



# **Electromechanical Engineering Program**



**B.Sc. Program Specification**

**Bylaw 2023 according to NARS2018**

**Benha University – Benha Faculty of Engineering**

**2024-2025**

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*Wael A. Mohamed*

**Date:** 19 / 11 / 2024

## **A- General**

### **1. Basic Information**

<b>Program Title</b>	Electromechanical Engineering Program
<b>Program Type</b>	<input checked="" type="checkbox"/> Single <input type="checkbox"/> Double <input type="checkbox"/> Multiple
<b>Department responsible of program</b>	Mechanical Engineering Program Electrical Engineering Program
<b>Program Coordinator</b>	Assoc. Prof. Wael Abdel-Rahman Mohamed
<b>Quality Coordinator</b>	Dr. Beshoy Abdou Aziz Ayoub
<b>Date of program Approval</b>	2023
<b>Internal Evaluator</b>	Prof. Saleh Hemida Mohamed Kaytbay
<b>Date of Internal Evaluator</b>	September 2024
<b>Program URL</b>	<a href="https://beng.bu.edu.eg/index.php/programs/electromechanical-engineering-program">https://beng.bu.edu.eg/index.php/programs/electromechanical-engineering-program</a>

## **B- Professional Information**

### **1. Program Mission**

Electromechanical Engineering Program is committed to graduate engineers with an outstanding knowledge and specialized skills, keeping up with the rapid developing trends, and providing research to serve society and the community.

### **2. Program Objectives (PO's)**

The objectives of the BSc in the Electromechanical Engineering program are to enable its graduates to:

**PO1.** Apply a wide spectrum of engineering knowledge, science and specialized skills with analytic, critical and systemic thinking to identify and solve engineering problems in real life situation.

**PO2.** Behave professionally and adhere to engineering ethics and standards and work to develop the profession and the community and promote sustainability principles.

**PO3.** Work in and lead a heterogeneous team and display leadership qualities, business administration, and entrepreneurial skills.

**PO4.** Master self-learning and life -long learning strategies to communicate effectively in academic/professional fields.

**PO5.** Solve problems in the areas of integrated mechanics, electronics, computers, and software systems.

**PO6.** Capable of analyzing and investigating the inter-disciplinary characteristics of mechanical, electrical, and hydraulic systems.

### **3. Graduates Attributes (GA's)**

By the completion of the Electromechanical Engineering program of study, and according to NARS 2018, the graduate will be capable to:

- 1.** Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.
- 2.** Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems 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 specialties and assume responsibility for own and team performance.
- 5.** Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community;
- 6.** Value the importance of the environment, both physical and natural, and work to promote sustainability 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 learning and 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.

In addition to all engineering graduate attributes defined by NARS 2018, Electromechanical Engineering graduate should be able to:

- 11.** Communicate effectively with experience to the use of computer applications in various electromechanical engineering disciplines.
- 12.** Produce a design system that satisfies a given specification in electromechanical system.
- 13.** Evaluate the sustainability and environmental issues related to electromechanical systems.
- 14.** Solve problems in the areas of integrated mechanics, electronics, computers, and software systems, and analyze and investigate the inter-disciplinary characteristics of mechanical, electrical, and hydraulic systems.

#### **4. Program Competencies (PC's)**

The program courses fulfill the **NARS 2018**

In addition to the competencies for all Engineering Programs (**A-Level**), the Electromechanical Engineering Program graduate must be able to (**B-Level**) and (**D-Level**):

##### **Level A: The engineering graduate must be able to:**

- A1.** Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
- A2.** 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.
- A3.** 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.
- A4.** Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
- A5.** Practice research techniques and methods of investigation as an inherent part of learning.
- A6.** Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
- A7.** Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
- A8.** Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
- A9.** Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
- A10.** Acquire and apply new knowledge, and practice self, lifelong and other learning strategies.

##### **Level B: In addition to the competences for all Engineering Programs (A-Level), the Electromechanical Engineering Program graduate must be able to (B-Level from NARS2018 Mechanical Department Competences):**

- B1.** 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.

**B2.** 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.

**B3.** Select conventional mechanical equipment according to the required performance.

**B4.** Adopt suitable national and international standards and codes; and integrate legal, economic and financial aspects to design, build, operate, inspect and maintain mechanical equipment and systems.

**Level D: In addition to the competences for all Engineering Programs (A-Level), and Mechanical Engineering (B-Level) the Electromechanical Engineering Program graduate must be able to (D-Level from NARS2018 Electrical Department Competences) (Selected Competencies not all competencies):**

**D1.** Select, model, and analyze electrical power systems applicable to the specific discipline by applying the concepts of generation, transmission, and distribution of electrical power systems.

**D2.** Design, model and analyze an electrical / electronic / digital system or component for a specific application; and identify the tools required to optimize this design.

**D3.** Design and implement elements, modules, sub-systems, or systems in electrical engineering using technological and professional tools.

**D4.** Estimate and measure the performance of an electrical / electronic / digital system and circuit under specific input excitation and evaluate its suitability for a specific application.

**D5.** Adopt suitable national and international standards and codes to: design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

## **5. Program Academic Standards**

- Academic reference Standards of Electromechanical Engineering program approved by faculty council in **12/11/2019 No. 385**

## **6. Reference standards**

- National Academic Reference Standards of (NARS) 2018 which were issued by the National Authority for Quality Assurance & Accreditation of Education NAQAAE.

## **7. Program Structure and Contents**

### **7.1 Program Duration: (9 semesters)**

## 7.2 Program Structure:

<b>Total hours of the program:-</b>	<b>160</b> hours
<b>Theoretical:-</b>	<b>113</b> hours
<b>Practical/Exercises:-</b>	<b>163</b> hours
<b>Compulsory Courses:-</b>	<b>136</b> Credit hours
<b>Elective Course:-</b>	<b>18</b> Credit hours
<b>Humanity – Elective :-</b>	<b>6</b> Credit hours
<b>Selective:-</b>	None

Subject Area	Required	Program Total Credit Hours	
		Hours of five Levels	% Hours of five Levels
Humanities and Social Sciences	9-12%	14	8.75
Mathematics and Basic Sciences	20-26%	36	22.5
Basic Engineering Sciences	20-23%	33	20.625
Applied Engineering and Design	20-22%	34	21.25
Computer Applications and ICT	9-11%	17	10.625
Projects and Practice	8-10%	14	8.75
Discretionary	6-8%	12	7.5

## 7.3 Program Courses Vs. Requirements

### 7.3.1 List of Compulsory Courses

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Requirements			
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirements
Level 0	FRB001	Analytical geometry & Linear Algebra	.....	3	2	0	2	4		3		
	FRB003	Statics	.....	3	2	0	2	4		3		
	FRB005	Waves and Heat	.....	3	2	2	1	5		3		
	FRB007	Chemistry for Engineers	.....	4	3	2	1	6		4		
	FRM009	Engineering Drawing	.....	2	0	0	4	4		2		
	UHS101	Foreign Language	.....	2	2	0	0	2	2			
	UHS103	Social issues	.....	2	2	0	0	2	2			
	FRB002	Integration & Multivariable functions	FRB001	3	2	0	2	4		3		
	FRB004	Dynamics	FRB003	3	2	0	2	4		3		
	FRB006	Electricity and Magnetism	.....	3	2	2	1	5		3		
	FRM008	Production Systems Engineering	.....	2	1	3	0	4		2		
	FRM010	Computer Aided Drafting	FRM009	2	1	2	0	3		2		
	FRE012	Computer Programming Fundamentals	.....	2	0	2	2	4		2		
	UHS102	Information and Communication Technology	.....	2	2	0	0	2	2			
Level 1	FRB 101	Engineering Differential Equations	FRB 002	3	2	0	2	4			3	
	EMM 101	Fluid Mechanics I	FRB 004	2	2	1	0	3			2	
	EMM 103	Mechanics of Machinery	FRB 004	3	2	0	2	4			3	
	EME 105	Electric Circuits Analysis	FRB 006	3	2	1	2	5			3	



Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Requirements			
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirements
	EMM 107	Strength and properties of Materials	FRB 004	2	2	1	0	3			2	
	EMM 109	Thermodynamics I	FRB 005	2	2	1	0	3			2	
	FRB 103	Environmental Pollution and Industrial Safety	FRB 007	2	2	1	0	3		2		
	FRB 104	Engineering Numerical Analysis	FRB 101	3	2	0	2	4			3	
	EMM 102	Fluid Mechanics II	EMM 101	2	2	1	0	3			2	
	EMM 104	Manufacture Technology	FRM 008	3	2	2	0	4			3	
	EME 106	Electrical Machines	EME 105	3	2	1	1	4			3	
	EMM 108	Measurements and Instrumentation	FRB 006	3	2	1	1	4			3	
	EMM 110	Solid Mechanics	EMM 107	2	2	1	0	3			2	
EMM 112	Thermodynamics II	EMM 109	2	2	1	0	3			2		
Level 2	FRB 201	Applied Engineering Probability and Mathematical Statistics	FRB 002	3	2	0	2	4			3	
	EME 201	Logic Circuits and Micro processors	EME 105	3	2	1	2	5			3	
	EMM 203	Heat Transfer	EMM 109	3	2	1	1	4			3	
	EMM 205	Projects Management	.....	2	2	0	1	3			2	
	EME 207	Electrical Power Systems	EME 106	3	2	0	2	4			3	
	EMM 209	Design of Machine Elements	EMM 104 & EMM 110	3	2	1	2	5			3	
	FRB 206	Multiple Integrals & Complex Analysis	FRB 002	3	2	0	2	4			3	
	EMM 202	Vibrations and System Dynamics	EMM 103, EMM 107	3	2	1	1	4			3	
	EMM 204	Plumbing Systems	EMM 102	3	2	0	2	4				3
	EME 206	Electronic Devices and Circuits	EME 201	3	2	1	1	4			3	
EMM 208	Fluid Machinery	EMM 102	3	2	1	1	4			3		

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Requirements			
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirements
	EME 210	Electric Power Distribution Systems	EME 207	3	2	0	3	5				3
Level 3	EMM 301	Refrigeration	EMM 112	2	2	1	0	3				2
	EMM 303	Air Conditioning Systems	EMM 112	3	2	1	1	4				3
	EME 305	Low Current Distribution Systems	EME 210	3	2	0	2	4				3
	EMM 307	Fire Fighting Systems	EMM 102	3	2	0	2	4				3
	EMM 309	Combustion	EMM 112	3	2	1	1	4			3	
	UHS XXX	Humanities Elective I	.....	2	2	0	0	2	2			
	UHS XXX	Humanities Elective II	.....	2	2	0	0	2	2			
	EMM 302	Refrigeration and AC Systems/Components	EMM 301 & EMM 303	3	2	1	1	4				3
	EME 304	Automatic Control	EME 106	2	2	1	0	3			2	
	EMM 3XX	Elective I	*	3	2	0	2	4				3
	EME 3XX	Elective II	*	3	2	0	2	4				3
	EMM 3XX	Elective III	*	3	2	0	2	4				3
	EMM 390	Senior Design Project I	**	2	0	4	0	4				2
UHS 104	Professional Ethics	.....	2	2	0	0	2	2				
Level 4	EMM 401	Computer Applications in El/Mec System	EME 305 & EMM 303	2	1	2	0	3				2
	EMM 403	Process Control and Building management System	EME 304	2	2	1	0	3				2
	EMM 3XX	Elective IV	*	3	2	0	2	4				3
	EME 3XX	Elective V	*	3	2	0	2	4				3
	EMM 3XX	Elective VI	*	3	2	0	2	4				3
	UHS XXX	Humanities Elective III	.....	2	2	0	0	2	2			

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Requirements			
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirements
	EMM 490	Senior Design Project II	EMM 390	3	1	4	0	5				3
FT	FT 103	Field Training I	***									
	FT 203	Field Training II	****									
<b>Total hours of five Levels</b>									<b>14</b>	<b>32</b>	<b>67</b>	<b>47</b>
<b>% Hours of five Levels</b>									<b>8.75</b>	<b>20</b>	<b>41.875</b>	<b>29.375</b>
<b>Reference Ratio</b>									<b>Min 8%</b>	<b>Min 20%</b>	<b>Min 35%</b>	<b>Max 30%</b>
<b>** The student can register for the Senior Design Project course after passing 70% of the program cr. hr<sub>s</sub>, 112 hr<sub>s</sub></b>												
<b>*** Completion of 65 Credit Hours</b>												
<b>****Completion of 96 Credit Hours</b>												

### 7.3.2 List of Elective Courses

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Subject Area				
	Code	Course Title		Cr.Hrs	Lect.	Lab.	Tut.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirements	
Elective Course-1	Four	EMM 312	Renewable Energy	EME 106 & EMM 109	3	2	0	2	4				3
		EMM 314	Elevators and Escalators	EMM 209	3	2	0	2	4				3
		EMM 316	Solar Thermal and PV Systems	EMM 203	3	2	0	2	4				3
Elective Course-2	Four	EME 322	Advanced Industrial Electronics	EME 206	3	2	0	2	4				3
		EME 324	Electrical Protection	EME 305	3	2	0	2	4				3
		EME 326	Electrostatic and Electromagnetic Fields	EME 106	3	2	0	2	4				3
Elective Course-3	Four	EMM 332	Internal Combustion Engines	EMM 309	3	2	0	2	4				3
		EMM 334	Essentials of Energy Management	EMM 205	3	2	0	2	4				3
		EMM 336	Wind Energy System Design	EMM 208 & EMM 309	3	2	0	2	4				3
Elective Course-4	Four	EMM 411	Cold Stores and Industrial Refrigeration	EMM 301	3	2	0	2	4				3
		EMM 413	Automotive Engineering	EMM 309	3	2	0	2	4				3
		EMM 415	Power Stations	EMM 112	3	2	0	2	4				3
Elective Course-5	Four	EME 421	Electro-Hydraulic Circuits	EME 304	3	2	0	2	4				3
		EME 423	Codes and Specifications of El/Mec Systems	EMM 302 & EME 305	3	2	0	2	4				3
		EME 425	Computer Networks	EME 105	3	2	0	2	4				3
Elective Course-6	Four	EMM 431	Modern Control System	EME 304	3	2	0	2	4				3
		EMM 433	Power System Analysis	EME 305	3	2	0	2	4				3
		EMM 435	Electrical Drives	EME 106 & EME 304	3	2	0	2	4				3

### 8. Subject Area

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Subject Area						
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	Humanities and Social Sciences	Mathematics and Basic Sciences	Basic Engineering Sciences	Applied Engineering and Design	Computer Applications and ICT	Projects and Practice	Discretionary
Level 0	FRB001	Analytical geometry & Linear Algebra	.....	3	2	0	2	4		3					
	FRB003	Statics	.....	3	2	0	2	4		3					
	FRB005	Waves and Heat	.....	3	2	2	1	5		3					
	FRB007	Chemistry for Engineers	.....	4	3	2	1	6		4					
	FRM009	Engineering Drawing	.....	2	0	0	4	4			2				
	UHS101	Foreign Language	.....	2	2	0	0	2	2						
	UHS103	Social issues	.....	2	2	0	0	2	2						
	FRB002	Integration & Multivariable functions	FRB001	3	2	0	2	4		3					
	FRB004	Dynamics	FRB003	3	2	0	2	4		3					
	FRB006	Electricity and Magnetism	.....	3	2	2	1	5		3					
	FRM008	Production Systems Engineering	.....	2	1	3	0	4			2				
	FRM010	Computer Aided Drafting	FRM009	2	1	2	0	3					2		
	FRE012	Computer Programming Fundamentals	.....	2	0	2	2	4			2				
	UHS102	Information and Communication	.....	2	2	0	0	2	2						

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Subject Area						
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	Humanities and Social Sciences	Mathematics and Basic Sciences	Basic Engineering Sciences	Applied Engineering and Design	Computer Applications and ICT	Projects and Practice	Discretionary
		Technology													
Level 1	FRB 101	Engineering Differential Equations	FRB 002	3	2	0	2	4		3					
	EMM 101	Fluid Mechanics I	FRB 004	2	2	1	0	3			2				
	EMM 103	Mechanics of Machinery	FRB 004	3	2	0	2	4			3				
	EME 105	Electric Circuits Analysis	FRB 006	3	2	1	2	5			3				
	EMM 107	Strength and properties of Materials	FRB 004	2	2	1	0	3			2				
	EMM 109	Thermodynamics I	FRB 005	2	2	1	0	3			2				
	FRB 103	Environmental Pollution and Industrial Safety	FRB 007	2	2	1	0	3		2					
	FRB 104	Engineering Numerical Analysis	FRB 101	3	2	0	2	4		3					
	EMM 102	Fluid Mechanics II	EMM 101	2	2	1	0	3			2				
	EMM 104	Manufacture Technology	FRM 008	3	2	2	0	4				3			
	EME 106	Electrical Machines	EME 105	3	2	1	1	4				3			
	EMM 108	Measurements and Instrumentation	FRB 006	3	2	1	1	4				3			
EMM 110	Solid Mechanics	EMM 107	2	2	1	0	3				2				
EMM 112	Thermodynamics II	EMM 109	2	2	1	0	3			2					

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Subject Area						
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	Humanities and Social Sciences	Mathematics and Basic Sciences	Basic Engineering Sciences	Applied Engineering and Design	Computer Applications and ICT	Projects and Practice	Discretionary
Level 2	FRB 201	Applied Engineering Probability and Mathematical Statistics	FRB 002	3	2	0	2	4		3					
	EME 201	Logic Circuits and Micro processors	EME 105	3	2	1	2	5			3				
	EMM 203	Heat Transfer	EMM 109	3	2	1	1	4			3				
	EMM 205	Projects Management	.....	2	2	0	1	3			2				
	EME 207	Electrical Power Systems	EME 106	3	2	0	2	4				3			
	EMM 209	Design of Machine Elements	EMM 104 & EMM 110	3	2	1	2	5				3			
	FRB 206	Multiple Integrals & Complex Analysis	FRB 002	3	2	0	2	4		3					
	EMM 202	Vibrations and System Dynamics	EMM 103, EMM 107	3	2	1	1	4			3				
	EMM 204	Plumbing Systems	EMM 102	3	2	0	2	4						3	
	EME 206	Electronic Devices and Circuits	EME 201	3	2	1	1	4				3			
	EMM 208	Fluid Machinery	EMM 102	3	2	1	1	4				3			
EME 210	Electric Power Distribution Systems	EME 207	3	2	0	3	5						3		
Level 3	EMM 301	Refrigeration	EMM 112	2	2	1	0	3				2			
	EMM 303	Air Conditioning Systems	EMM 112	3	2	1	1	4				3			
	EME 305	Low Current Distribution Systems	EME 210	3	2	0	2	4					3		

Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Subject Area						
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	Humanities and Social Sciences	Mathematics and Basic Sciences	Basic Engineering Sciences	Applied Engineering and Design	Computer Applications and ICT	Projects and Practice	Discretionary
	EMM 307	Fire Fighting Systems	EMM 102	3	2	0	2	4						3	
	EMM 309	Combustion	EMM 112	3	2	1	1	4				3			
	UHS XXX	<b>Humanities Elective I</b>	.....	2	2	0	0	2	2						
	UHS XXX	<b>Humanities Elective II</b>	.....	2	2	0	0	2	2						
	EMM 302	Refrigeration and AC Systems/Components	EMM 301 & EMM 303	3	2	1	1	4				3			
	EME 304	Automatic Control	EME 106	2	2	1	0	3					2		
	EMM 3XX	<b>Elective I</b>	*	3	2	0	2	4							3
	EME 3XX	<b>Elective II</b>	*	3	2	0	2	4							3
	EMM 3XX	<b>Elective III</b>	*	3	2	0	2	4							3
	EMM 390	Senior Design Project I	**	2	0	4	0	4						2	
	UHS 104	Professional Ethics	.....	2	2	0	0	2	2						
Level 4	EMM 401	Computer Applications in EI/Mec System	EME 305 & EMM 303	2	1	2	0	3					2		
	EMM 403	Process Control and Building management System	EME 304	2	2	1	0	3					2		
	EMM 3XX	<b>Elective IV</b>	*	3	2	0	2	4							3
	EME 3XX	<b>Elective V</b>	*	3	2	0	2	4					3		
	EMM 3XX	<b>Elective VI</b>	*	3	2	0	2	4					3		



Level	Courses		Pr. Req.	Weekly Contact Hours					Credit Hours of Subject Area						
	Code	Course Title		Cr. Hrs	Lect.	Lab.	Tut.	Total	Humanities and Social Sciences	Mathematics and Basic Sciences	Basic Engineering Sciences	Applied Engineering and Design	Computer Applications and ICT	Projects and Practice	Discretionary
	UHS XXX	Humanities Elective III	.....	2	2	0	0	2	2						
	EMM 490	Senior Design Project II	EMM 390	3	1	4	0	5						3	
FT	FT 103	Field Training I	***												
	FT 203	Field Training II	****												
<b>Total hours of five Levels</b>									<b>14</b>	<b>36</b>	<b>33</b>	<b>34</b>	<b>17</b>	<b>14</b>	<b>12</b>
<b>% Hours of five Levels</b>									<b>8.75</b>	<b>22.5</b>	<b>20.625</b>	<b>21.25</b>	<b>10.625</b>	<b>8.75</b>	<b>7.5</b>
<b>Reference Ratio from NARS</b>									9-12%	20-26%	20-23%	20-22%	9-11%	8-10%	6-8%
<b>** The student can register for the Senior Design Project course after passing 70% of the program cr. hr<sub>s</sub>, 112 hr<sub>s</sub></b>															
<b>*** Completion of 65 Credit Hours</b>															
<b>****Completion of 96 Credit Hours</b>															

## **9. Program Admission Requirements**

- For obtaining a bachelor's degree in Electromechanical Engineering, registration is allowed for those who have a general secondary certificate or who are transferred from other faculties.
- Students who are not enrolled directly to the faculty of engineering, Benha University, through the National Coordination Office, but has achieved the minimum Engineering Sector requirement, can join the programs paying the separate Tuition Fees decided by the Faculty Council every year
- The required bachelor's degree duration **must not be less than 9 semesters**.
- The maximum study limit **is ten academic years**, provided that the student is enrolled at the minimum credit limit for one semester.
- The academic year consists of three semesters:
  - The first semester (the **Fall Semester**) and its duration is fifteen weeks and starts on the third Saturday of September.
  - The second semester (**Spring Semester**) and its duration is fifteen weeks and starts on the second Saturday of February.
  - The **Summer Semester** and its duration is not less than seven weeks and starts from the first Saturday of July.

## **10. Regulations for Progression and Program Completion**

- For obtaining a bachelor's degree from the Faculty of Engineering in Benha in the new program, Credit Hours system, the student should be successfully passed in **160 credit hours**, and with average points of **at least 2.00**
- Success in the graduation Project
- **Zero-Credit courses are marked as Pass or Fail (as the Summer Training)**. The student gets a grade but does not contribute to the cumulative GPA. To pass the course, the student should get at least 60% of the course total marks.
- The grades for each course are distributed in percentages between the semester work of research, reports and tests, Practical/oral exams, mid-semester exam, final written exam.
- A written exam is held for each course in the middle of the semester and a written exam at the end of the semester.
- The grades for each course are distributed according to the following table:

<b>Work</b>	<b>Week</b>	<b>% Degree</b>
<b>First Exam (mid-term)</b>	7	30
<b>Second Exam (Written or Experimental Exam )</b>	12	20
<b>Semester Work</b>	During the Semester	10
<b>Final Exam</b>	16	40

- grades for a project Graduation, are evaluated based on 50% semester work and 50% end-of-year discussion
- The student fails the course if he obtains an F grade (less than 60% of the course marks) or was not allowed to attend the final examination because of exceeding the absence percentage or cheating ... etc. or did not attend the final examination without submitting a prior excuse that is approved by the council of the administration of the program.
- For the student to pass a course, the minimum mark that must be earned in the final exam is 30% of the total exam marks, otherwise the student will fail the course irrespective of the total marks he earned in the course, and he will get an F grade in this course.
- The student must attend at least 75% of all course contact hours to be allowed to attend the course final examination.
- If the grades of one of the courses include a practical or oral test, they are included in the grades of the written exam (Second Exam).
- A student that absents from the final written exam is considered failed the course.
- If one of the courses does not include a written exam (such as the graduation project), the practical or oral exams are treated as the written exam.

## **11. Course Grades , Honors and Awards**

- The student will be assessed in the exams each academic year, and the total grade will be according to one of the following:
  - **A<sup>+</sup>** : More than 97% (Points =4.00), **A** : (93- 97)% (Points =4.00), **A<sup>-</sup>**:(89- 93)% (Points = 3.70)
  - **B<sup>+</sup>** : (84-89)% (Points =3.30), **B** : (80-84)% (Points =3.00), **B<sup>-</sup>**:(76-80)% (Points=2.70)
  - **C<sup>+</sup>** : (73-76)% (Points =2.30), **C** : (70-73)% (Points =2.00), **C<sup>-</sup>**:(67-70)% (Points=1.70)
  - **D<sup>+</sup>** : (64-67)% (Points =1.30), **D** : (60-64)% (Points =1.00)
  - **F** : Less than 60%(Points=0.00)
- For a student to achieve the declaration of honor, he has to fulfill the following conditions:
  - Maintain a cumulative GPA of 3.3 throughout his study at the Program and any semester GPA should be higher than or equal 3.3.
  - Does not fail any course throughout his study at the Program.
  - Did not get any penalty throughout his study at the Faculty
- When a student repeats a course in which he previously obtained a grade (F) or was absent without an excuse (NE), the grade he obtained in the repetition is calculated with a maximum of (B+). but when he studies a course in which he previously obtained a grade of absence with an excuse (E), the grade is calculated for him which he obtained in the replay.

- In all cases, when calculating the cumulative average, it is calculated the last grade only, provided that both grades are mentioned in the student's academic record.
- The points obtained by the student in each course are calculated as the number of credit hours for the course multiplied by the points obtained by the student according to the table of grades.
- Calculates the GPA Semester average score for any semester, by dividing the sum of Points earned by the student in this semester, divided by the total credit hours for these courses.
- The cumulative GPA is calculated at the end of each semester by dividing the sum of all course points that the student has studied by the sum of credit hours for these courses.
- The total cumulative point average is calculated by dividing the sum of all course's points by the total number of credit hours studied by the student for these courses.

## **12. Teaching and Learning Methods**

<b>Teaching &amp; Learning Methods</b>
Lecture
Tutorials
Computer-based Instruction
Problem-based Learning
Project-based Learning
Interactive Learning
Presentations
Report
Co-operative Learning
Brain Storming
Projects
Discussion
Practical-based Learning
Self-Learning
Case Study
Practical-based Learning
Hybrid Learning

### 13. Student Assessment (Methods and Rules for Student Assessment)

Assessment Methods		
<b>Formative Assessment</b>	Tests	Oral Test
		Mid- term
		Experimental
		Quizzes
	Reports	
	Observation	
	Discussions	
	Projects	Projects
		Mini Projects
	Assignments	
Presentations		
<b>Summative Assessment</b>	Practical Exam	
	Oral Exam	
	Final Exam	

### 14. Program Evaluation

Evaluator	Tool	Sample
Senior Students	Questionnaire-meeting	50% of the students
Graduates	Questionnaire-meeting	25 % of the Graduates
Stakeholders	Questionnaire-meeting	10
Internal Evaluator	Report	9/2024

## **15. Program Matrices**

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### 15.1 Faculty Mission Vs. Program Mission Matrix

Faculty Mission		Program Mission		
		Electromechanical Engineering Program is committed to graduate engineers with an outstanding knowledge and specialized skills, keeping up with the rapid developing trends, and providing research to serve society and the community.		
		Program is committed to graduate engineers with an outstanding knowledge and specialized skills	Keeping up with the rapid developing trends	Providing research to serve society and community.
Benha Faculty of Engineering - Benha University is committed to graduate well prepared engineers equipped with knowledge and skills necessary to compete in labor market, and capable of using and developing modern technology, and providing research in engineering fields to serve society and community.	Benha Faculty of Engineering - Benha University is committed to graduate well prepared engineers equipped with knowledge and skills necessary to compete in labor market	*		
	Capable of using and developing modern technology		*	
	Providing research in engineering fields to serve society and community			*

### 15.2 Program Mission Vs. Program Objectives Matrix

Program Mission		Program Objectives					
		PO1	PO2	PO3	PO4	PO5	PO6
Electromechanical Engineering Program is committed to graduate engineers with an outstanding knowledge and specialized skills, keeping up with the rapid developing trends, and providing research to serve society and the community.	Program is committed to graduate engineers with an outstanding knowledge and specialized skills	*				*	*
	Keeping up with the rapid developing trends		*	*	*	*	*
	Providing research to serve society and community.				*		*

**15.3 Program Competencies Vs. (NARS 2018) CBE Matrix**

Program Competencies	(NARS 2018) CBE Matrix																	
	A – Level										Mechanical				Electrical			
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B1	B2	B3	B4
A 1	*																	
A 2		*																
A 3			*															
A 4				*														
A 5					*													
A 6						*												
A 7							*											
A 8								*										
A 9									*									
A 10										*								
B 1											*							
B 2												*						
B 3													*					
B 4														*				
D 1															*			
D 2																*		
D 3																	*	
D 4																		*



**15.4 Program Learning Outcomes Vs. (NARS 2018) CBE Matrix**

Program Learning Outcomes	(NARS 2018) CBE Matrix																	
	A – Level										Mechanical				Electrical			
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B1	B2	B3	B4
PLO 1	*																	
PLO 2		*																
PLO 3			*															
PLO 4				*														
PLO 5					*													
PLO 6						*												
PLO 7							*											
PLO 8								*										
PLO 9									*									
PLO 10										*								
PLO 11											*							
PLO 12												*						
PLO 13													*					
PLO 14														*				
PLO 15															*			
PLO 16																*		
PLO 17																	*	
PLO 18																		*

**15.5 Program Learning Outcomes Vs. Program Competencies**

Program Learning Outcomes	Program Competencies																	
	A – Level										B-Level				D-Level			
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4
PLO 1	*																	
PLO 2		*																
PLO 3			*															
PLO 4				*														
PLO 5					*													
PLO 6						*												
PLO 7							*											
PLO 8								*										
PLO 9									*									
PLO 10										*								
PLO 11											*							
PLO 12												*						
PLO 13													*					
PLO 14														*				
PLO 15															*			
PLO 16																*		
PLO 17																	*	
PLO 18																		*

**15.6 Program Mission Vs. Program Competencies Matrix**

Program Mission		Program Competencies																	
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4
Electromechanical Engineering Program is committed to graduate engineers with an outstanding knowledge, keeping up with the rapid developing trends, and providing research to serve society and the community.	Program is committed to graduate engineers with an outstanding knowledge	*	*	*	*		*	*	*	*		*	*	*	*	*	*	*	*
	Keeping up with the rapid developing trends	*	*	*	*	*				*	*	*	*	*	*	*	*	*	*
	Providing research to serve society and community.	*	*			*	*		*		*	*	*	*		*			*

**15.7 Program Objectives Vs. Program Competencies Matrix**

Program Objectives	Program Competencies																		
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4	D5
<b>PO1</b>	*	*							*		*	*	*	*	*	*	*		*
<b>PO2</b>			*				*												
<b>PO3</b>							*	*	*		*	*		*					*
<b>PO4</b>					*			*		*			*		*				
<b>PO5</b>			*	*			*	*	*			*	*			*	*	*	
<b>PO6</b>	*	*				*					*	*	*		*			*	

**15.8 Program Objectives vs. Graduate Attributes Matrix**

Program Objectives	Graduate Attributes													
	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12	GA13	GA14
PO1	*	*									*			
PO2			*		*	*							*	
PO3				*						*				
PO4								*	*					
PO5							*				*	*		*
PO6							*					*		*

**15.9 Program Competencies Vs Graduate Attributes**

Program Competencies	Graduate Attributes													
	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12	GA13	GA14
A1	*	*									*			*
A2		*												*
A3			*		*	*						*		
A4						*	*						*	
A5								*					*	
A6				*										
A7				*										
A8									*			*		
A9										*				
A10								*				*		
B1												*		*
B2											*	*		*
B3													*	
B4													*	

Program Competencies	Graduate Attributes													
	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12	GA13	GA14
D1														*
D2											*	*		*
D3											*	*		
D4													*	
D5													*	

### 15.10 Program Competencies Vs. Program Courses

Courses			Program Competencies																		
Level	Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4	Total
Level 0-1	FRB 001	Analytical geometry & Linear Algebra	1		1																2
	FRB 003	Statics	1	1																	2
	FRB 005	Waves and Heat	1	1																	2
	FRB 007	Chemistry for Engineers	1	1																	2
	FRM 009	Engineering Drawing						1		1											2
	UHS 103	Social issues							1			1									2
	UHS 101	Foreign Language									1	1									2
Level 0-2	FRB 002	Integration & Multivariable functions	1		1																2
	FRB 004	Dynamics	1	1																	2
	FRB 006	Electricity and Magnetism	1	1																	2
	FRM 008	Production Systems Engineering				1		1													2
	FRM 010	Engineering Drawing by Computer				1				1											2
	FRE 012	Computer Programming	1		1																2
	UHS 102	Information and Communication Technology				1						1									2

Courses			Program Competencies																		
Level	Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4	Total
Level 1-1	FRB 101	Engineering Differential Equations	1	1									1								2
	EMM 101	Fluid Mechanics I		1									1								2
	EMM 103	Mechanics of Machinery			1					1			1	1		1					4
	FRB 103	Environmental Pollution and Industrial Safety	1	1		1							1								3
	EME 105	Electric Circuits Analysis	1	1									1					1	1		4
	EMM 107	Strength and properties of Materials											1	1							2
	EMM 109	Thermodynamics I	1	1									1	1							4
Level 1-2	FRB 104	Engineering Numerical Analysis	1	1									1								2
	EMM 102	Fluid Mechanics II	1	1									1		1						4
	EMM 104	Manufacture Technology						1					1								2
	EME 106	Electrical Machines					1						1				1				2
	EMM 108	Measurements and Instrumentation		1									1			1	1			1	4
	EMM 110	Solid Mechanics		1									1								2
	EMM 112	Thermodynamics II	1	1									1	1							4
	FT 103	Field Training I							1			1									2
Level 2-1	FRB 201	Applied Engineering Probability and Mathematical Statistics	1	1									1								2
	EME 201	Logic Circuits and Micro processors		1	1								1					1	1		4
	EMM 203	Heat Transfer	1	1									1		1						4
	EMM 205	Projects Management								1	1		1								2
	EME 207	Electrical Power Systems											1				1	1			2
	EMM 209	Design of Machine Elements											1	1							2
Level 2-2	FRB 206	Multiple Integrals & Complex Analysis	1	1									1								2
	EMM 202	Vibrations and System Dynamics	1	1									1	1							4

Courses			Program Competencies																		
Level	Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4	Total
	EMM 204	Plumbing Systems	1	1									1		1						4
	EME 206	Electronic Devices and Circuits		1									1					1	1	1	5
	EMM 208	Fluid Machinery	1										1		1						3
	EME 210	Electric Power Distribution Systems														1	1				2
	FT 203	Field Training II							1			1									2
Level 3-1	EMM 301	Refrigeration	1	1									1	1							4
	EMM 303	Air Conditioning Systems	1	1									1	1							4
	EME 305	Low Current Distribution Systems														1	1				2
	EMM 307	Fire Fighting Systems	1	1									1		1						4
	EMM 309	Combustion	1	1									1	1							4
	UHS XXX	Humanities Elective I	Refer to the next two courses																		
Humanities Elective I	UHS 201	Principles of Entrepreneurship and Project Management			1	1															2
	UHS 203	Human Resources Management			1	1															
Level 3-1	UHS XXX	Humanities Elective II	Refer to the next two courses																		
Humanities Elective II	UHS 301	Communication and Presentation Skills								1	1										2
	UHS 302	Leadership Skills								1	1										
Level 3-2	EMM 302	Refrigeration and AC Systems/Components	1	1									1	1							4
	EME 304	Automatic Control											1				1				2
	EMM 3XX	Elective I	Refer to the next three courses																		

Courses			Program Competencies																			
Level	Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4	Total	
Elective I	EMM 312	Renewable Energy											1	1			1				3	
	EMM 314	Elevators and Escalators											1	1			1					
	EMM 316	Solar Thermal and PV Systems											1	1			1					
Level 3-2	EME 3XX	Elective II	Refer to the next three courses																			
Elective II	EME 322	Advanced Industrial Electronics																1	1		2	
	EME 324	Electrical Protection																1	1			
	EME 326	Electrostatic and Electromagnetic Fields																1	1			
Level 3-2	EMM 3XX	Elective III	Refer to the next three courses																			
Elective III	EMM 332	Internal Combustion Engines	1	1									1	1	1						5	
	EMM 334	Essentials of Energy Management	1	1									1	1	1							
	EMM 336	Wind Energy System Design	1	1									1	1	1							
Level 3-2	EMM 390	Senior Design Project I		1	1			1	1			1		1	1	1			1		9	
	UHS 104	Professional Ethics				1	1														2	
Level 4-1	EMM 401	Computer Applications in EI/Mec System											1	1		1					3	
	EMM 403	Process Control and Building management System											1	1					1	1	4	
	EMM 4XX	Elective IV	Refer to the next three courses																			
Elective IV	EMM 411	Cold Stores and Industrial Refrigeration											1	1	1						3	
	EMM 413	Automotive Engineering											1	1	1							
	EMM 415	Power Stations											1	1	1							



Courses			Program Competencies																		
Level	Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4	Total
<b>Level 4-1</b>	EME 4XX	Elective V	Refer to the next three courses																		
<b>Elective V</b>	EME 421	Electro-Hydraulic Circuits				1							1	1							3
	EME 423	Codes and Specifications of EI/Mec Systems				1							1	1							
	EME 425	Computer Networks				1							1	1							
<b>Level 4-1</b>	EME 4XX	Elective VI	Refer to the next three courses																		
<b>Elective VI</b>	EME 431	Modern Control System																	1	1	3
	EME 433	Power System Analysis															1	1	1		
	EME 435	Electrical Drives															1	1	1		
<b>Level 4-1</b>	EMM 490	Senior Design Project II		1	1			1	1			1		1	1	1		1			9
	UHS XXX	Humanities Elective III	Refer to the next two courses																		
<b>Humanities Elective III</b>	UHS 801	Research Methodologies					1					1									2
	UHS 803	Thinking Skills					1					1									
<b>Total</b>			<b>27</b>	<b>30</b>	<b>8</b>	<b>7</b>	<b>3</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>2</b>	<b>8</b>	<b>24</b>	<b>18</b>	<b>10</b>	<b>7</b>	<b>8</b>	<b>8</b>	<b>6</b>	<b>4</b>	<b>186</b>

### 15.11 Program Competencies Vs. Learning and Teaching Methods

Teaching and Learning Methods	Program competencies																	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4
Lecture	*	*	*	*		*		*	*		*	*	*	*	*	*	*	*
Tutorials	*	*	*	*		*		*			*	*	*	*	*	*	*	*
Computer-based Instruction	*	*	*	*				*				*				*		*
Problem-based Learning	*	*	*	*					*		*	*		*				
Project-based Learning			*			*	*		*			*		*	*	*	*	
Interactive Learning	*	*		*			*	*	*	*		*	*					
Presentations		*	*	*	*			*	*							*	*	
Report					*		*		*	*			*	*				
Co-operative Learning					*		*										*	*
Brain Storming			*	*			*	*	*				*	*	*			
Projects			*			*	*	*	*				*	*		*	*	*
Discussion	*	*	*	*		*		*		*	*		*	*	*			*
Case Study			*	*					*	*			*	*	*	*	*	*
Practical-based Learning	*	*		*		*	*	*			*						*	*
Self-Learning					*					*						*	*	*
Hybrid Learning	*		*	*	*			*	*	*	*	*	*	*	*	*	*	*

Teaching and Learning Methods for Students with Special Needs:
Methods
1. Discussion Session
2. Extra Lectures
3. Create classroom centers
4. Rotate lessons
5. Provide different levels of books and materials

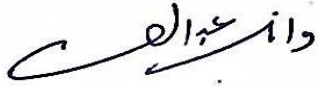

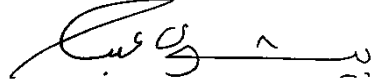
### 15.12 Program Competencies Vs. Assessment Methods

Assessment Methods		Program Competencies																	
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4
<b>Formative Assessment Method</b>																			
<b>Tests</b>	<b>Oral Test</b>	*	*	*	*	*	*	*	*	*	*	*							
	<b>Mid-term</b>	*	*	*	*		*		*	*		*	*	*	*	*	*	*	*
	<b>Experimental</b>	*	*	*	*		*	*				*					*	*	*
	<b>Quizzes</b>	*	*	*	*		*		*			*	*	*	*	*	*	*	*
<b>Reports</b>		*	*	*	*	*	*	*	*	*	*	*		*		*			
<b>Observation</b>		*	*	*	*	*		*	*	*	*								
<b>Discussions</b>		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<b>Projects</b>	<b>Projects</b>	*	*	*	*	*	*	*	*	*	*	*		*		*	*	*	*
	<b>Mini Projects</b>	*	*	*	*	*	*	*	*	*	*	*		*		*	*	*	*
<b>Assignments</b>		*	*	*	*		*		*	*	*	*	*	*	*	*	*	*	*
<b>Presentations</b>				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<b>Summative Assessment Method</b>																			
<b>Practical</b>			*		*			*	*			*							
<b>Oral Exam</b>		*	*	*		*	*	*	*	*	*	*							
<b>Final Exam</b>		*	*	*	*		*		*	*	*	*	*	*	*	*	*	*	*

### 15.13 Assessment Methods Vs. Teaching and Learning Methods

Assessment Methods		Teaching and Learning Methods															
		Lecture	Tutorials	Computer-based Instruction	Problem-based Learning	Project-based Learning	Interactive Learning	Presentations	Report	Co-operative Learning	Brain- Storming	Projects	Discussion	Case Study	Practical-based Learning	Self-Learning	Hybrid Learning
Tests	Oral Test	*	*	*	*	*	*	*	*			*	*	*	*	*	*
	Mid-term	*	*	*	*		*	*			*		*		*		*
	Experimental	*	*	*	*		*					*		*			*
	Quizzes	*	*	*	*							*		*			*
Reports		*						*	*			*		*	*	*	*
Observation		*	*		*		*	*		*	*			*			*
Discussions		*	*	*	*	*		*	*		*		*	*	*		*
Projects	Projects				*		*	*	*		*	*	*	*	*	*	*
	Mini Projects	*	*	*	*	*	*	*		*	*		*	*	*		*
Assignments		*	*	*	*		*					*		*			*
Presentations		*				*	*	*	*			*		*		*	*
Practical		*		*			*							*			*
Oral Exam		*		*		*	*	*	*			*	*		*	*	*
Final Exam		*	*	*	*		*	*			*		*		*		*

فريق توصيف البرنامج وتبنى المعايير الأكاديمية لبرنامج الهندسة الكهروميكانيكية (نظام الساعات المعتمدة) بالبرامج المتعددة التخصصات بكلية الهندسة ببها - جامعة بنها.

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