Energy and Sustainable Energy Engineering Department (ESE)
With the credit hours system
2020 - 2021

A-Basic Information

Department Offering the Program: Mechanical Engineering Department.

Study System: Credit Hours System.

Program Total Credit Hours: 175 credits.

Program Duration: 5-Years (10 Levels).

Program Coordinator: Prof. Ahmed Reda El Shami

Students Supervisor(s): Dr. Eng. Khaled el Naggar & Dr. Eng. Mohamed Emam

B- Professional Information

1. Faculty Mission

The mission of Faculty of Engineering at Shoubra is: "The faculty of Engineering at Shoubra is committed to prepare a graduate with competencies and problem-solving skills that qualify each engineer to compete in local and regional labor markets, the graduate will be able to innovate and become an entrepreneur. The faculty also committed to the development of engineering sciences and producing internationally distinguished scientific research, with the framework of human values and social responsibility "

2. Program mission

The program is committed to qualify students for successful careers in the areas of energy and sustainable energy by providing graduates with adequate knowledge and their applications about the latest technologies of green energy generation from solar energy sources, wind energy, bio-fuel (biofuels), bio-products, natural gas and optimal design of traditional and non-conventional power plants.

To judge the compatibility between the program mission and faculty mission, the following matrix is used.

Key Words of Faculty Mission / Key Words of Program Mission	prepare a graduate with competencies and problem-solving skills	compete in local and regional labor markets	innovate and become an entrepreneur	development of engineering sciences	producing internationally distinguished scientific research	human values and social responsibility
Qualify students for successful and distinguished careers in the fields of energy and sustainable energy	√		√			
Adequate knowledge and their applications about the latest technologies of green energy generation from solar energy sources, wind energy, bio-fuel (biofuels), bio-products, natural gas	√	√			√	√
Optimal design of traditional and non-conventional power plants.				√	√	

3. Program Objectives

The Energy and Sustainable Energy Engineering program aims to develop the necessary skills, design, problem solving ability that meet the professional requirements of traditional, new and renewable technologies.

The graduates of the Energy and Sustainable Energy Engineering Program should be able to:

1. **Deepening students' knowledge backgrounds** in materials science, design and manufacturing techniques, circuit design, energy resources and their impact on the environment so that students have a strong theoretical background, enabling them to come up with a range of innovative approaches to generate efficient and clean energy.

2 - Preparation of a graduate who has the ability to understand the basics of energy engineering and analysis of electricity generation systems to maintain the life of the original equipment to reach the best efficiency.

3. Supply the labor market with quality specialists in the fields of mechanical and electrical engineering, physics and chemistry of electricity generation from **solar, wind energy** or other alternative energies.

4. Prepare a creative graduate who has the ability to design, construct and operate equipment that transforms this energy and is used to generate electricity without any adverse effect on the surrounding environment.

5 - Supervising the power generating units and the ability to operate and shut down the various power units in normal and emergency conditions.

6- Develop solutions to the technical and administrative problems that power plants may face.

7 - Follow-up maintenance work for all equipment and maintenance of power units.

8- Evaluation of the thermal performance of thermal power plants and assessment of energy sources used and provide technical advice.

9 - Provide the students with the fundamentals knowledge of energy system analysis, principles of economical science and engineering economy.

10 - Acquire the knowledge and skills necessary for energy conservation, transportation, storage and save of energy systems.

11 **- Knowledge of** different types of new and renewable traditional energies.

12 - Provide students to be able to design and construct energy systems in order to function effectively in any of the Conventional Energy and Sustainable Energy Engineering roles after graduation, you will need to ensure, with our help, that you have developed the following attributes, which we believe capture the qualities that all competent engineers should possess.

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

Key Words of Program Mission / Program Objectives	*Qualify students for successful and distinguished careers in the fields of energy and sustainable energy*	*Adequate knowledge and their applications about the latest technologies of green energy generation from solar energy sources, wind energy, bio-fuel (biofuels), bio-products, natural gas*	Optimal design of traditional and non-conventional power plants..
Objective #1	√	√	
Objective #2	√		√
Objective #3	√	√	√
Objective #4		√	
Objective #5			√
Objective #6		√	√
Objective #7			√
Objective #8		√	√
Objective #9	√		
Objective #10	√		√
Objective #11		√	
Objective #12	√	√	√

4. Graduate Attributes

According to the National Academic Reference Standard (NARS2018), the graduates of ESE program must satisfy the following attributes:

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 the general attributes of the engineer according to NARS 2018, The ESE engineer should be able to:

11. Demonstrate increased depth and coverage of knowledge and understanding of energy and sustainable energy technologies and resources management;
12. Carry out preliminary designs of fluid transmission and energy and power systems, investigate their performance and solve their essential operational problems;
13. Use energy efficiently, operate and maintain energy systems;
14. Apply and integrate knowledge, understanding and skills of different subjects and available computer software to solve real problems in industries and power stations ;
15. Lead or supervise a group of engineers or technicians and other work force;
16. Design, operate and maintain sustainable energy systems;
17. Evaluate the sustainability and environmental issues related to energy systems and apply industrial safety;
18. Use the computer graphics for design, communication and visualization.

5. Program Competencies

According to the National Academic Reference Standard, the EEC program must satisfy the following Competencies:

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.

2- Sustainable Energy NARS Competencies in 2018		
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 support to energy and sustainable energy
	B.3	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

3- - Sustainable Energy ARS (The University of Edinburgh Benchmark)		
Level D (ARS)	D.1	Model, Analyze, design and operate internal combustion engines, pumps, turbines, and compressors according to current developments and technologies
	D.2	Apply quantitative methods and computer software relevant to energy and sustainable energy engineering, in order to solve engineering problems.
	D.3	Carry out preliminary designs of sustainable energy sources including solar, wind, and geothermal energy, and biotechnology and solve their operational problems.
	D.4	Work in a variety of energy systems operations, maintenance and overhaul

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	D1	D2	D3	D4
Objective #1	√		√	√							√			√			
Objective #2	√	√	√							√	√						√
Objective #3						√	√						√	√			√
Objective #4			√			√			√			√	√				√
Objective #5				√		√						√			√		
Objective #6					√				√					√			
Objective #7						√								√			√
Objective #8		√			√						√			√	√	√	
Objective #9	√	√	√								√			√			
Objective #10										√			√				
Objective #11					√												√
Objective #12			√	√	√		√					√				√	

6. Academic standards

6.a Nationally: National Academic References Standards (NARS 2018)

6.b External references for standards (Benchmarks): (The University of Edinburgh)

The external references for standards considered in the development of this program were the National Academic Reference Standards (NARS) prepared by the engineering education sector of the supreme council of universities in Egypt and those of the University of Edinburgh, Institution of Mechanical Engineers (MEng (Hons)).

7. Attributes of program graduates as per NARS Requirements for engineering programs, in general

The graduates of the engineering programs should 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 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

11. Demonstrate increased depth and coverage of knowledge and understanding of energy and sustainable energy technologies and resources management;

12. Carry out preliminary designs of fluid transmission and energy and power systems, investigate their performance and solve their essential operational problems;

13. Use energy efficiently, Operate and maintain energy systems;

14. Apply and integrate knowledge, understanding and skills of different subjects and available computer software to solve real problems in industries and power stations;

15. Lead or supervise a group of engineers or technicians and other work force;

16. Design, operate and maintain sustainable energy systems;

17. Evaluate the sustainability and environmental issues related to energy systems and apply industrial safety;

18. Use the computer graphics for design, communication and visualization.

8. Curriculum Structure and Contents

8a. Program duration: (5-Levels), 10 semesters

8b. Program structure: Contact hours system

No. of credit hours: 175

(Contact Lectures: 122, contact tutorial /Exercises: 60, contact lab: 69)

8c. Indicative curricula Content by Subject Area

	Subject Area	CR	%	NARS Requirements
A	Humanities and Social Sciences (Univ. Req.)	16	9.14	9-12%
B	Mathematics and Basic Sciences	38	21.71	20-26%
C	Basic Engineering Sciences (Faculty/Spec. Req.)	39	22.29	20-23%
D	Applied Engineering and Design	38	21.71	20-22%
E	Computer Applications and ICT	16	9.14	9-11%
F	Projects and Practice	16	9.14	8-10%
G	Electives subjects	12	6.86	6-8%
		175	100	

Practical/Field Training: the students must carry out 3 weeks of the first field training after studying 80 CR and the second field training after studying 120 CR.

9. Program Levels and Courses

The B.Sc. degree in Energy and Sustainable Energy Engineering consists of total 175

List of Elective Courses (12 Credit Hours)

"Student has to choose four of the following courses"

Electives subjects			CR
1	ESE410	Hydraulic and Pneumatic systems	3
2	ESE411	Selected topics in sustainable energy	3
3	ESE412	Air Conditioning & Refrigeration and Environmental Control	3
4	ESE413	Internal Combustion Engines	3
5	ESE510	Energy Management	3
6	ESE511	Marine Energy Systems	3
7	ESE512	Geothermal Energy	3
8	ESE513	Dynamic Uninterruptable Power Supply System	3

First Year (Preparatory Year / Zero Level of Program)

First Semester:

Code	Subject	Credit Hours	Contact Hours				Marks	Prerequisites	Program NARS Covered
			Lec.	Tut	Lab	Total			
EMP101	Engineering Mathematics (1)	3	2	2	-	4	100	---	As attached matrix
EMP103	Physics (1)	3	2	-	3	5	100	---	
EMP105	Engineering Chemistry	3	2	-	3	5	100	---	
EMP106	Engineering Mechanics (1)	3	2	2	-	4	100	---	
MDP101	Engineering Drawing (1)	3	2	-	3	5	100	---	
GEN101	English Language	2	2	-	-	2	100	---	
		17	12	4	9	25	600		

Second Semester:

Code	Subject	Credit Hours	Contact Hours				Marks	Prerequisites	Program NARS Covered
			Lec.	Tut	Lab	Total			
EMP102	Engineering Mathematics (2)	3	2	2	-	4	100	EMP101	As attached matrix
EMP104	Physics (2)	3	2	-	3	5	100	EMP103	
EMP107	Engineering Mechanics (2)	3	2	2	-	4	100	EMP106	
CPE101	Computer Programming	3	2	-	3	5	100	---	
MDP103	Production Technology & Workshops	3	2	-	3	5	100	---	
MDP102	Engineering Drawing (2)	3	2	-	3	5	100	MDP101	
GEN102	Engineering & Society	2	2	-	-	2	100	---	
		20	14	4	12	30	700		

Second Year (First Level of Program)

First Semester:

Code	Subject	Credit Hours	Contact Hours				Marks	Prerequisites	Program NARS Covered
			Lec.	Tut	Lab	Total			
EMP201	Engineering Mathematics (3)	3	2	2	-	4	100	EMP102	As attached matrix
MPE201	Thermodynamics	3	2	-	3	5	100	EMP103	
MDP201	Materials Science	3	2	-	3	5	100	EMP105	
MDP212	Manufacturing Technology	2	1	-	3	4	100	MDP103	
MDP203	Computer Aided Mechanical Drawing	3	2	-	3	5	100	MDP102	
GEN201	Technical Report Writing	2	2	-	-	4	100	GEN101	
		16	11	2	12	25	600		

Second Semester:

Code	Subject	Credit Hours	Contact Hours				Marks	Prerequisites	Program NARS Covered
			Lec.	Tut	Lab	Total			
EMP202	Engineering Mathematics (4)	3	2	2	-	4	100	EMP201	As attached matrix
EMP203	Physics (3)	3	2	2	-	4	100	EMP104	
MPE202	Fluid Mechanics	3	2	-	3	5	100	EMP103	
MDP204	Mechanics & Testing of Materials	3	2	-	3	5	100	MDP201	
EPM201	Electrical Engineering I	3	2	2	-	4	100	EMP103	
GEN202	Psychology & Organization Behavior	2	2	-	-	2	100	---	
		17	12	6	6	24	600		

Third Year (Second Level of Program)

First Semester:

Code	Subject	Credit Hours	Contact Hours				Marks	Prerequisites	Program NARS Covered
			Lec.	Tut	Lab	Total			
MPE301	Heat & Mass Transfer	3	2	-	3	5	100	MPE201	As attached matrix
MPE302	Applied Fluid Mechanics	3	2	2	-	4	100	MPE202	
ELC301	Electronic Engineering	3	2	2	-	4	100	EPM301	
EMP311	Organic Chemistry	2	1	2	-	3	100	EMP105	
MDP311	Machine Components Design	2	1	2	-	3	100	MDP204	
EPM302	Electrical Engineering II	2	1	2	-	3	100	EPM201	
GEN301	Leadership and Management skills	2	2	-	-	2	100	---	
		17	11	10	3	24	700		

Second Semester:

Code	Subject	Credit Hours	Contact Hours				Marks	Prerequisites	Program NARS Covered
			Lec.	Tut	Lab	Total			
MPE303	Measurements & instrumentation Systems	3	2	-	3	5	100	EMP104	As attached matrix
ESE380	Field Training I	1	1			1			
MPE304	Applied Thermodynamics	3	2	2	-	4	100	MPE201	
EPM301	Electrical Power Engineering	3	2	2	-	4	100	EPM201	
MDP312	Theory of Machines	2	1	2	-	3	100	EMP107	
MPE305	Numerical Methods for Engineers	3	2	-	3	5	100	EMP202	
GEN302	Professional Ethics	2	2	-	-	2	100	-	
		17	12	6	6	24	600		

After completion of this semester, student performs Industrial Training (1) course (**ESE380**) for six weeks during summer corresponding to 1 Credit Hour.

Fourth Year (Third Level of Program)

First Semester:

Code	Subject	Credit Hours	Contact Hours				Marks	Prerequisites	Program NARS Covered
			Lec.	Tut	Lab	Total			
ESE411	Selected topics in Sustainable Energy	2	1	2	-	3	100	MPE201	As attached matrix
MDP401	Vibration & Dynamics	3	2	-	3	5	100	MDP302	
EPM401	Electrical Machines	3	2	-	3	5	100	EPM301	
ESE402	Fuel & Advanced Combustion	3	2	-	3	5	100	MPE304	
ESE4XX	Elective (1)	3	2	2		4	100	---	
GEN401	Legislations, contract and procurement management	2	2	-	-	2	100	---	
		16	11	4	9	24	600		

Second Semester:

Code	Subject	Credit Hours	Contact Hours				Marks	Prerequisites	Program NARS Covered
			Lec.	Tut	Lab	Total			
ESE403	Energy & Conservation Management	3	2	2	-	4	100	ESE411	As attached matrix
MPE401	Applied Heat & Mass Transfer	3	2	-	3	5	100	MPE301	
ESE404	Bioenergy	3	2	2	-	4	100	EMP301	
ESE405	Solar Energy	3	2	2	-	4	100	ESE401	
ESE4XX	Elective (2)	3	2	2	-	4	100	---	
ESE480	Field Training II	1	1			1			
GEN402	Human Resources Management	2	2	-	-	2	100	---	
EPM402	Power System Analysis	3	2	2	-	4	100	EPM301	
		21	15	10	3	28	700		

After completion of this semester, student performs Industrial Training (2) course (**ESE480**) for six weeks during summer corresponding to 1 Credit Hour.

Fifth Year (Fourth Level of Program)

First Semester:

Code	Subject	Credit Hours	Contact Hours				Marks	Prerequisites	Program NARS Covered
			Lec.	Tut	Lab	Total			
ESE511	Energy Economics	2	1	2	-	3	100	ESE411	As attached matrix
ESE502	Wind Energy	3	2	2	-	4	100	MPE302	
MDP501	Control Systems analysis & Design	3	2	-	3	5	100	MDP401	
ESE503	Solar Cells Fundamentals	3	2	2	-	4	100	ESE405	
ESE5XX	Elective (3)	3	2	2	-	4	100	---	
ESE591	Project (1)	3	3	-	-	3	100	120 CR	
		17	12	8	3	23	600		

Second Semester:

Code	Subject	Credit Hours	Contact Hours				Marks	Prerequisites	Program NARS Covered
			Lec.	Tut	Lab	Total			
ESE504	Power Stations	3	2	2	-	4	100	MPE304	As attached matrix
ESE525	Computer Applications in Fluid Mechanics	2	1	-	3	4	100	MPE305, MPE302	
ESE506	Energy Storage & Transmission	3	2	2	-	4	100	ESE403, ESE511	
EPM501	Power Electronics	3	2	-	3	5	-	ELC301	
ESE5XX	Elective (4)	3	2	2	-	4	100	---	
ESE592	Project (2)	3	3	-	-	3	100	ESE591	
		17	12	6	6	24	500		

Total Number of Subjects: **65** Total Number of Credit Hours:**175 Hrs**

10. Program admission requirements

Having Egyptian Secondary education or equivalent certificate with major in Mathematics, then after fulfilling the admission requirements the students will be able to attend the Program.

11. Regulations for progression and program completion First Level/Semester

a. The student is considered successful in a certain level if he completes at least 36 credit hours in this level.

b. The referred student has to study the courses in which he has failed again with actual grade when he passes successfully. In case the student was considered absent with acceptable excuse in a course, he gets the actual grade,

c. The grades of the successful student in a course and in the general grade are evaluated as follows:-

Grade	Student percentage	Grade	No.Points
Excellent	more than 97%	A^+	4.00
	from 93% to less than 97%	A	4.00
	from 89% to less than 93%	A^-	3.70
Very good	from 84% to less than 89%	B^+	3.30
	from 80% to less than 84%	B	3.00
Good	from 76% to less than 80%	B^-	2.70
	from 73% to less than 76%	C^+	2.30
	from 70% to less than 73%	C	2.00
Pass	from 67% to less than 70%	C^-	1.70
	from 64% to less than 67%	D^+	1.30
	from 60% to less than 64%	D	1.00
Fail	less than 60%	F	0.00

The B.Sc. general grade for students is based on the cumulative marks obtained during all the years of study. The students are then arranged serially according their cumulative sum (not less than 2).

12. Teaching and Learning Methods

Program Competencies		Teaching and Learning Methods									
		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Level A	A1	√	√	√							
	A2				√	√			√	√	
	A3	√	√	√							√
	A4	√	√	√			√				
	A5									√	√
	A6				√	√	√		√		
	A7							√		√	√
	A8				√			√			
	A9				√			√		√	
	A10				√					√	√
Level B	B1	√	√	√						√	√
	B2	√	√	√					√		
	B3	√	√			√		√	√		
Level D	D1	√	√		√				√	√	
	D2	√			√	√			√	√	
	D3	√			√	√			√	√	
	D4	√	√		√		√		√	√	

13. Assessment Methods

Program Competencies		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A1	√	√		√			√	√		√
	A2			√		√		√	√		√
	A3	√	√		√				√	√	
	A4	√	√		√				√		
	A5						√	√			√
	A6					√		√	√	√	√
	A7							√	√	√	
	A8			√				√	√	√	
	A9			√				√	√		
	A10						√		√	√	√
Level B	B1	√	√	√	√		√	√	√		
	B2	√	√		√	√		√	√		
	B3	√	√	√	√			√	√		
Level D	D1	√	√		√		√		√	√	
	D2	√	√				√		√	√	
	D3	√	√				√		√	√	
	D4	√	√			√			√	√	

14. Evaluation of Program Competencies

Evaluator	Tool	Sample
1. Senior students	Evaluation sheet	25%
2. Alumni	Evaluation sheet & interview	5%
3. Stakeholders (Employers)	Evaluation sheet & interview	5
4. External Evaluator(s) (External Examiner(s))	Report	1
5. Internal Evaluator(s) (Internal Examiner(s))	Report	2

Coordinator of
Program Quality assurance committee

Dr. Khaled El Naggar
Date 4 /4 / 2021

Program Coordinator

Prof. Dr. Ahmed Reda
Date 4 / 4 / 2021

Appendix: Course Matrix with program Competences:

Course Code	Course Name	Engineering Competencies (2018)										"Department" Sustainable Energy Competencies (NARS)			"Discipline" Sustainable Energy Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	D1	D2	D3	D4
EMP101	Engineering Mathematics (1)	√		√														
EMP103	Physics (1)	√	√					√										
EMP105	Engineering Chemistry	√	√					√										
EMP106	Engineering Mechanics (1)	√		√														
MDP101	Engineering Drawing (1)	√					√		√									
GEN101	English Language							√	√									
EMP102	Engineering Mathematics (2)	√		√														
EMP104	Physics (2)	√	√					√										
EMP107	Engineering Mechanics (2)	√		√														
CPE101	Computer Programming	√			√		√	√		√	√							
MDP103	Production Technology & Workshops		√				√			√								
MDP102	Engineering Drawing (2)		√		√				√									
GEN102	Engineering & Society			√	√													
EMP201	Engineering Mathematics (3)	√							√									
MPE201	Thermodynamics	√										√			√			

إعتماد مجلس إدارة البرنامج رقم (93) بتاريخ 20-9- 2021 و المصادقة بمجلس الكلية رقم (1) بتاريخ 21-9-2021

Course Code	Course Name	Engineering Competencies (2018)										"Department" Sustainable Energy Competencies (NARS)			"Discipline" Sustainable Energy Competencies (ARS)			
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	D1	D2	D3	D4
MDP201	Materials Science	√	√									√						
MDP212	Manufacturing Technology	√		√							√	√						√
MDP203	Computer Aided Mechanical Drawing			√						√	√	√	√			√	√	
GEN201	Technical Report Writing							√	√									
EMP202	Engineering Mathematics (4)	√							√									
EMP203	Physics (3)	√							√									
MPE202	Fluid Mechanics	√										√						
MDP204	Mechanics & Testing of Materials	√		√							√	√	√					
EPM201	Electrical Engineering I	√	√											√				
GEN202	Psychology & Organization Behavior			√				√	√	√								
MPE301	Heat & Mass Transfer	√	√			√					√	√						
MPE302	Applied Fluid Mechanics	√	√	√		√						√						
ELC301	Electronic Engineering	√		√		√												
EMP311	Organic Chemistry	√				√					√							
MDP301	Machine Components Design			√	√							√	√					
EPM302	Electrical Engineering II	√	√											√				

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		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	D1	D2	D3	D4
GEN301	Leadership and Management skills			√			√		√	√	√							
MPE303	Measurements & instrumentation Systems	√	√	√							√	√						
ESE380	Field Training I			√	√			√	√	√			√		√			
MPE304	Applied Thermodynamics	√							√		√	√		√	√			
EPM301	Electrical Power Engineering					√	√				√			√			√	√
MDP312	Theory of Machines	√										√		√				
MPE305	Numerical Methods for Engineers	√											√			√		
GEN302	Professional Ethics						√	√		√								
ESE411	Selected topics in Sustainable Energy			√		√										√		
MDP401	Vibration & Dynamics	√		√								√						√
EPM401	Electrical Machines		√	√										√				
ESE402	Fuel & Advanced Combustion	√		√									√		√			√
ESE410	Elective (1)			√	√					√		√	√		√			√
GEN401	Legislations, contract and procurement management						√			√	√							
ESE403	Energy & Conservation Management	√	√										√					√

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MPE401	Applied Heat & Mass Transfer	√	√	√		√					√	√						
ESE404	Bioenergy	√		√		√					√						√	
ESE405	Solar Energy	√	√	√		√						√	√			√		√
ESE412	Elective (2)	√			√	√						√						√
ESE480	Field Training II			√	√			√	√	√			√		√			
GEN402	Human Resources Management				√	√	√	√	√	√	√							
EPM402	Power System Analysis	√	√	√								√		√		√		√
ESE501	Energy Economics			√					√							√		
ESE502	Wind Energy	√	√	√		√						√	√			√		√
MDP501	Control Systems analysis & Design	√					√			√		√	√	√				√
ESE503	Solar Cells Fundamentals											√		√			√	
ESE510	Elective (3)				√	√				√		√	√		√			√
ESE591	Project (1)	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	
ESE504	Power Stations	√		√									√		√			√
ESE525	Computer Applications in Fluid Mechanics												√			√		
ESE506	Energy Storage & Transmission	√	√	√										√				√

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		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	D1	D2	D3	D4
EPM501	Power Electronics		√				√							√				
ESE512	Elective (4)				√							√				√		√
ESE592	Project (2)	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√	