	
2	Air pollution, noise environment pollution,		X												X
3	Thermal pollution, pollution of water resources, pollution of solid wastes	X		X						X					
4	Global environmental pollution problems,					X						X			
5	Methods for controlling different types of pollution,			X	X		X								
6	Standard specifications for clean environment,					X									X

Table [3]: Learning-Teaching method / ILOs Matrix

#	Method	Course ILOs												
		a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	d1	d2
1	Interactive Lecturing	X	X	X	X	X	X	X	X					
2	Problem solving				X	X	X	X					X	X
3	Experiential learning								X	X	X			

Table [4]: Assessment method / ILOs Matrix

#	Method	Course ILOs												
		a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	d1	d2
1	Written exams. : Quiz1	X	X	X	X	X								
2	Laboratory reports. : Conduction re- port								X					
3	Written exams. : Quiz2						X	X						
4	Laboratory reports. : Convection report									X				
5	Written exams. : Quiz3						X	X						
6	Laboratory reports. : Heat exchangers report											X		
8	Oral exams. : Oral exam												X	X
9	Final exam : Final exam	X	X	X	X	X	X	X						



Faculty of Engineering and Technology
Department of Mechanical Engineering
Mechatronics Program

Fall 2017
Course Specifications
MPR 563: Pollution Control

Programme(s) on which the course is given:	B.Sc. in Mechatronics Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Mechanical Engineering
Department offering the course:	Mechanical Engineering
Academic year/Level:	Level five
Date of specification approval:	November 2017

A- Basic Information

Title:	Pollution Control	Code:	MPR 563		
Credit Hrs:	2	Lect.:	2	Tut. /Lab:	1
Prerequisite:	MPR 251: Engineering Thermodynamics				

B- Professional Information

1-Catalog Course Description.

Classification of sources and effects of pollution especially those which are related to mechanical power engineering (air pollution, noise and work environment pollution, thermal pollution, pollution of water resources, pollution of solid wastes), Global environmental pollution problems, Methods for controlling different types of pollution, Standard specifications for clean environment, Introduction to environment management systems.

2-Overall aims of the course.

By the end of the course the students will be able to:

- 1) Understand fundamentals of pollution due to combustion
- 2) Understand fundamentals of pollution due to particulate matters
- 3) Apply the fundamental principles of gas pollution controls
- 4) Apply the fundamental principles of particulate matter controls
- 5) Understand fundamentals of thermal pollution
- 6) Understand fundamentals of water pollution
- 7) Understand reasons of global effects of pollutants
- 8) Develop skills for analyzing experimental data and working in teams
- 9) Share ideas and work in a team.

3-Intended learning outcomes of course (ILOs).

a- Knowledge and understanding.

By the end of this course the student should be able to:

- a1. Identify basic applied and engineering science.
- a2. Identify principles in the of design of mechanical components, different materials, and manufacturing technologies in the field of mechanical power engineering and some other engineering disciplines.
- a3. Identify principles in the field of design of fluid flow, thermodynamics, gas dynamics, turbo- machinery, heat transfer engineering and fundamentals of thermal and fluid processes
- a4. Develop conceptual and detailed design of construction projects and fluid power systems..
- a5. Design of applications in energy technologies, and design of power stations, considering the constraints which mechanical power engineers have to judge to reach at an optimum solution .
- a 6. Design of combustion, internal combustion engines, and boilers. installations.
- a7. Design of refrigeration & air conditioning, and automatic control systems and to demonstrate knowledge of mechanical power engineering contemporary issues.
- a8. Identify engineering economy, legislation, business and management techniques and practices appropriate to mechanical power engineering applications.

b- Intellectual skills.

By the end of this course the student should be able to:

- b1. Define the mechanical power engineering problems and evaluate designs, processes, and performance and propose improvements.
- b2. Derive different solution alternatives for the engineering problems, analyze, interpret data and design experiments to obtain new data, and evaluate the power losses in the fluid transmission lines and networks
- b3. Analyze the performance of the basic types of internal combustion engines, hydraulic machines, fluid power systems, subsystems and various control valves and actuators. Analyze the solution alternatives and choose the optimum one.

c- Professional and practical skills:

By the end of this course the student should be able to:

- c1. Use laboratory, workshop equipment and field devices competently and safely.
- c2. Analyze the record data in the laboratory.
- c3. Prepare engineering drawings, computer graphics, and write specialized technical reports.
- c4. Write computer programs pertaining to mechanical power and energy engineering to describe the basic thermal and fluid processes mathematically, and use the computer software for their simulation and analysis..
- c5. Conduct various mechanical engineering measurements, design, operate, repair and maintain fluid hydraulic power systems and flow networks for diverse applications
- c6. Finish drawings both manually and using CAD
- c7. Work in mechanical power and energy operations, maintenance and overhaul and carry out maintenance of different types of projects.

d- General and transferable skills:

By the end of this course the student should be able to:

- d1. Collaborate effectively within multidisciplinary team.
- d2. Share ideas, communicate effectively and work in stressful environment and within constraints.
- d3. Lead and motivate individuals and work with others according to the rules of the professional Ethics.
- d4. Use digital libraries and/or Learning systems and demonstrate efficient IT capabilities..

4-Course ILOs versus Program ILOs relation

See Appendix, table [1]

5-Course Contents:

#	Topics	Lec.	Tut	Lab
1	Classification of sources and effects of pollutants.	4	1	
2	Air pollution, noise environment pollution,	6	1	1
3	Thermal pollution, pollution of water resources, pollution of solid wastes	6	4	
4	Global environmental pollution problems,	4	1	
5	Methods for controlling different types of pollution,	6	6	
6	Standard specifications for clean environment,	4	1	
Total		30	14	1

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7-Assessment:

Tools		Assessment Method	Time Schedule	%
Midterm	1 st	Written Exam	5 th - 6 th week	15
	2 nd	Written Exam	10 th -11 th week	15
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	10
Assignments, Participation, & Quizzes		Reports, follow up during tut. /lab work, & written exam.	Weekly	10
Final Exam		Written	16 th - 17 th week.	40
Total				100

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8-List of references:

8.1 Essential references (textbooks)

McGraw-Hill, Inc.1995 . Air Pollution control Engineering Noel de Nevers

9-Facilities required for teaching and learning:

- Teaching Aids (Presentation board, overhead projector, data show)

Course coordinator: Prof. M. Abdelrashid

Head of Department: Prof. Yehia Hendawy

Date: Nov. 2017

Course Instructor: Prof. M. Abdelrashid