المعهد العالى للهندسة
بمحافظة 6أكتوبر
إشراف وزارة التعليم العالى

culture & science city
مدينة الثقافة والعلوم

# مرفق (3-1/3/2)

# توصيف برنامج هندسة الميكاترونيات طبقا لمعايير المراجعة القياسية NARS 2018

# *Specifications of Mechatronics Engineering Program*

# *High Institute of Engineering, 6th of October City.*
# *Department: Mechatronics Engineering*
# *Specifications of Mechatronics Engineering (B.Sc. Program)*
# *2023-2024*

## A- Basic Information

**1- Program title:** Mechatronics Engineering Program
**2- Program type:** Single
**3- Department:** Mechatronics Engineering
**4- Coordinator:** Dr. Amer Abdelhakeem
**5- External evaluator:** Prof. Dr. Ahmed Attia

## B- Professional Information

### 1. Institute Mission:

The High Institute of Engineering - 6th of October is committed to graduating engineers capable of meeting the needs of the local and regional labor market at a distinguished competitive level within the framework of values and customs that support community service, continuous self-learning and innovation through the development of educational programs and tools for scientific research and entrepreneurship.

### 2. Program Mission:

The Mechatronics Engineering Department is committed to preparing a distinguished graduate capable of competing locally and regionally through distinguished engineering education in the field of mechatronics engineering, and providing him with the skills of continuous self-learning, scientific research and innovation, while adhering to the rules and ethics of the profession within a framework of moral and societal values.

| Key Words of Institute Mission / Key Words of Program Mission | meeting the needs of the local and regional labor market | a distinguished competitive level | within the framework of values and customs that support community service | self-learning | innovation | Scientific research and entrepreneurship . |
|---|---|---|---|---|---|---|
| preparing a distinguished graduate | | √ | | | | |
| capable of competing locally and regionally | √ | √ | | | | |
| providing him with the skills of continuous self-learning | | | | √ | | |
| scientific research and innovation | | | | | √ | √ |
| adhering to the rules and ethics of the profession within a framework of moral and societal values | | | √ | | | |

## 3. Program Educational Objectives:

**The mechatronics engineering program objectives are:**

1. Apply and synergistic integrate knowledge and understanding of mathematics, physics, engineering sciences and skills to solve engineering problems in various multidisciplinary mechanical, electronics, control and computer programs available to solve real problems in industries, automation application to meet the required needs within realistic constraints.
2. Commitment to ethics, professionalism, and the use of appropriate and modern engineering techniques, skills and tools necessary for design, implementation and project management in the field of mechatronics engineering.
3. Acquire effective communication and leadership skills and the ability to work efficiently and cooperatively within multidisciplinary teams.
4. Developing personal and engineering skills and engage in lifelong learning.
5. Apply engineering solutions taking into account the impact on community and the environment.
6. Understand the ethical and social implications of the profession regarding industrial safety, public safety, and sustainability issues.
7. Design, operation and maintenance of Multidisciplinary Intelligent mechatronics systems, and automation, verifying their performance and solving their basic operational problems.

| Key Words of Program Mission / Program Objectives | preparing a distinguished graduate | capable of competing locally and regionally | providing him with the skills of continuous self-learning | scientific research and innovation | adhering to the rules and ethics of the profession within a framework of moral and societal values |
|---|---|---|---|---|---|
| Objective #1 | √ | | | √ | |
| Objective #2 | √ | | | | √ |
| Objective #3 | √ | √ | | | |
| Objective #4 | √ | | √ | | |
| Objective #5 | | | | | √ |
| Objective #6 | | | | | √ |
| Objective #7 | | | | √ | |

## 4. Graduate Attributes

According to the National Academic Reference Standard (NARS 2018), the graduates of any engineering program must satisfy the following attributes:

1) Master a wide spectrum of engineering knowledge and specialized skills and can apply acquiredknowledge using theories and abstract thinking in real life situations.
2) Apply analytic critical and systemic thinking to identify, diagnose and solve engineeringproblems with a wide range of complexity and variation.
3) Behave professionally and adhere to engineering ethics and standards.
4) Work in and lead a heterogeneous team of professionals from different engineering specialtiesand assume responsibility for own and team performance.
5) Recognize his/her role in promoting the engineering field and contribute in the development ofthe profession and the community.

6) Value the importance of the environment, both physical and natural, and work to promotesustainability principles.
7) Use techniques, skills and modern engineering tools necessary for engineering practice.
8) Assume full responsibility for own learning and self-development, engage in lifelong learningand demonstrate the capacity to engage in post- graduate and research studies.
9) Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
10) Demonstrate leadership qualities, business administration and entrepreneurial skills.

**Besides the above-mentioned general attributes of all engineering graduates, the mechatronics engineering graduates must satisfy the following attributes***:*

11) Use of mathematics, physical science and systems analysis tools in components and systemdesign.
12) Students will learn engineering sciences and demonstrate the application of this knowledge 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) Graduates should have wide choices leading to specialization in mechanics, electronics, design, computer software or other areas.

**To judge the compatibility of graduate attributes with program objectives, the following matrix is used**

| Program Objectives / Graduate Attributes | Objective #1 | Objective #2 | Objective #3 | Objective #4 | Objective #5 | Objective #6 | Objective #7 |
|---|---|---|---|---|---|---|---|
| Attribute #1 | √ | | | √ | | | |
| Attribute #2 | √ | | | | | | |
| Attribute #3 | | √ | | | | | |
| Attribute #4 | | | √ | | | | |
| Attribute #5 | | | | √ | √ | | |
| Attribute #6 | | | | | √ | √ | |
| Attribute #7 | √ | √ | | | | | |
| Attribute #8 | | | | √ | | | |
| Attribute #9 | | | √ | | | | |
| Attribute #10 | | √ | √ | | | | |
| Attribute #11 | √ | | | | | | |
| Attribute #12 | | | | √ | | | √ |
| Attribute #13 | | | | | | | √ |
| Attribute #14 | √ | | | | | | √ |
| Attribute #15 | √ | | | | | | √ |

# 5. Academic Standards of Program

## 5.1. Program Competencies

According to the National Academic Reference Standard, the program in Mechatronics Engineering must satisfy the following Competencies:

| 5.1. General Engineering NARS Competencies in 2018 | | |
|---|---|---|
| **Level A (NARS)** | A.1 | Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics. |
| | A.2 | Develop and conduct appropriate experimentation and/or simulation,analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions. |
| | A.3 | Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economic, environmental, ethical and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development. |
| | A.4 | Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles. |
| | A.5 | Practice research techniques and methods of investigation as an inherent part of learning. |
| | A.6 | Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements. |
| | A.7 | Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams. |
| | A.8 | Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools. |
| | A.9 | Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations |
| | A.10 | Acquire and apply new knowledge; and practice self, lifelong and other learning strategies. |

| 5.2. Mechanical Engineering NARS | | |
|---|---|---|
| **Level B (NARS)** | B.1 | Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of Thermodynamics, Heat Transfer, Fluid Mechanics, solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis, Dynamics and Vibrations. |
| | B.2 | Plan, manage and carry out designs of mechanical systems and machine elements using appropriate materials both traditional means and computer- aided tools and software contemporary to the mechanical engineering field. |
| | B.3 | Select conventional mechanical equipment according to the required performance. |
| | B.4 | Adopt suitable national and international standards and codes, integrate legal, economic, and financial aspects to design, build, operate, inspect and maintain mechanical equipment and systems. |

| 5.3. Mechatronics ARS | | |
|---|---|---|
| **Level C (ARS)** | C.1 | Analyzing the performance of mechatronic systems using scientific, mathematical and computer models andassessing their limits for specific cases. |
| | C.2 | Defining and classifying the performance of mechatronic systems and components through the use of analytical methods and modeling techniques. |
| | C.3 | Design mechatronic systems using a systems approach to meet specific specifications and requirements. |
| | C.4 | Incorporating a wide range of tools,analytical techniques, equipment and software packages for designing and developing mechatronic systems. |
| | C.5 | Demonstrate the engineering principles in the fields of logic design, circuit analysis, computer organization and architectures, memory hierarchy, advanced computer architectures, embedded systems, signal processing, operating systems, real-time systems and reliability analysis. |
| | C.6 | Design and implement of mechatronic systems including the mechanical, electrical, digital elements, modules, sub-systems or systems using technological and professional tools. |

**To judge the compatibility of program objectives with its competencies, the following matrix isused:**

| Program Competencies / Program Objectives | Engineering Competencies (2018) | | | | | | | | | | "Department" Mechanical Engineering Competencies (NARS) | | | | "Discipline" Mechatronics Engineering Competencies (ARS) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | C5 | C6 |
| Objective #1 | √ | √ | √ | √ | | | | | | | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Objective #2 | | | √ | √ | | √ | | | | | | √ | | | | √ | | | | |
| Objective #3 | | | | | √ | | √ | √ | √ | | √ | | | | | | | √ | | |
| Objective #4 | | | | | √ | | | √ | √ | √ | √ | √ | | | | | | | | |
| Objective #5 | | | √ | √ | | | | | | | | | √ | | | | | | | |
| Objective #6 | | | √ | √ | | √ | | | | | √ | | | | | | √ | | | |
| Objective #7 | √ | √ | | | | | | | | | √ | √ | | | √ | √ | √ | √ | √ | √ |

## 6. National Academic References Standards (NARS)

The department is adopted exactly **NARS** as reference academic standards for levels A and B of this program (*National Academic Reference Standards (NARS) for Engineering 2nd edition, issued in 2018).* When developing the program competencies for Level C (ARS), some programs were referred to, such as the Mechatronics Engineering Program in the Faculties of Engineering at Ain Shams University and Mansoura University.

## 7. Curriculum Structure and Content

**7. a. Program Duration:** 10 semesters (5-years)
**7b. Program Structure:** Credit hours' system

| | | |
|---|---|---|
| 7.b.i– No. of Credit hours: 180 | Compulsory hours: 163 | Elective hours: 17 |
| 7.b.ii– No. of Contact hours: 282 | Lectures: 117 | Tutorial/Exercises 165 |
| 7.b.iii– No. of Contact hours of humanities& social sciences : hours = 17 hrs | | |
| 7.b.iv– No. of Contact hours of institute requirements (Mathematics and basic science& Basic Engineering science): hours = 131 hrs | | |
| 7.b.v– No. of Contact hours of general mechatronic program requirements (Major) (Applied Engineering and Design subjects& Basic Engineering science): hours = 122 hrs | | |
| 7.b.vi– No. of Contact hours of specialized requirements (Minor) (Computer Application and ICT& Project and Practice& Discretionary subjects): hours =60 hrs | | |

| Subject Area | Hours | % | Tolerance |
|---|---|---|---|
| Humanities and Social Sciences (Univ. Req.) | 17 | 9.44 | 9–12 % |
| Mathematics and Basic Sciences | 41 | 22.78 | 20–26 % |
| Basic Engineering Sciences (Faculty/Spec. Req.) | 39 | 21.67 | 20–23 % |
| Applied Engineering and Design | 38 | 21.11 | 20–22 % |
| Computer Applications and ICT | 18 | 10 | 9–11 % |
| Projects and Practice | 15 | 8.33 | 8–10 % |
| **Subtotal** | 168 | 93.33 | 92–94 % |
| Discretionary (Institution character-identifying) subjects | 12 | 6.67 | 6–8 % |
| **Total** | 180 | 100 | 100% |

## 7.c Program Courses

### Humanities and Social Sciences (Institute Requirements) (9-12)%

| *Humanities and Social Sciences (Institute Requirements) (9-12)%* | | | |
|---|---|---|---|
| No. | **Code** | **Course** | **Credit Hours** |
| 1 | HUM001 | English Language | 1 |
| 2 | HUM002 | Engineering and technology History | 2 |
| 3 | HUM103 | Principle of Scientific Thinking | 2 |
| 4 | HUM205 | Economics | 2 |
| 6 | HUM308 | Business Administration | 2 |
| 7 | HUM1XX | Human elective Course 1 | 2 |
| 8 | HUM2XX | Human elective course 1 | 2 |
| 9 | HUM3XX | Human elective course 1 | 2 |
| 10 | HUM4XX | Human elective course 1 | 2 |
| **Sum** | | | **17** |
| **Percentage%** | | | **9.44%** |

| *Humanities and Social Sciences (Elective Courses1)* | | | |
|---|---|---|---|
| No. | **Code** | **Course** | **Credit Hours** |
| 1 | **HUM104** | Industrial Safety and Environment | **2** |
| 2 | **HUM105** | Environmental Sciences | **2** |
| 3 | **HUM206** | Law and Ethics for Engineering | **2** |
| 4 | **HUM207** | Research Methods | **2** |
| 5 | **HUM307** | Communication Skills | **2** |
| 6 | **HUM309** | Psychology | **2** |
| 7 | **HUM410** | Technical Report Writing | **2** |
| 8 | **HUM411** | Marketing | **2** |

## Mathematics and Basic Sciences (20-26)%

| *Mathematics and Basic Sciences (20-26)%* | | | |
|---|---|---|---|
| No. | **Code** | **Course** | **Credit Hours** |
| 1 | BAS001 | Mathematics 1 | 3 |
| 2 | BAS002 | Physics 1 | 3 |
| 3 | BAS003 | Mechanics 1 | 3 |
| 4 | MTE001 | Engineering Drawing 1 | 3 |
| 5 | BAS006 | Mathematics 2 | 3 |
| 6 | BAS007 | Physics 2 | 3 |
| 7 | BAS008 | Mechanics 2 | 3 |
| 8 | BAS009 | Engineering Chemistry | 3 |
| 9 | MTE002 | Engineering Drawing 2 | 4 |
| 10 | MTE103 | Materials Science | 3 |
| 11 | MTE104 | Fluid Mechanics | 4 |
| 12 | BAS101 | Mathematics 3 | 3 |
| 13 | BAS106 | Mathematics 4 | 3 |
| **Sum** | | | **41** |
| **Percentage%** | | | **22.78%** |

## Basic Engineering Sciences (Major Requirements for MTE) (20-23) %

| *Basic Engineering Sciences (Major Requirements for MTE) (20-23)%* | | | |
|---|---|---|---|
| No. | **Code** | **Course** | **Credit Hours** |
| 1 | MTE102 | Thermodynamics | 3 |
| 2 | ICE102 | Electric Circuits | 4 |
| 3 | MTE105 | Dynamics of Rigid Bodies | 3 |
| 4 | MTE201 | Heat Transfer | 3 |
| 5 | MTE202 | Mechanical Vibration | 3 |
| 6 | MTE203 | Numerical Methods | 3 |
| 7 | MTE204 | Materials Technology | 3 |
| 8 | MTE206 | Measurements and Instrumentations | 3 |
| 9 | MTE107 | Electromagnetic Fields | 3 |
| 10 | MTE208 | Electrical Machines | 4 |
| 11 | ICE204 | Advances Electronic Circuits | 3 |
| 12 | MTE209 | Digital and Logic Circuits | 4 |
| **Sum** | | | **39** |
| **Percentage%** | | | **21.67%** |

# Applied Engineering and Design
# (Special Requirements for MTE) (20-22)%

| *Applied Engineering and Design (Special Requirements for MTE) (20-22)%* | | | |
|---|---|---|---|
| No. | **Code** | **Course** | **Credit Hours** |
| 1 | MTE101 | Introduction to Mechatronics Engineering | 3 |
| 2 | MTE106 | Project Planning | 3 |
| 3 | MTE205 | Mechanical Design | 3 |
| 4 | MTE207 | Quality Control | 3 |
| 5 | MTE307 | Microprocessor | 3 |
| 6 | BAS302 | Statistics | 3 |
| 7 | MTE301 | Introduction To System Dynamics | 3 |
| 8 | MTE302 | Kinematics And Dynamics Of Machines | 3 |
| 9 | MTE304 | Principles Of Control Systems | 3 |
| 10 | MTE305 | Design Of Mechatronics Systems | 3 |
| 11 | MTE403 | Digital Control Systems | 3 |
| 12 | MTE408 | Feasibility Studies | 2 |
| 13 | MTE41X | Elective Course (2) | 3 |
| **Sum** | | | **38** |
| **Percentage%** | | | **21.11%** |

| *Applied Engineering &Design (Special Requirements for MTE) (Elective Courses)* | | | |
|---|---|---|---|
| No. | **Code** | **Course** | **Credit Hours** |
| 1 | MTE411 | Turbo machinery | **3** |
| 2 | MTE412 | Renewable Energy | **3** |
| 3 | MTE413 | Refrigeration & Air Conditioning | **3** |
| 4 | MTE421 | Digital Signal Processing | **3** |
| 5 | MTE422 | Image Processing | **3** |
| 6 | MTE423 | Fuzzy Logic | **3** |
| 7 | MTE431 | Artificial Intelligence | **3** |
| 8 | MTE432 | Flexible manufacturing systems | **3** |
| 9 | MTE433 | Computer Aided Manufacturing | **3** |

## Computer Application and ICT (9-11) %

| *Computer Application and ICT (9-11) %* | | | |
|---|---|---|---|
| No. | **Code** | **Course** | **Credit Hours** |
| 1 | ICE001 | Computer Introduction | 2 |
| 2 | MTE303 | Computer Aided Design | 3 |
| 3 | MTE306 | Computer Numerical Control | 3 |
| 4 | MTE402 | Programmable Logic Controllers | 3 |
| 5 | MTE309 | Microcontroller And Applications | 4 |
| 6 | MTE42X | Elective Course (2) | 3 |
| **Sum** | | | **18** |
| **Percentage%** | | | **10%** |

## Project and Practice (8-10) %

| *Project and Practice (8-10) %* | | | |
|---|---|---|---|
| No. | **Code** | **Course** | **Credit Hours** |
| 1 | MTE401 | Graduation Project (Phase 1) | 4 |
| 2 | MTE405 | Graduation Project (Phase 2) | 4 |
| 3 | MTE003 | PRODUCTION TECHNOLOGY | 3 |
| 4 | MTE308 | Power Electronics | 4 |
| **Sum** | | | **15** |
| **Percentage%** | | | **8.33%** |

## Discretionary (Institution character-identifying) subjects (6-8)%

| *Discretionary (Institute character-identifying) subjects (6-8)%* | | | |
|---|---|---|---|
| No. | **Code** | **Course** | **Credit Hours** |
| 1 | MTE404 | Robotic | 3 |
| 2 | MTE406 | Pneumatic and Hydraulic Control Systems | 3 |
| 3 | MTE43X | Elective Course (2) | 3 |
| 4 | MTE407 | Modeling and Simulation of Dynamic Systems | 3 |
| **Sum** | | | **12** |
| **Percentage%** | | | **6.67%** |

**Year of Program 1 (Freshman (0)) Semester 1**

Compulsory

| Code | Course Title | Credit Hours | No. of hours / week | | | | Prerequisite |
|---|---|---|---|---|---|---|---|
| | | | Lect. | Tut. | Lab. | Total | |
| **BAS001** | Mathematics 1 | **3** | **2** | **2** | **0** | **4** | |
| **BAS002** | Physics 1 | **3** | **2** | **0** | **3** | **5** | |
| **BAS003** | Mechanics 1 | **3** | **2** | **2** | **0** | **4** | |
| **MTE001** | Engineering Drawing 1 | **3** | **2** | **2** | **0** | **4** | |
| **MTE003** | PRODUCTION TECHNOLOGY | **3** | **2** | **0** | **3** | **5** | |
| **HUM001** | English Language | **1** | **1** | **0** | **0** | **1** | |
| **ICE001** | Computer Introduction | **2** | **1** | **0** | **3** | **4** | |

**Year of Program 1 (Freshman (0)) Semester 2**

Compulsory

| Code | Course Title | Credit Hours | No. of hours / week | | | | Prerequisite |
|---|---|---|---|---|---|---|---|
| | | | Lect. | Tut. | Lab. | Total | |
| **BAS006** | Mathematics 2 | **3** | **2** | **2** | **0** | 4 | BAS001 |
| **BAS007** | Physics 2 | **3** | **2** | **2** | **3** | 7 | BAS002 |
| **BAS008** | Mechanics 2 | **3** | **2** | **2** | **0** | 4 | BAS003 |
| **BAS009** | Engineering Chemistry | **3** | **2** | **0** | **3** | 5 | |
| **MTE002** | Engineering Drawing 2 | **4** | **2** | **2** | **3** | 7 | MTE001 |
| **HUM002** | Engineering &Technology History | **2** | **2** | **0** | **0** | 2 | |

**Year of Program 2 - (First Year Mechatronics) Semester 1**
Compulsory

| Code | Course Title | Credit Hours | No. of hours / week | | | | Prerequisite |
|---|---|---|---|---|---|---|---|
| | | | Lect. | Tut. | Lab. | Total | |
| **HUM103** | Principles of Scientific Thinking | 2 | 2 | 0 | 0 | 2 | |
| **BAS101** | Mathematics 3 | 3 | 2 | 2 | 0 | 4 | BAS006 |
| **MTE101** | Introduction to Mechatronics Engineering | 3 | 2 | 2 | 0 | 4 | BAS007 |
| **MTE102** | Thermodynamics | 3 | 2 | 2 | 0 | 4 | BAS007 |
| **MTE103** | Materials Science | 3 | 2 | 2 | 2 | 6 | BAS007 |
| **ICE102** | Electric Circuits | 4 | 2 | 2 | 3 | 7 | BAS007 |

**Year of Program 2 - (First Year Mechatronics) Semester 2**
Compulsory

| Code | Course Title | Credit Hours | No. of hours / week | | | | Prerequisite |
|---|---|---|---|---|---|---|---|
| | | | Lect. | Tut. | Lab | Total | |
| **HUM1XX** | Human Elective Course 1 | 2 | 2 | 0 | 0 | 2 | |
| **BAS106** | Mathematics 4 | 3 | 2 | 2 | 0 | 4 | BAS101 |
| **MTE104** | Fluid Mechanics | 4 | 2 | 2 | 3 | 7 | |
| **MTE105** | Dynamics of Rigid Bodies | 3 | 2 | 2 | 0 | 4 | BAS008 |
| **MTE106** | Project Planning | 3 | 2 | 2 | 0 | 4 | |
| **MTE107** | Electromagnetic Fields | 3 | 2 | 2 | 0 | 4 | BAS007 |

**Year of Program 3 - (Second Year Mechatronics) Semester 1**
Compulsory

| Code | Course Title | Credit Hours | No. of hours / week | | | | Prerequisite |
|---|---|---|---|---|---|---|---|
| | | | Lect. | Tut. | Lab. | Total | |
| **HUM205** | Economics | 2 | 2 | 0 | 0 | 2 | |
| **MTE201** | Heat Transfer | 3 | 2 | 2 | 1 | 5 | MTE102 |
| **MTE208** | Electrical Machines | 4 | 2 | 2 | 3 | 7 | ICE102 |
| **MTE202** | Mechanical Vibration | 3 | 2 | 2 | 0 | 4 | MTE105 |
| **MTE203** | Numerical Methods | 3 | 2 | 2 | 2 | 6 | BAS106 |
| **ICE204** | Advanced Electronic Circuits | 3 | 2 | 2 | 2 | 6 | BAS007 |

**Year of Program 3 - (Second Year Mechatronics) Semester 2**
Compulsory

| Code | Course Title | Credit Hours | No. of hours / week | | | | Prerequisite |
|---|---|---|---|---|---|---|---|
| | | | Lect. | Tut. | Lab. | Total | |
| **HUM2XX** | Human Elective Course 1 | 2 | 2 | 0 | 0 | 2 | |
| **MTE204** | Materials Technology | 3 | 2 | 2 | 2 | 6 | MTE103 |
| **MTE205** | Mechanical Design | 3 | 2 | 2 | 2 | 6 | MTE105 |
| **MTE206** | Measurements and Instrumentations | 3 | 2 | 2 | 2 | 6 | BAS007 |
| **MTE209** | Digital and Logic Circuits | 4 | 2 | 2 | 3 | 7 | ICE204 |
| **MTE207** | Quality Control | 3 | 2 | 2 | 0 | 4 | |

**Year of Program 4 - (Third Year Mechatronics) Semester 1**

Compulsory

| Code | Course Title | Credit Hours | No. of hours / week | | | | Prerequisite |
|---|---|---|---|---|---|---|---|
| | | | Lect. | Tut. | Lab | Total | |
| **HUM3XX** | Human Elective Course 1 | 2 | 2 | 0 | 0 | 2 | |
| **MTE301** | Introduction To System Dynamics | 3 | 2 | 2 | 0 | 4 | MTE206 |
| **MTE307** | Microprocessor | 3 | 2 | 2 | 2 | 6 | ICE204 |
| **MTE308** | Power Electronics | 4 | 2 | 2 | 3 | 7 | ICE204 |
| **MTE302** | Kinematics And Dynamics Of Machines | 3 | 2 | 2 | 0 | 4 | MTE205 |
| **MTE303** | Computer Aided Design | 3 | 2 | 0 | 3 | 5 | MTE205 |

**Year of Program 4 - (Third Year Mechatronics) Semester 2**

Compulsory

| Code | Course Title | Credit Hours | No. of hours / week | | | | Prerequisite |
|---|---|---|---|---|---|---|---|
| | | | Lect. | Tut. | Lab | Total | |
| **HUM308** | Business Administration | 2 | 2 | 0 | 0 | 2 | |
| **MTE304** | Principles Of Control Systems | 3 | 2 | 2 | 2 | 6 | MTE301 |
| **MTE309** | Microcontroller And Applications | 4 | 2 | 2 | 3 | 7 | MTE307 |
| **MTE305** | Design Mechatronics Systems | 3 | 2 | 2 | 0 | 4 | MTE301 |
| **MTE306** | Computer Numerical Control | 3 | 2 | 2 | 2 | 6 | MTE303 |
| **BAS302** | Statistics | 3 | 2 | 2 | 0 | 4 | |

**Year of Program 5 - (Fourth Year Mechatronics) Semester 1**

Compulsory

| Code | Course Title | Credit Hours | No. of hours / week | | | | Prerequisite |
|---|---|---|---|---|---|---|---|
| | | | Lect. | Tut. | Lab | Total | |
| **HUM4XX** | Human Elective Course 1 | 2 | 2 | 0 | 0 | 2 | |
| **MTE401** | Graduation Project (Phase 1) | 4 | 0 | 8 | 0 | 8 | |
| **MTE402** | Programmable Logic Controllers | 3 | 2 | 2 | 2 | 6 | MTE309 |
| **MTE403** | Digital Control Systems | 3 | 2 | 2 | 0 | 4 | MTE304 |
| **MTE404** | Robotic | 3 | 2 | 2 | 0 | 4 | MTE302 |
| **MTE41X** | Elective Course 2 | 3 | 2 | 2 | 0 | 4 | |

**Year of Program 5 (Fourth Year Mechatronics) Semester 2**

Compulsory

| Code | Course Title | Credit Hours | No. of hours / week | | | | Prerequisite |
|---|---|---|---|---|---|---|---|
| | | | Lect. | Tut. | Lab | Total | |
| **MTE405** | Graduation Project (Phase 2) | 4 | 0 | 8 | 0 | 8 | MTE401 |
| **MTE406** | Control of Pneumatic and Hydraulic Systems | 3 | 2 | 2 | 2 | 6 | MTE104 |
| **MTE407** | Modeling and Simulation of Dynamic Systems | 3 | 2 | 2 | 0 | 4 | MTE301 |
| **MTE408** | Feasibility Studies | 2 | 2 | 0 | 0 | 2 | |
| **MTE42X** | Elective Course 2 | 3 | 2 | 2 | 0 | 4 | |
| **MTE43X** | Elective Course 2 | 3 | 2 | 2 | 0 | 4 | |

## 8. Program Admission Requirements

Having Egyptian Secondary education or equivalent certificate with major in Mathematics, then after passing the preparatory year and fulfilling the admission requirements the students will beable to attend the department.

## 9. Regulations for progression and program completion

a) If the student requests for the repeat of a course, that he previously gained (F),he/ she will not gain more than (B+) of the repetition grade. When the cumulative grade is counted, the final grade only is counted. The final two grades will be recorded on the student's record. If the student gets fail grade more than one time, only one fail grade will be counted in the final cumulativeaverage.

b) The points obtained by the student in each course are counted as the number of hours approved for the course multiplied by the points obtained by the student according to the scale of estimates

c) The average grade point (GPA) for each semester as well as CGPA iscalculated according to the following equations:

$$\text{Average Quarterly Assessment Points (GPA)} = \frac{\text{The total point of credit hours awarded by the student in the semester}}{\text{Total credit hours for these courses registered in the semester}}$$

$$\text{Average Quarterly Assessment Points (CGPA)} = \frac{\text{Total credit points for all courses studied by the student until their date}}{\text{Total credit hours for all courses studied by the student until their date}}$$

**The total points of the grade of any course**

| Total Points | Grade | The student's Percentage |
|---|---|---|
| 4.00 | A+ | 97% and above |
| 4.00 | A | 93% and less than 97% |
| 3.70 | A- | 89% and less than 93% |
| 3.30 | B+ | 84% and less than 89% |
| 3.00 | B | 80% and less than 84% |
| 2.70 | B- | 76% and less than 80% |

| Total Points | Grade | The student's Percentage |
|---|---|---|
| 2.30 | C+ | 73% and less than 76% |
| 2.00 | C | 70% and less than 73% |
| 1.70 | C- | 67% and less than 70% |
| 1.30 | D+ | 64% and less than 67% |
| 1.00 | D | 60% and less than 64% |
| 0.00 | F | Less than 60% |

## 10. Teaching and Learning Methods

Considering that the program competences illustrate a wholistic status that would be achieved through a journey involves many different courses within different levels, and the final competence achievement can only be assessed at the end of its journey, each single competence is broken-down into measurable Learning Outcomes LOs that should be achieved in different courses.Thus, the program graduate competence may be considered as the final goal, while the courses LOs may be considered as the procedural aims/objectives. Hence, different teaching and learning methods are applied in program courses to cover the three domains given by the following table.For more details, please refer to the course specifications.

- **Teaching and Learning Methods**
  - Face-to-face Lecture
  - Online Education
  - Tutorial / Exercise
  - Group Discussions
  - Laboratory
  - Site Visit
  - Presentation
  - Collaborate Learning (Team Project)
  - Research and Reporting
  - Class Activity
  - Case Study
  - Assignments/homework
  - Brain Storming

| Teaching & Learning Methods | Learning Outcomes Domains (Courses LOs) | | |
|---|---|---|---|
| | Cognitive | Psychomotor | Affective |
| Face-to-face Lecture | ✓ | ✓ | ✓ |
| Online Education | ✓ | | ✓ |
| Tutorial / Exercise | | ✓ | ✓ |
| Group Discussions | ✓ | | |
| Laboratory | ✓ | ✓ | |
| Site Visit | | | ✓ |
| Presentation | ✓ | | ✓ |
| Collaborate Learning (Team Project) | ✓ | | ✓ |
| Research and Reporting | | ✓ | ✓ |
| Class Activity | ✓ | ✓ | |
| Case Study | ✓ | ✓ | |
| Assignments/homework | | ✓ | ✓ |
| Brain Storming | ✓ | ✓ | |

## 11. Assessment Methods of Program Intended Learning Outcomes:

Different assessment methods are applied in the program courses to assess these Learning Outcomes. The following table illustrates the assessment methods and what they assess in most cases. For further detail, refer to the courses' specifications

- Written Exams
- Online Exams
- Oral Exam
- Quizzes
- Lab Exam
- Take-Home Exam
- Research Assignments
- Reporting Assignments
- Project Assignments
- In-class Questions
- Class activities

| Formative assessment | Learning Outcomes Domains (Courses LOs) | | |
|---|---|---|---|
| | Cognitive | Psychomotor | Affective |
| Quizzes | ✓ | ✓ | ✓ |
| Research Assignments | ✓ | | ✓ |
| In-class Questions | ✓ | ✓ | ✓ |
| Class activities | ✓ | ✓ | ✓ |

| Summative assessments | Learning Outcomes Domains (Courses LOs) | | |
|---|---|---|---|
| | Cognitive | Psychomotor | Affective |
| Written Exams | ✓ | ✓ | ✓ |
| Online Exams | ✓ | ✓ | |
| Oral Exam | ✓ | ✓ | ✓ |
| Lab Exam | ✓ | ✓ | |
| Take-Home Exam | ✓ | ✓ | ✓ |
| Reporting Assignments | ✓ | | ✓ |
| Project Assignments | ✓ | ✓ | ✓ |

## 12. Evaluation of Program Learning Outcomes

| Evaluator | Tool | Sample |
|---|---|---|
| 1- Senior students | Questionnaire | Sample of 25% out of students in years 1,2 and 3 |
| 2- Alumni | Questionnaire | Sample of 25% of final year students |
| 3- Stakeholders (Employers) | Questionnaire | Samples from different sectors |
| 4-Internal Evaluator(s) | Internal Report | 1-2 reports |
| 5-ExternalEvaluator(s) | External Report | 1-2 reports |
| 6- Other | Non | ---- |

## Course Matrix with program Competences

The following matrix is used to judge the compatibility between the program competences and program courses

| Course Code | Course Name | Course type | Engineering Competencies (2018) | | | | | | | | | | "Department" Mechanical Engineering Competencies (NARS) | | | | "Discipline" Mechatronics Engineering Competencies (ARS) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | C5 | C6 |
| BAS001 | MATHEMATICS 1 | C | √ | | | | | | | √ | | | | | | | | | | | | |
| BAS 002 | PHYSICS 1 | C | √ | √ | | | | | | √ | | | | | | | | | | | | |
| BAS 003 | MECHANICS 1 | C | √ | | | | √ | | | | | √ | | | | | | | | | | |
| MTE003 | PRODUCTION TECHNOLOGY | C | √ | | √ | √ | √ | | | | | | | | | | | | | | | |
| MTE001 | ENGINEERING DRAWING 1 | C | √ | | √ | | | | | | √ | | | | | | | | | | | |
| ICE 001 | COMPUTER INTRODUCTION | C | √ | | √ | | √ | | | | | | | | | | | | | | | |
| HUM 001 | ENGLISH LANGUAGE | C | | | | | | | √ | √ | | | | | | | | | | | | |
| BAS007 | PHYSICS 2 | C | √ | √ | | | | | | √ | | | | | | | | | | | | |
| BAS006 | MATHEMATICS 2 | C | √ | | | | | | | √ | | | | | | | | | | | | |
| BAS008 | MECHANICS 2 | C | √ | | √ | | √ | | | | | | | | | | | | | | | |
| BAS 009 | ENGINEERING CHEMISTRY | C | √ | √ | | | | | | √ | | | | | | | | | | | | |
| MTE002 | ENGINEERING DRAWING 2 | C | √ | | √ | | | | | | √ | √ | | | | | | | | | | |
| HUM 002 | HISTORY OF ENGINEERING & TECHNOLOGY | C | | | √ | | | | | √ | √ | | | | | | | | | | | |

**Course Type:**

**C = Compulsory,**

**E = Elective**

| Course Code | Course Name | Course type | Engineering Competencies (2018) | | | | | | | | | | "Department" Mechanical Engineering Competencies (NARS) | | | | "Discipline" Mechatronics Engineering Competencies (ARS) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | C5 | C6 |
| BAS 101 | MATHEMATICS 3 | C | √ | | | | | | | √ | | | | | | | | | | | | |
| HUM 103 | PRINCIPLES OF SCIENTIFIC THINKING | C | | | | | √ | | | | √ | √ | | | | | | | | | | |
| MTE101 | INTRODUCTION TO MECHATRONICS ENGINEERING | C | √ | | | | √ | | | | | | √ | | | | √ | | | | | |
| MTE102 | THERMODYNAMICS | C | √ | | √ | | √ | | | | | √ | √ | | √ | | | | | | | |
| MTE103 | MATERIAL SCINCE | C | √ | √ | | | √ | | | | | | √ | | | | | | | | | |
| ICE102 | ELECTRIC CIRCUITS | C | √ | √ | | | | √ | √ | | | | | | | | | | | | √ | √ |
| HUM 104 | INDUSTRIAL SAFETY & ENVIRONMENTAL | E | √ | | √ | √ | | | | | | | | | | | | | | | | |
| HUM 105 | ENVIROMENTAL SCIENCES | E | | | √ | √ | | | | | √ | √ | | | | | | | | | | |
| BAS 106 | MATHEMATICS 4 | C | √ | | | | | | | √ | | | | | | | | | | | | |
| MTE104 | FLUID MECHANICS | C | √ | | | | | | | √ | | | √ | | | | | | | | | |
| MTE105 | DYNAMIC OF RIGID BODIES | C | √ | | √ | | | | | | | | √ | | | | | | | | | |
| MTE106 | PROJECT PLANNING | C | | | √ | | | √ | | √ | | | | | | √ | | | | | | |
| MTE107 | ELECTROMAGNETIC FIELDS | C | √ | √ | | | | | | | | | | | | √ | | √ | | | √ | |
| HUM 205 | ECONOMICS | C | | | | | | | | √ | | | | | | | | | | | | |
| MTE201 | HEAT TRANSFER | C | √ | √ | | | | | | √ | | | √ | | | | | | | | | |

| Course Code | Course Name | Course type | Engineering Competencies (2018) | | | | | | | | | | "Department" Mechanical Engineering Competencies (NARS) | | | | "Discipline" Mechatronics Engineering Competencies (ARS) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | C5 | C6 |
| MTE208 | ELECTRICAL MACHINES | C | √ | √ | | | | | | | | √ | | | √ | | | | | | √ | √ |
| MTE202 | MECHANICAL VIBRATION | C | √ | √ | | | | | | | | | √ | √ | | | | | | | | |
| MTE203 | NUMERICAL METHODS | C | √ | √ | | | √ | | | | | | √ | | | | | | | √ | | |
| ICE204 | ADVANCED ELECTRONIC CIRCUITS | C | √ | √ | | | | | | | | √ | | | | | √ | | | | √ | |
| HUM 206 | LAW AND ETHICS FOR ENGINEERING | E | | | | √ | | | √ | | √ | | | | | | | | | | | |
| HUM 207 | RESEARCH METHODS | E | | √ | | | √ | | | | | | | | | | | | | | | |
| MTE204 | MATERIALS TECHNOLOGY | C | √ | √ | | | √ | | | | | | √ | | | | | | | | | |
| MTE205 | MECHANICAL DESIGN | C | √ | | √ | | | | | | √ | √ | | √ | | | | | | | | |
| MTE206 | MEASURMENTS AND INSTRUMENTATION | C | √ | √ | | √ | √ | | | | | | √ | | √ | | | | | | | |
| MTE209 | DIGITAL AND LOGIC CIRCUITS | C | √ | √ | | | | | | | | | | | √ | | | | | | √ | √ |
| MTE207 | QUALITY CONTROL | C | | | | √ | | | | √ | | | | | | √ | | | √ | | | |
| HUM 307 | COMMUNICATION SKILLS | E | | | | | | | √ | √ | | | | | | | | | | | | |
| MTE301 | INTRODUCTION TO SYSTEM DYNAMICS | C | √ | | | | | | | | | | √ | √ | | | | | | | | |
| MTE307 | MICROPROCESSOR | C | √ | √ | √ | | | | | | | | √ | √ | | √ | √ | | | √ | √ | √ |
| MTE308 | POWER ELECRONICS | C | √ | | | | √ | | | | √ | | | | | | √ | | | | √ | √ |

| Course Code | Course Name | Course type | Engineering Competencies (2018) | | | | | | | | | | "Department" Mechanical Engineering Competencies (NARS) | | | | "Discipline" Mechatronics Engineering Competencies (ARS) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | C5 | C6 |
| MTE302 | KINEMATICS AND DYNAMOCS Of MACHINES | C | | | √ | | | | | | | | | √ | √ | | | | | | | |
| MTE303 | COMPUTER AIDED DESIGN | C | | √ | | | | | | √ | | | | √ | | | | | √ | | | |
| HUM 308 | BUSINESS ADMINISTRATION | C | √ | | √ | | √ | | | √ | | | | | | | | | | | | |
| HUM 309 | PSYCHOLOGY | E | | | | | √ | | √ | √ | | | | | | | | | | | | |
| MTE304 | PRINCIPLES OF CONTROL SYSTEMS | C | √ | √ | | | | | | | | | √ | | | | √ | √ | √ | | | |
| MTE309 | MICROCONTROLLER AND APPLICATIONS | C | | √ | √ | √ | | | | | | √ | | | √ | √ | | | √ | √ | | √ |
| MTE305 | DESIGN MECHATRONICS SYSTEMS | C | √ | | √ | | | | | | √ | √ | | √ | | | | | | | | |
| MTE306 | COMPUTER NUMERICAL CONTROL | C | √ | √ | | | | | | | | √ | | | | √ | | | √ | | | |
| BAS302 | STATISTICS | C | √ | √ | √ | | | | | | | | | | | | | | | | | |
| HUM 410 | THECHNICAL REPORT WRITING | E | | | | | √ | | √ | √ | √ | √ | | | | | | | | | | |
| HUM 411 | MARKETING | E | | | | | | | | | √ | √ | | | | | | | | | | |
| MTE401 | GRADUATION PROJECT (Phase 1) | C | √ | √ | | | √ | √ | √ | | | √ | √ | √ | √ | | √ | √ | √ | | | √ |
| MTE402 | PROGRAMMABLE LOGIC CONTROLLERS | C | | | √ | | | | | | | | √ | | | | √ | | √ | | √ | √ |
| MTE403 | DIGITAL CONTROL SYSTEMS | C | √ | | | | | | | | | | √ | | | | √ | √ | √ | | √ | √ |

| Course Code | Course Name | Course type | Engineering Competencies (2018) | | | | | | | | | | "Department" Mechanical Engineering Competencies (NARS) | | | | "Discipline" Mechatronics Engineering Competencies (ARS) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | C5 | C6 |
| MTE404 | ROBOTIC | C | √ | | √ | √ | | | | | | | | | | √ | | | | | | |
| MTE41X | TURBO MACHINERY | E | √ | | | | | | | | | √ | √ | | √ | | | | | | | |
| MTE41X | RENEWABLE ENERGY | E | √ | √ | | | √ | | | | | | √ | | | | | | | | | |
| MTE41X | REFREGIRATION & AIR CONDITIONING | E | √ | | √ | | | | | | | | √ | √ | √ | √ | | | | | | |
| MTE405 | GRADUATION PROJECT (Phase 2) | C | √ | √ | | | √ | √ | √ | | | √ | √ | √ | √ | | √ | √ | √ | | | √ |
| MTE406 | CONTROL OF PENUMATIC AND HYDRAULIC SYSTEMS | C | √ | | √ | | | | | | √ | √ | | √ | | | | | | | | |
| MTE407 | Modeling and Simulation of Dynamic Systems | C | √ | | | | | | | | | | √ | √ | | | | √ | √ | √ | | √ |
| MTE408 | FEASIBILITY STUDIES | C | | | | | √ | | | √ | | | √ | | | | | | | | | |
| MTE42X | DIGITAL SIGNAL PROCESSING | E | √ | √ | √ | | | √ | | | | | | | | | | | | | √ | √ |
| MTE42X | IMAGE PROCESSING | E | √ | √ | √ | | | √ | | | | | | | | | | | | | √ | √ |
| MTE42X | FUZZY LOGIC | E | √ | | | √ | | | | | √ | √ | √ | | √ | | √ | | √ | | | √ |
| MTE43X | ARTIFICIAL INTELLIGENCE | E | √ | √ | √ | | | √ | | | √ | √ | | | | | | | | | √ | √ |
| MTE43X | Flexible manufacturing systems | E | | | √ | | | √ | | | | | | √ | | | | | | | √ | |
| MTE43X | Computer Aided Manufacturing | E | √ | | √ | | | | | | | | √ | √ | | | | | | | | |