Benha University
Benha Faculty of Engineering

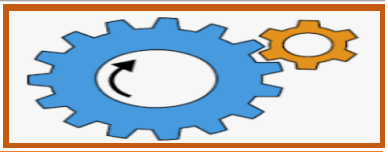
Electromechanical Engineering Program

B.Sc. Program Specification

Bylaw 2017 according to NARS2018

Benha University – Benha Faculty of Engineering





2023-2024

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A. General

1. Basic Information

Program Title	Electromechanical Engineering Program
Program Type	■ Single ☐ Double ☐ Multiple
Department responsible of program	Mechanical Engineering Program Electrical Engineering Program
Program Coordinator	Assoc. Prof. Wael Abdel-Rahman Mohamed
Quality Coordinator	Dr. Beshoy Abdou Aziz
Date of program Approval	2017
Date of Internal Evaluator	January 2023
Internal Evaluator	Dr. Ahmed Moustafa Hussein Dr. Mohamed Salah Selmy
Date of External Evaluator	June 2023
External Evaluator	Dr. Ebrahim Mohamed Esmail
Program URL	https://beng.bu.edu.eg/index.php/programs/electromechanical-engineering-program

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 Electromechanical Engineering program are to enable its graduates to:

1. 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.
2. Behave professionally and adhere to engineering ethics and standards and work to develop the profession and the community and promote sustainability principles.
3. Work in and lead a heterogeneous team and display leadership qualities, business administration, and entrepreneurial skills.
4. Master self-learning and life -long learning strategies to communicate effectively in academic/professional fields.
5. Solve problems in the areas of integrated mechanics, electronics, computers, and software systems.

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

3. Graduates Attributes (GA's)

Graduate attributes are the academic abilities, personal qualities, and skills which Electromechanical Engineering graduates should have.

According to NARS 2018 all engineering graduates must be able 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) (Program Learning Outcomes (PLO'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) PLO1. Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.
(A2) PLO2. 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) PLO3. 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) PLO4. Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.
(A5) PLO5. Practice research techniques and methods of investigation as an inherent part of learning.
(A6) PLO6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
(A7) PLO7. Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.
(A8) PLO8. Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.
(A9) PLO9. Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
(A10) PLO10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

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

(B1) PLO11. 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) PLO12. 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) PLO13. Select conventional mechanical equipment according to the required performance.

(B4) PLO14. 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 competencies 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 Competencies) (Selected Competencies not all competencies):

(D1) PLO15. Design, model and analyze an electrical / electronic / digital system or component for a specific application; and identify the tools required to optimize this design.
(D2) PLO16. Design and implement elements, modules, sub-systems, or systems in electrical engineering using technological and professional tools.
(D3) PLO17. 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.
(D4) PLO18. 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 on 2019.

6. Reference standards

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

7. Program Structure and Contents

7.1 Program Duration: five years (10 semesters)

7.2 Program Structure:

Total hours of the program:-	**177** credit hours
Theoretical:-	**120** hours
Practical/Exercises:-	**150** hours
Compulsory:-	**157** credit hours
Elective Course:-	**12** credit hours
Humanity – Elective:-	**8** credit hours
Selective:-	None

Subject Area	Program Total Credit Hours		NARS Requirements
	Cr.Hrs. of Five Levels	% Cr.Hrs. of Five Levels	
Humanities and Social Sciences (Univ. Req.)	18	10.11	9-12%
Mathematics and Basic Sciences	36	20.22	20-26%
Basic Engineering Sciences (Faculty/Spec. Req.)	39	21.91	20-23%
Applied Engineering and Design	39	21.91	20-22%
Computer Applications and ICT	15	9	9-11%
Projects and Practice	18	10.11	8-10%
Discretionary (Institution character-identifying) subjects	12	6.74	6-8%
Total	177	100	**100%**

Program Coordinator: Assoc. Prof. Wael Abdel-Rahman Mohamed

Wael A. Mohamed

Date: 12 / 9 / 2023

7.3 Program Courses Vs. Requirements

7.3.1 List of Compulsory Courses

To judge the compatibility of program compulsory courses with its credit hours of requirements, the following matrix is used:

Year	Term	Courses		Prerequisites	Weekly Contact Hours					Credit Hours of Requirements			
		Code	Course Title		Cr. Hrs.	Lect.	Tut.	Lab.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirement
First Year	1st Term	FRB101	Mathematics I	……	3	2	2	0	4		3		
		FRB103	Mechanics I	……	3	2	2	0	4		3		
		FRB105	General Chemistry	……	3	2	1	2	5		3		
		FRB107	Physics I	……	3	2	2	2	6		3		
		FRM109	Engineering Graphics	……	4	2	4	1	7		4		
		HS101	English language	……	2	2	0	0	2	2			
	2nd Term	FRB102	Mathematics II	FRB101	3	2	2	2	6		3		
		FRB104	Mechanics II	FRB103	3	2	2	0	4		3		
		FRM106	Production Engineering	……	3	2	0	3	5		3		
		FRB108	Physics II	FRB107	3	2	2	2	6		3		
		FRE110	Computer Programming	……	3	2	0	3	5		3		
		HS102	Human Rights	……	2	2	0	0	2	2			
Second Year	1st Term	FRB201	Mathematics III	FRB102	3	2	2	0	4		3		
		EMM201	Computer Aided Drafting (CAD)	FRM109	3	2	0	3	5			3	
		EMM203	Fluid Mechanics I	FRB104	3	2	1	1	4			3	
		EMM205	Mechanics of Machinery	FRB104	3	2	1	1	4			3	
		EME207	Electric Circuits I	FRB108	3	2	1	1	4			3	
		EMM209	Measurements and	FRB108	3	2	1	2	5			3	

Year	Term	Courses		Prerequisites	Weekly Contact Hours					Credit Hours of Requirements			
		Code	Course Title		Cr. Hrs.	Lect.	Tut.	Lab.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirement
			Instrumentation										
		HS201	Technical Writing	……	2	2	0	0	2	2			
	2nd Term	FRB202	Math IV	FRB201	3	2	2	0	4		3		
		EMM202	Strength and properties of Materials	FRB104	3	2	1	1	4			3	
		EME204	Logic Circuits and Micro processors	EME207	3	2	1	1	4			3	
		EMM206	Thermodynamics I	FRB107	3	2	1	1	4			3	
		EME208	Electric Circuits II	EME207	3	2	1	1	4			3	
		EMM210	Manufacture Technology	FRM106	3	2	2	1	5			3	
		HS202	Engineering Economics	……	2	2	0	0	2	2			
Third Year	1st Term	FRB301	Numerical Method	FRB201	3	2	2	0	4		3		
		EMM301	Fluid Mechanics II	EMM203	3	2	2	1	5			3	
		EMM303	Projects Management	……	2	2	0	0	4			2	
		EMM305	Heat Transfer	EMM206	3	2	2	1	5			3	
		EME307	Electrical Power Systems	EME208	3	2	2	1	5			3	
		EMM309	Design of Machine Elements	FRM109, EMM202	3	2	2	0	4			3	
	2nd Term	FRB302	Probabilities & Statistics	FRB201	3	2	2	0	4		3		
		EMM302	Thermodynamics II	EMM206	3	2	2	1	5			3	
		EMM304	Vibrations and System Dynamics	EMM205	3	2	2	1	5			3	
		EME306	Electronic Devices and Circuits	EME208	3	2	2	1	5			3	
		EMM308	Solid Mechanics	FRB103	3	2	2	1	5			3	

Year	Term	Courses		Prerequisites	Weekly Contact Hours					Credit Hours of Requirements			
		Code	Course Title		Cr. Hrs.	Lect.	Tut.	Lab.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirement
		HS3XX	**Humanities-Elective 1**	**……**	**2**	**2**	**0**	**0**	**2**	**2**			
Fourth Year	1st Term	EMM401	Refrigeration	EMM302	3	2	2	1	5				3
		EMM403	Fluid Machinery	EMM301	3	2	2	1	5				3
		EME405	Automatic Control	EMM304	3	2	2	1	5			3	
		EMM407	Plumbing Systems	EMM301	3	2	2	1	5				3
		EME409	Electric Power Distribution Systems I	EME307	3	2	2	1	5				3
		HS401	Legislation & Engineering Ethics	……	2	2	0	0	2	2			
	2nd Term	EMM402	Air Conditioning Systems	EMM302	3	2	2	1	5				3
		EME404	Low Current Distribution Systems	EME208	3	2	2	1	5				3
		EMM406	Fire Fighting Systems	EMM301	3	2	2	1	5				3
		EME410	Electric Power Distribution Systems II	EME409	3	2	2	1	5				3
		EMM408	Combustion and Engines	EMM302	3	2	2	1	5			3	
		HS4XX	**Humanities – Elective 2**	**……**	**2**	**2**	**0**	**0**	**2**	**2**			
Fifth Year	1st Term	EME501	Process Control and Building management System	EME405	3	2	2	1	5				3
		EMM503	Refrigeration and AC Systems/Components	EMM401, EMM402	3	2	2	1	5				3
		EMM5XX	**Elective 1**	*	**3**	**2**	**2**	**1**	**5**				**3**
		EME5XX	**Elective 2**	*	**3**	**2**	**2**	**1**	**5**				**3**
		HS5XX	**Humanities –Elective 3**	**……**	**2**	**2**	**0**	**0**	**2**	**2**			

Year	Term	Courses		Prerequisites	Weekly Contact Hours					Credit Hours of Requirements			
		Code	Course Title		Cr. Hrs.	Lect.	Tut.	Lab.	Total	University Requirements	Faculty Requirements	Discipline Requirements	Program Requirement
		EM507	Project I	**	3	3	0	1	4				3
	2nd Term	EME502	Electrical Machines	EME208	3	2	2	1	5			3	
		EME504	Computer Applications in El/Mec System	EMM402, EME409	3	2	2	1	5				3
		EME5XX	**Elective III**	*	**3**	**2**	**2**	**1**	**5**				**3**
		EMM5XX	**Elective IV**	*	**3**	**2**	**2**	**1**	**5**				**3**
		HS5XX	**Humanities –Elective 4**	**……**	**2**	**2**	**0**	**0**	**2**	**2**			
		EM508	Project II	**	3	3	0	1	4				3
FT		**FT 103**	**Field Training I**	***									
		FT 203	**Field Training II**	***									
Total hours of five years										**18**	**43**	**65**	**51**
% Hours of five years										**10.17**	**24.29**	**36.72**	**28.81**
Reference Ratio										**Min 8%**	**Min 20%**	**Min 35%**	**Max 30%**

**** The student can register for the Project I and Project II courses after passing 125 hr, as well as passing FT103 and FT203.**

***** Completion of 120 Credit Hours**

7.3.2 List of Elective Courses

To judge the compatibility of program elective courses with its credit hours of requirements, the following matrix is used:

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
Elective Course I	Five	EMM505	Renewable Energy	EMM206	3	2	1	2	5				3
		EMM507	Elevators and Escalators	……	3	2	1	2	5				3
		EMM509	Solar Thermal and PV systems	EMM305	3	2	1	2	5				3
Elective Course II	Five	EME511	Advanced Industrial Electronics	EME306	3	2	1	2	5				3
		EME513	Communications Engineering	EME404	3	2	1	2	5				3
		EME515	Electrostatic and Electromagnetic Fields	EME208	3	2	1	2	5				
Elective Course III	Five	EME506	Electro-hydraulic circuits	EMM501	3	2	1	2	5				3
		EME508	Codes and Specification of Electromechanical Systems	……	3	2	1	2	5				3
		EME510	Computer Network	……	3	2	1	2	5				3
Elective Course IV	Five	EMM512	Cold Stores and Industrial Refrigeration	EMM401	3	2	1	2	5				3
		EMM514	Automotive Engineering	EMM408	3	2	1	2	5				3
		EMM516	Thermal power stations	EMM302	3	2	1	2	5				3

8. Subject Area

To judge the compatibility of program compulsory courses with its credit hours of subject area, the following matrix is used:

		Courses		Prerequisites	Weekly Contact Hours					Credit Hours of Subject Area						
Year	Term	Code	Course Title		Cr. Hrs.	Lect.	Tut.	Lab.	Total	Humanities and Social Sciences	Mathematics and Basic Sciences	Basic Engineering Sciences	Applied Engineering and Design	Computer Applications and ICT	Projects and Practice	Discretionary
First Year	1st Term	FRB101	Mathematics I	……	3	2	2	0	4		3					
		FRB103	Mechanics I	……	3	2	2	0	4		3					
		FRB105	General Chemistry	……	3	2	1	2	5		3					
		FRB107	Physics I	……	3	2	2	2	6		3					
		FRM109	Engineering Graphics	……	4	2	4	1	7			4				
		HS101	English language	……	2	2	0	0	2	2						
	2nd Term	FRB102	Mathematics II	FRB101	3	2	2	2	6		3					
		FRB104	Mechanics II	FRB103	3	2	2	0	4		3					
		FRM106	Production Engineering	……	3	2	0	3	5			3				
		FRB108	Physics II	FRB107	3	2	2	2	6		3					
		FRE110	Computer Programming	……	3	2	0	3	5		3					
		HS102	Human Rights	……	2	2	0	0	2	2						
d	T	FRB201	Mathematics III	FRB102	3	2	2	0	4		3					

Year	Term	Courses		Prerequisites	Weekly Contact Hours					Credit Hours of Subject Area						
		Code	Course Title		Cr. Hrs.	Lect.	Tut.	Lab.	Total	Humanities and Social Sciences	Mathematics and Basic Sciences	Basic Engineering Sciences	Applied Engineering and Design	Computer Applications and ICT	Projects and Practice	Discretionary
		EMM201	Computer Aided Drafting (CAD)	FRM109	3	2	0	3	5					3		
		EMM203	Fluid Mechanics I	FRB104	3	2	1	1	4			3				
		EMM205	Mechanics of Machinery	FRB104	3	2	1	1	4			3				
		EME207	Electric Circuits I	FRB108	3	2	1	1	4			3				
		EMM209	Measurements and Instrumentation	FRB108	3	2	1	2	5				3			
		HS201	Technical Writing	……	2	2	0	0	2	2						
	2nd Term	FRB202	Math IV	FRB201	3	2	2	0	4		3					
		EMM202	Strength and properties of Materials	FRB104	3	2	1	1	4			3				
		EME204	Logic Circuits and Micro processors	EME207	3	2	1	1	4			3				
		EMM206	Thermodynamics I	FRB107	3	2	1	1	4			3				
		EME208	Electric Circuits II	EME207	3	2	1	1	4			3				
		EMM210	Manufacture Technology	FRM106	3	2	2	1	5				3			
		HS202	Engineering Economics	……	2	2	0	0	2	2						
Third Year	1st Term	FRB301	Numerical Methods	FRB201	3	2	2	0	4		3					
		EMM301	Fluid Mechanics II	EMM203	3	2	2	1	5			3				
		EMM303	Projects Management	……	2	2	0	0	4			2				
		EMM305	Heat Transfer	EMM206	3	2	2	1	5			3				

		Courses		Prerequisites	Weekly Contact Hours					Credit Hours of Subject Area						
Year	Term	Code	Course Title		Cr. Hrs.	Lect.	Tut.	Lab.	Total	Humanities and Social Sciences	Mathematics and Basic Sciences	Basic Engineering Sciences	Applied Engineering and Design	Computer Applications and ICT	Projects and Practice	Discretionary
		EME307	Electrical Power Systems	EME208	3	2	2	1	5				3			
		EMM309	Design of Machine Elements	FRM109, EMM202	3	2	2	0	4				3			
	2nd Term	FRB302	Probabilities & Statistics	FRB201	3	2	2	0	4		3					
		EMM302	Thermodynamics II	EMM206	3	2	2	1	5			3				
		EMM304	Vibrations and System Dynamics	EMM205	3	2	2	1	5				3			
		EME306	Electronic Devices and Circuits	EME208	3	2	2	1	5				3			
		EMM308	Solid Mechanics	FRB103	3	2	2	1	5				3			
		HS3XX	**Humanities-Elective 1**	**……**	**2**	**2**	**0**	**0**	**2**	**2**						
Fourth Year	1st Term	EMM401	Refrigeration	EMM302	3	2	2	1	5				3			
		EMM403	Fluid Machinery	EMM301	3	2	2	1	5				3			
		EME405	Automatic Control	EMM304	3	2	2	1	5					3		
		EMM407	Plumbing Systems	EMM301	3	2	2	1	5						3	
		EME409	Electric Power Distribution Systems I	EME307	3	2	2	1	5						3	
		HS401	Legislation & Engineering Ethics	……	2	2	0	0	2	2						
	Te	EMM402	Air Conditioning Systems	EMM302	3	2	2	1	5				3			

		Courses		Prerequisites	Weekly Contact Hours					Credit Hours of Subject Area						
Year	Term	Code	Course Title		Cr. Hrs.	Lect.	Tut.	Lab.	Total	Humanities and Social Sciences	Mathematics and Basic Sciences	Basic Engineering Sciences	Applied Engineering and Design	Computer Applications and ICT	Projects and Practice	Discretionary
		EME404	Low Current Distribution Systems	EME208	3	2	2	1	5					3		
		EMM406	Fire Fighting Systems	EMM301	3	2	2	1	5						3	
		EME410	Electric Power Distribution Systems II	EME409	3	2	2	1	5						3	
		EMM408	Combustion and Engines	EMM302	3	2	2	1	5				3			
		HS4XX	**Humanities – Elective 2**	**……**	**2**	**2**	**0**	**0**	**2**	**2**						
Fifth Year	**1st Term**	EME501	Process Control and Building management System	EME405	3	2	2	1	5					3		
		EMM503	Refrigeration and AC Systems/Components	EMM401, EMM402	3	2	2	1	5				3			
		EMM5XX	**Elective I**	*	**3**	**2**	**2**	**1**	**5**							**3**
		EME5XX	**Elective II**	*	**3**	**2**	**2**	**1**	**5**							**3**
		HS5XX	**Humanities –Elective 3**	**……**	**2**	**2**	**0**	**0**	**2**	**2**						
		EM507	Project I	**	3	3	0	1	4						3	
	2nd Term	EME502	Electrical Machines	EME208	3	2	2	1	5				3			
		EME504	Computer Applications in El/Mec System	EMM402, EME409	3	2	2	1	5					3		
		EME5XX	**Elective III**	*	**3**	**2**	**2**	**1**	**5**							**3**
		EMM5XX	**Elective IV**	*	**3**	**2**	**2**	**1**	**5**							**3**

Year	Term	Courses: Code	Courses: Course Title	Prerequisites	Weekly Contact Hours: Cr. Hrs.	Lect.	Tut.	Lab.	Total	Credit Hours of Subject Area: Humanities and Social Sciences	Mathematics and Basic Sciences	Basic Engineering Sciences	Applied Engineering and Design	Computer Applications and ICT	Projects and Practice	Discretionary
		HS5XX	**Humanities –Elective 4**	**……**	**2**	**2**	**0**	**0**	**2**	**2**						
		EM508	Project II	**	3	3	0	1	4						3	
FT		**FT 103**	**Field Training I**	***												
		FT 203	**Field Training II**	***												
Total hours of five years										**18**	**36**	**39**	**39**	**15**	**18**	**12**
% Hours of five years										**10.11**	**20.22**	**21.91**	**21.91**	**9**	**10.11**	**6.74**
Reference Ratio from NARS										**9-12%**	**20-26%**	**20-23%**	**20-22%**	**9-11%**	**8-10%**	**6-8%**

**** The student can register for the Project I and Project II courses after passing 125 hr, as well as passing FT103 and FT203.**

***** Completion of 120 Credit Hours**

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 this program, Credit Hours system, the student should be successfully passed in **177 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:

Work	Week	% Degree
First Exam (mid-term)	7	30
Second Exam (Written Exam)	12	20
Semester Work	During the Semester	10
Final Exam	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**$^{+}$: More than 97% (Points =4.00), **A** : (93- 97)% (Points =4.00), **A**$^{-}$:(89- 93)% (Points = 3.70)

→ **B**$^{+}$: (84-89)% (Points =3.30), **B** : (80-84)% (Points =3.00), **B**$^{-}$:(76-80)% (Points=2.70)

→ **C**$^{+}$: (73-76)% (Points =2.30), **C** : (70-73)% (Points =2.00), **C**$^{-}$:(67-70)% (Points=1.70)

→ **D**$^{+}$: (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

Teaching & Learning Methods
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		
Formative Assessment	Tests	Oral Test
		Mid- term
		Experimental
		Quizzes
	Reports	
	Observation	
	Discussions	
	Projects	Projects
		Mini Projects
	Assignments	
	Presentations	
Summative Assessment	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	1/2023
External Evaluator	Report	6/2023

15. Program Matrices

15.1 Faculty Mission Vs. Program Mission Matrix

To judge the compatibility of faculty mission with the program mission, the following matrix is used:

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

To judge the compatibility of program objectives with its mission, the following matrix is used:

Program Mission		Program Objectives					
		PO1	PO2	PO3	PO4	PO5	PO6
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 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

To judge the compatibility of program competencies and the CBE (NARS 2018), the following matrix is used:

Program Competences	(NARS 2018) CBE Matrix																	
	A – Level										Mechanical				Electrical			
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B2	B3	B4	B5
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	B2	B3	B4	B5
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 ARS of Program Vs. B-Level Electrical (NARS 2018) Matrix

		B-Level Electrical (NARS 2018) (CBE)				
		B1	B2	B3	B4	B5
ARS of Program	D1		*			
	D2			*		
	D3				*	
	D4					*

15.6 Program Learning Outcomes Vs. Program Competencies

To judge the compatibility of program competencies and its learning outcomes, the following matrix is used:

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																		*

15.7 Program Mission Vs. (NARS 2018) CBE Matrix

To judge the compatibility of program mission with its competencies, the following matrix is used:

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 and specialized skills	*	*	*	*		*	*	*	*		*	*	*	*	*	*	*	*
	Keeping up with the rapid developing trends	*	*	*	*	*				*	*	*	*	*	*	*	*	*	*
	Providing research to serve society and community.	*	*			*	*		*		*	*	*	*		*			*

15.8 Program Objectives Vs. Program Competencies Matrix

To judge the compatibility of program objectives with its competencies, the following matrix is used:

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

15.9 Program Objectives Vs. Graduate Attributes Matrix

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

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

15.10 Graduate Competencies Vs. Graduate Attributes Matrix

To judge the compatibility of program graduate attributes with its competencies, the following matrix is used:

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											*	*		*

Program Competencies	Graduate Attributes													
	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12	GA13	GA14
B3													*	
B4													*	
D1														*
D2											*	*		*
D3											*	*		
D4													*	

15.11 Program Competencies Vs. Courses

To judge the compatibility of program courses with its competencies, the following matrix is used:

Compulsory Courses				Program Competencies																
Year		Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4
First Year	1st Term	FRB101	Mathematics I	1	1																
		FRB103	Mechanics I	1	1																
		FRB105	General Chemistry	1	1																
		FRB107	Physics I	1	1																
		FRM109	Engineering Graphics						1		1										
		HS101	English language					1			1		1								
	2nd Term	FRB102	Mathematics II	1	1																
		FRB104	Mechanics II	1	1																
		FRM106	Production Engineering				1		1												
		FRB108	Physics II	1	1																

Compulsory Courses				Program Competencies																	
Year		Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4
		FRE110	Computer Programming	1	1																
		HS102	Societal Issues					1		1			1								
Second Year	1st Term	FRB201	Mathematics III	1	1																
		EMM201	Computer Aided Drafting (CAD)	1			1				1										
		EMM203	Fluid Mechanics I		1									1							
		EMM205	Mechanics of Machinery	1											1						
		EME207	Electric Circuits I	1														1	1		
		EMM209	Measurements and Instrumentation		1												1			1	
		HS201	Technical Writing								1	1									
	2nd Term	FRB202	Math IV	1	1																
		EMM202	Strength and properties of Materials		1									1							
		EME204	Logic Circuits and Microprocessors		1	1												1	1		
		EMM206	Thermodynamics I	1	1									1							
		EME208	Electric Circuits II	1														1	1		
		EMM210	Manufacture Technology											1	1						
		HS202	Engineering Economics	1								1									
Third Year	1st Term	FRB301	Numerical Method	1	1																
		EMM301	Fluid Mechanics II											1		1					

Compulsory Courses				Program Competencies																	
Year		Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4
		EMM303	Projects Management												1						
		EMM305	Heat Transfer		1									1							
		EME307	Electrical Power Systems															1		1	
		EMM309	Design of Machine Elements											1	1						
	2nd Term	FRB302	Probabilities & Statistics	1	1																
		EMM302	Thermodynamics II	1	1									1	1						
		EMM304	Vibrations and System Dynamics											1	1				1		
		EME306	Electronic Devices and Circuits	1														1	1		
		EMM308	Solid Mechanics											1	1						
		HS3XX	Humanities-Elective 1				1	1													
Fourth Year	1st Term	EMM401	Refrigeration		1									1	1						
		EMM403	Fluid Machinery	1	1									1		1					
		EME405	Automatic Control	1														1		1	
		EMM407	Plumbing Systems	1	1									1							
		EME409	Electric Power Distribution Systems I															1			1
		HS401	Legislation & Engineering Ethics									1	1								
	2nd Term	EMM402	Air Conditioning Systems	1	1									1	1						
		EME404	Low Current Distribution Systems																	1	1

Compulsory Courses				Program Competencies																	
Year		Code	Course Title	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1	D2	D3	D4
		EMM406	Fire Fighting Systems				1								1		1				
		EMM408	Combustion and Engines	1	1									1							
		EME410	Electric Power Distribution Systems II															1			1
		HS4XX	Humanities-Elective 2					1	1			1									
Fifth Year	1st Term	EME501	Process Control and Building Management											1	1				1	1	
		EMM503	Refrigeration and AC Systems / Components	1	1									1	1						
		EMM5XX	Elective I											1			1				
		EME5XX	Elective II															1	1		1
		HS5XX	Humanities –Elective 3								1	1									
		EM507	Project I		1	1			1	1			1		1	1	1		1		
	2nd Term	EME502	Electrical Machines					1										1			1
		EME504	Computer Applications in Elec./Mech. Systems											1	1		1				
		EME5XX	Elective III				1							1	1						1
		EMM5XX	Elective IV											1	1	1					
		HS5XX	Humanities –Elective 4				1				1										
		EM508	Project II		1	1			1	1			1		1	1	1		1		
FT		**EMM/E380**	**Field Training I**							1			1		1						
		EMM/E480	**Field Training II**							1			1		1						

15.12 Program Competencies Vs. Learning and Teaching Methods

To judge the compatibility of program learning and teaching methods with its competencies, the following matrix is used:

Teaching and Learning Methods	Program Competencies (Program Learning Outcomes)																	
	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	*	*	*					*		*	*		*	*			*	*
Self-Learning					*					*					*	*	*	
Case Study			*	*					*	*			*	*	*	*	*	*
Practical-based 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

15.13 Program Competencies Vs. Assessment Methods

To judge the compatibility of program assessment methods with its competencies, the following matrix is used:

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

15.14 Assessment Methods Vs. Teaching and Learning Methods

To judge the compatibility of program assessment methods with its teaching and learning methods, the following matrix is used:

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		*	*										*				*

Coordinator of Program Quality Assurance Committee

Beshoy Abdou

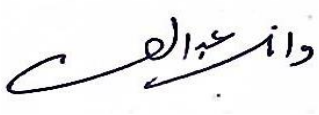
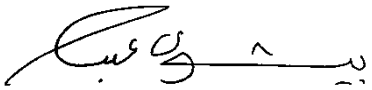
Dr. Beshoy Abdou Aziz
Date: 12 / 9 / 2023

Program Coordinator

Wael A. Mohamed

Assoc. Prof. Wael Abdel-Rahman Mohamed
Date: 12 / 9 / 2023

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

الإسم	الصفة	التوقيع
1. أ.م.د. وائل عبد الرحمن محمد	منسق البرنامج	
2. د. بيشوى عبده عزيز ايوب	منسق الجودة بالبرنامج	
3. د. محمد اسامة محمد حلمى	عضو	
4. د. ايمن سليمان سلمى	عضو	
5. د. امير عزيز مصطفى	عضو