توصيف مقررات المستوى الصفرى

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: All Programs
Department offering the course: Engineering Mathematics & Physics Department

1- Course Data

Course Code: EMP 101
Course Title: Engineering Mathematics (1)
Semester/level: First / zero
Specialization: Engineering Mathematics
Credit Hours: 3
Lecture: 2 **Tutorial:** 2 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:

1) Recognize all elementary functions trigonometric, logarithmic, hyperbolic, exponential, inverse functions
2) Recognize limits and continuity
3) Recognize the rules of differentiation
4) Recognize the essential information about Binomial theorem, finite series, partial fraction, complex numbers and mathematical induction.
5) Deal with properties of matrices
6) Recognize the essential rules of indefinite integration

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying engineering fundamentals in mathematics by studying rules of differentiation, binomial theorem, finite series, partial fraction, complex numbers and mathematical induction and properties of matrices

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.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Differentiation and Integration: Functions – Limits –Differentiation - indefinite integrals - Integral properties.
Linear Algebra: Binomial Theorem-Partial fraction-Complex Numbers- Linear Equations-Matrices-Matrix properties.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies	
		A1	A3
1	**Introduction to Course**: Limits	√	
2	**Introduction to Course**: continuity	√	√
3	Functions: trigonometric - hyperbolic - logarithmic	√	
4	Functions: exponential, inverse functions	√	√
5	Rules of differentiation for different functions	√	

6		√	√
8	Binomial theorem	√	
9	Partial fraction	√	
10	Mathematical induction	√	√
11	Complex numbers - Finite series	√	
13	Matrices	√	
14	Rules of the indefinite integrals	√	

5- a) Teaching and Learning Methods

Course 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	√	√	√							
	A3				√			√			

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A1	√	√		√						√
	A3							√	√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination 1	7	30 %
Final Examination	(As Schedule)	40 %
Home assignments, and Reports	2, 4, 6, 10	10%
Midterm Examination 2	12	20 %
Total		**100 %**

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lecture notes and training sheets

b- Books

1. Alan Jeffrey, "Advanced engineering Mathematics", University of new castle – upon-Tyne, 2002.
2. Robert C. Wrede Murray R. Spiegel "Schaums Outlines Advanced Calculus", 2nd edition

c- Recommended Books

-

d- Web Sites

www.Google.com
https://drive.google.com/drive/my-drive

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies	
	A1	A3
Course Objective #1	√	√
Course Objective #2	√	√
Course Objective #3	√	√
Course Objective #4	√	√
Course Objective #5	√	
Course Objective #6	√	

- Course Coordinator: Dr. Khaled el Naggar **Signature:**

- Program Coordinator: Prof. Dr. Said Abdallah **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: All Programs
Department offering the course: Engineering Mathematics & Physics Department

1- Course Data

Course Code: EMP 103 **Course Title:** Physics (1)
Semester/Level: First / Zero **Specialization:** Engineering physics
Credit Hours: 3 **Lecture:** 2 **Tutorial:** 0 **Lab:** 3

2- Course Objectives

For students undertaking this course, they will be able to:
1) Recognize laws of gravitation.
2) Recognize concepts of elasticity & waves in elastic media.
3) Recognize laws of fluid dynamics, viscosity and surface tension.
4) Deal with electric field and to understand and deal with Coulomb law
5) Understand and deal with electric capacitors, Kirchhoff's law, Gauss law and electric potential
6) Apply numerical modeling methods to engineering problems

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying engineering fundamentals in physics by studying laws of gravitation**,** fluid dynamics, viscosity and surface tension and concepts of elasticity.

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.

A7) Function efficiently as an individual and as a member of multi-disciplinary and multi-cultural teams.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Properties of Matter: Physical Quantities-Standard Units and Dimensions-Harmonic Motion-Physical Properties of Materials-Physical properties of Fluids-Viscosity-Surface Tension-Sound waves. Heat and Thermodynamics: Heat transfer-Gas theorem-First and Second law of thermodynamics-temperature Measurement.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies		
		A1	A2	A7
1	Properties of Matter: Physical Quantities-Standard Units and Dimensions	√		
2	Harmonic Motion	√		√
3	Harmonic Motion	√	√	
4	Physical Properties of Materials	√		
5	Physical Properties of Materials	√	√	
6	Physical properties of Fluids-Viscosity-Surface Tension-Sound waves	√		
8	Physical properties of Fluids-Viscosity-Surface Tension-Sound waves	√	√	√
9	Heat and Thermodynamics: Heat transfer-Gas theorem	√		√
10	Heat and Thermodynamics: Heat transfer-Gas theorem	√		√
11	First and Second law of thermodynamics	√	√	√
13	Temperature Measurement	√		
14	Temperature Measurement	√		

5- a) Teaching and Learning Methods

Course 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				√	√		√			
	A7				√	√		√		√	√

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		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							√	√		
	A7							√	√	√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination 1	7	30 %
Final Examination	(As Schedule)	40 %
Home assignments, and Reports	3, 5, 8, 11	10%
Practical Examination	12	20 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lecture material and experimental sheets

b- Books

Physics, David Halliday, Robert Resnick and Kenneth S. Krane, John Willey & Sons, Inc
ISBN: 978-0-471-32057-9 , April 2001, 624 Pages.

c- Recommended Books

Physics for Scientists and Engineers with modern physics by Serway, Library of Congress Control Number: 2012947242, ISBN-13: 978-1-133-95405-7, ISBN-10: 1-133-95405-7

d- Web Sites

www.physics research.com, www.electrostaticResearch.com, www.Google.com

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies		
	A1	A2	A7
Course Objective #1	√		√
Course Objective #2	√	√	√
Course Objective #3	√	√	√
Course Objective #4	√	√	
Course Objective #5		√	
Course Objective #6		√	

- Course Coordinator: Dr. Ahmed Samir **Signature:**

- Program Coordinator: Prof. Dr. Said Abdallah **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: All Programs
Department offering the course: Engineering Mathematics & Physics Department

1- Course Data

Course Code: EMP 105 **Course Title:** Chemistry
Semester/Level: First / zero **Specialization:** Engineering Chemistry
Credit Hours: 3 **Lecture:** 2 **Tutorial:** 0 **Lab:** 3

2- Course Objectives

For students undertaking this course, they will be able to:

1) Recognize the essential information as introduction about the fundamentals and basic concepts of Chemistry and their applications, also about basic information related to the applications in the Engineers.
2) Recognize theory of equations and solve problems on gases, thermo chemistry and electrochemistry equations.
3) Recognize the properties of solutions and the colligative properties chemical equilibrium.
4) Recognize the basic tools necessary to obtain water treatments and Building materials.
5) Describe the concept phase diagrams of the chemical compounds and it is mixture.
6) Recognize some aspects on chemical industries.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying engineering fundamentals and basic concepts of chemistry and their applications.

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.7) Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Introduction to the properties of materials-Introduction to chemical thermodynamics-Solutions-Change in type and chemical balance-Electrical Chemistry-Kinematics of Chemical reactions-material and heat balance in combustion process-Fuel technology-Cement Industry-Fertilizer industry-Corrosion-Water Pollution and Water treatment-Air pollution-plastic industry.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies		
		A1	A2	A7
1	Introduction to the properties of materials	√		
2	Introduction to chemical thermodynamics	√		
3	Solutions	√	√	
4	Change in type and chemical balance	√		√

5	Electrical Chemistry	√	√	√
6	Kinematics of Chemical reactions	√		√
8	material and heat balance in combustion process	√	√	√
9	Fuel technology	√		√
10	Cement Industry	√		√
11	Fertilizer industry	√	√	
13	Corrosion-Water Pollution and Water treatment	√		
14	Air pollution & Plastic industry	√		

5- a) Teaching and Learning Methods

Course 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				√	√		√			
	A7				√	√		√		√	√

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		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							√	√		
	A7							√	√	√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination 1	7	30 %
Final Examination	(As Schedule)	40 %
Home assignments, and Reports	3, 5, 8, 11	10%
Practical Examination	12	20 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lecture material and experimental sheets

b- Books

Chemistry, The Central Science by T. L. Brown , H.E. LeMay, Jr. and Bruce E. Bursten, 10^{th} Edition, Prentice-Hall International,2006.

c- Recommended Books

-.

d- Web Sites

www.GeneralchemistryResearch.com

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies		
	A1	A2	A7
Course Objective #1	√		
Course Objective #2	√	√	
Course Objective #3	√	√	
Course Objective #4	√	√	√
Course Objective #5	√	√	√
Course Objective #6	√		

- Course Coordinator: Dr. Mohamed Magdy **Signature:**

- Program Coordinator: Prof. Dr. Said Abdallah **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: All Programs
Department offering the course: Engineering Mathematics & Physics Department

1- Course Data

Course Code: EMP 106 **Course Title:** Engineering Mechanics (1)
Semester/Level: First / Zero **Specialization:** Engineering Mechanics
Credit Hours: 3 **Lecture:** 2 **Tutorial:** 2 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:
1) Deal with vectors, find moments of forces about a point and a line
2) Replace a system of forces by (Force and moment), (Single forces) and a (wrench)
3) Recognize the equilibrium of a particle and statically determinate rigid body in 2D and 3D.
4) Identify the center of gravity of different geometries in 2D and 3D

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying engineering fundamentals in Statics by studying vectors, finding moments of forces, studying the equilibrium of a particle and the center of gravity of different geometries**.**

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.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Statics: Two- and three-dimensional vector representation of forces, moments and couples; static equilibrium of particles, rigid bodies, and engineering structures; analysis of external and internal forces in structures via the methods of free-body diagrams; and properties of cross-sectional areas.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies	
		A1	A3
1	Vector algebra and some of its applications in statics	√	
2		√	√
3	Equilibrium of a particle	√	
4	Couple, Movement of forces and reduction of system	√	√
5	Reduction of system	√	
6	Equilibrium of a rigid body	√	√
8	Center of gravity and first moment	√	
9	engineering structures	√	
10	analysis of external and internal forces in structures via the methods of free-body diagrams	√	
11		√	√

13	Properties of cross-sectional areas.	√	
14		√	

5- a) Teaching and Learning Methods

Course 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	√	√	√							
	A3				√			√			

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course 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	√	√		√						√
	A3							√	√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination 1	7	30 %
Final Examination	(As Schedule)	40 %
Oral Examination	14	5%
Home assignments, and Reports	2, 4, 6, 11	5%
Midterm Examination 2	12	20 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lecture notes and training sheets

b- Books

-

c- Recommended Books

Vector mechanics for Engineers, Ferdinand P.Beer, E.Russell Johnston
McGraw-Hill Education; 6Rev Ed edition (January 1, 2000), ISBN: 9780071311083

d- Web Sites

www.Google.com, www.vector mechanics for Engineers research.com
.

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies	
	A1	A3
Course Objective #1	√	√
Course Objective #2	√	√
Course Objective #3	√	√
Course Objective #4	√	√

- **Course Coordinator:** Prof. Dr. Mohamed Akl **Signature:**

- **Program Coordinator:** Prof. Dr. Said Abdallah **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: MDP101 **Course Title:** **Engineering Drawing (1)**
Semester/Level: First / zero **Specialization:** Energy Sustainable Engineering
Credit Hours: 3 **Lecture:** 2 **Tutorial:**0 **Lab:** 3

2- Course Objectives

For students undertaking this course, they will be able to:

1. Recognize the basics of engineering Graphics.
2. Recognize the sketching and line techniques.
3. Recognize how to draw an isometric.
4. Recognize the multi-view drawings and orthographic projection.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying engineering Graphics.

A.6) Plan, supervise and monitor implementation of engineering drawings and orthographic projection taking into consideration other trades requirements.

A.8) Communicate effectively graphically, verbally and in writing with a range of audiences using contemporary tools.

.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Introduction to Engineering Graphics - Basic Drafting and Lettering - Sketching and Line Techniques - Geometric Construction – Isometric Drawings - Multi-view Drawings and orthographic projection - Auxiliary Views.

b) Topics to be Covered weekly & Matrix of Competencies.

Week	Topics	Course Competencies		
		A1	A6	A8
1	Introduction to Engineering Graphics	√		√
2	Basic Drafting and Lettering	√		√
3	Sketching and Line Techniques	√		√
4, 5 & 6	Geometric Construction	√	√	
7	1st Midterm Exam	√	√	
8 & 9	Isometric Drawings	√	√	√
10 & 11	Multi-view Drawings and orthographic projection	√		√
12	2nd Midterm Exam	√	√	
13 & 14	Auxiliary Views	√	√	
15	Final Exam			

5- a) Teaching and Learning Methods

Course Competencies		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Level A	A1	√	√	√							√
	A6	√		√					√		√
	A8				√			√	√	√	

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my timetable declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A1	√	√	√	√						
	A6	√			√						√

	A8							√	√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Mini project	-	0 %
Home assignments, and Reports	2, 4, 6, 9	10 %
Oral exam	-	0 %
Total	-	**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

• Colin H Simmons, Dennis E Maguire, â€oeManual of Engineering Drawing, Elsevier Newnes. ISBN 0 7506 5120 2 Recommended Books

c- Recommended Books

James H. Earle "Engineering Design Graphics", Eleventh Edition
ISBN-13: 978-0131425736 ISBN-10: 9780131425736

d- Web Sites

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies		
	A1	A6	A8
Recognize the basics of engineering Graphics.	√	√	√
Recognize the sketching and line techniques.	√	√	√
Recognize how to draw an isometric.	√		√
Recognize the multi-view drawings and orthographic projection.	√		

- Course Coordinator:

Signature:

- Program Coordinator: **Prof.Dr. Ahmed Reda Elshamy** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: GEN101 **Course Title:** **English Language**
Semester/Level: First / zero **Specialization:** Energy Sustainable Engineering
Credit Hours: 2 **Lecture:** 2 **Tutorial:** 0 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:

1. Recognize tenses, phonetics and technical language to prepare and present technical reports.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

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.

4- Course Contents

a) **Course Description** (As indicated in program Bylaw)

English Language Grammar-Linguistic Composition-Essay Writing-Speech-Listening-Improving correct Reading Skills-using Interactive Multimedia in Teaching this course.

b) **Topics to be Covered weekly & Matrix of Competencies.**

Week	Topics	Course Competencies	
		A7	A8
1 & 2	English Language Grammar	√	√
3 & 4	Linguistic Composition	√	√
5 & 6	Essay Writing	√	
7	1st Midterm Exam		
8 & 9	Speech	√	
10 &11	Listening	√	√
12	2nd Midterm Exam		
13 & 14	Improving correct Reading Skills	√	√
15	Final Exam		

5- a) Teaching and Learning Methods

Course 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	A7	√						√			
	A8	√						√			

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my timetable declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course 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	A7	√		√			√				√
	A8	√		√							√

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Mini project	-	0 %
Home assignments, and Reports	2, 4, 6, 9	10%
Oral exam	-	0 %
Total	-	**100 %**

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- c- Recommended Books

d- Web Sites

1-

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies	
	A7	A8
Recognize tenses, phonetics and technical language to prepare and present technical reports.	√	√

- Course Coordinator:

Signature:

- Program Coordinator: **Prof.Dr. Ahmed Reda Elshamy** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: All Programs
Department offering the course: Engineering Mathematics & Physics Department

1- Course Data

Course Code: EMP 102 **Course Title:** Engineering Mathematics (1)
Semester/level: second / zero **Specialization:** Engineering Mathematics
Credit Hours: 3 **Lecture:** 2 **Tutorial:** 2 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:

1) Identify the applications of the definite integrals
2) Deal with the difference between circle, parabola, hyperbola and ellipse
3) Understand the properties of each conic section
4) Deal with solid geometry plane - line in space - sphere
5) Recognize the rules of definite and indefinite integration and the techniques of integration

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying engineering fundamentals in mathematics by studying applications of the definite integrals and the properties of different conic sections.

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.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Integration: Different methods for integration by substitution-partial fraction-Recurrent reduction-Rieman Series-Applications for calculating Surfaces and Volumes.
Analytical Geometry: Second Order equations- Pairs of straight Lines-Circle and group of Circles-Conic sections-Coordinate systems-Plane equation-Sphere Cylinder and Cone.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies	
		A1	A3
1	Equation of straight line	√	
2	Equation of pair of straight lines	√	√
3	Equation of circle	√	
4	Equation of parabola	√	√
5	Equation of ellipse	√	
6	Equation of hyperbola	√	√
8	Rules of indefinite integration	√	

9	Techniques of integration	√	
10	Rules of definite integration	√	
11	Applications of the definite integrals	√	√
13	Equation of line in space	√	
14	Equation of plane - Equation of sphere	√	

5- a) Teaching and Learning Methods

Course 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	√	√	√							
	A3				√			√			

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A1	√	√		√						√
	A3							√	√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination 1	7	30 %
Final Examination	(As Schedule)	40 %
Home assignments, and Reports	2, 4, 6, 11	10%
Midterm Examination 2	12	20 %
Total		**100 %**

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lecture notes and training sheets

b- Books

1. Alan Jeffrey, "Advanced engineering Mathematics", University of new castle – upon-Tyne, 2002.
2. Robert C. Wrede Murray R. Spiegel "Schaums Outlines Advanced Calculus", 2nd edition

c- Recommended Books

-

d- Web Sites

www.Google.com
https://drive.google.com/drive/my-drive

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies	
	A1	A3
Course Objective #1	√	√
Course Objective #2	√	√
Course Objective #3	√	√
Course Objective #4	√	
Course Objective #5	√	√

- Course Coordinator: Dr. Khaled el Naggar **Signature:**

- Program Coordinator: Prof. Dr. Said Abdallah **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: All Programs
Department offering the course: Engineering Mathematics & Physics Department

1- Course Data

Course Code: EMP 104 **Course Title:** Physics (2)
Semester/Level: second / zero **Lecture:** 2 **Tutorial:** 0 **Lab:** 3

2- Course Objectives

For students undertaking this course, they will be able to:

1) Recognize electricity and magnetism Electrical Induction-Gauss Law-Electrical voltage - Condensers and Insulated materials.
2) Recognize Ohm's law and simple circuit analysis-magnetic field- Faraday's law-Magnetic, induction.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying engineering fundamentals in physics by studying electricity and magnetism, electrical Induction, Gauss Law, electrical voltage, condensers and insulated materials.

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.

A7) Function efficiently as an individual and as a member of multi-disciplinary and multi- cultural teams.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Electricity and magnetism: Charge and matter-magnetic Field-Coulomb Law - Electrical Induction-Gauss Law-Electrical voltage - Condensers and Insulated materials-current Resistance and electro motive force-Ohm's law and simple circuit analysis-magnetic field- Faraday's law-Magnetic, induction.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies		
		A1	A2	A7
1	Electricity and magnetism: Charge and matter	√		
2	magnetic Field	√		√
3	Coulomb Law	√	√	
4	Electrical Induction	√		
5	Gauss Law-Electrical voltage	√	√	
6	Condensers and Insulated materials	√		
8	Current Resistance and electro motive force	√	√	√

9	Ohm's law and simple circuit analysis	√		√
10	Ohm's law and simple circuit analysis	√		√
11	Magnetic field	√	√	√
13	Faraday's law	√		
14	Magnetic induction	√		

5- a) Teaching and Learning Methods

Course Competencies		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				√	√		√			
	A7				√	√		√		√	√

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		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							√	√		
	A7							√	√	√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination 1	7	30 %
Final Examination	(As Schedule)	40 %
Home assignments, and Reports	3, 5, 8, 11	10%
Practical Examination	12	20 %
Total		**100 %**

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lecture material and experimental sheets

b- Books

Physics, David Halliday, Robert Resnick and Kenneth S. Krane, John Willey & Sons, Inc
ISBN: 978-0-471-32057-9 , April 2001, 624 Pages.

c- Recommended Books

Physics for Scientists and Engineers with modern physics by Serway, Library of Congress Control Number: 2012947242, ISBN-13: 978-1-133-95405-7, ISBN-10: 1-133-95405-7

d- Web Sites

www.physics research.com, www.electrostaticResearch.com, www.Google.com

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies		
	A1	A2	A7
Course Objective #1	√		√
Course Objective #2	√	√	√

- Course Coordinator: Prof. Dr. Ahmed Abdallah **Signature:**

- Program Coordinator: Prof. Dr. Said Abdallah **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: All Programs
Department offering the course: Engineering Mathematics & Physics Department

1- Course Data

Course Code: EMP 107
Course Title: Engineering Mechanics (2)
Semester/Level: Second / Zero
Specialization: Engineering Mechanics
Credit Hours: 3
Lecture: 2 **Tutorial:** 2 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:

1) Recognize the Kinematics of a particle (velocity, acceleration) moving on a line or in plane using different coordinate systems (Cartesian, polar and natural).
2) Recognize the motion of projectiles in plane (in non-resisting medium).
3) Recognize the simple harmonic motion.
4) Recognize kinetics of a particle using the principles of work and energy.
5) Deal with conservative forces.
6) Recognize the motion inside and outside a circle (Vertical and horizontal circle).
7) Recognize problems including impacts of bodies.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying engineering fundamentals in Dynamics by studying the kinematics of a particle and the motion of projectiles in plane.

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.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Dynamics: Kinematics of particles (Rectilinear Motion, Plane curvilinear motion, Space curvilinear motion, Relative motion) - Kinetics of particles (Newton's Second Law: Force, Mass and Acceleration Work and Energy Impulse and Momentum) - Kinematics of rigid bodies (Rotation, Absolute motion, Relative motion) - Kinetics of rigid bodies (Force, Mass and Acceleration Work and Energy Impulse and Momentum).

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies	
		A1	A3
1	Dynamics: Kinematics of particles: Rectilinear motion of a particle	√	
2	Plane curvilinear motion of	√	√

	a particle		
3	Space curvilinear motion of a particle	√	
4	Relative motion of a particle	√	√
5	Kinetics of particles (Newton's Second Law: Force, Mass and Acceleration	√	
6	Work and Energy Impulse and Momentum	√	√
8	Kinematics of rigid bodies (Rotation, Absolute motion, Relative motion)	√	
9		√	
10	Kinetics of rigid bodies (Force, Mass and Acceleration)	√	
11		√	√
13	Work and Energy Impulse and Momentum	√	
14		√	

5- a) Teaching and Learning Methods

Course Competencies		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Level A	A1	√	√	√							
	A3				√			√			

(Teaching and Learning Methods)

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A1	√	√		√						√
	A3							√	√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination 1	7	30 %
Final Examination	(As Schedule)	40 %
Oral Examination	14	5%
Home assignments, and Reports	2, 4, 6, 11	5%
Midterm Examination 2	12	20 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lecture notes and training sheets

b- Books

-

c- Recommended Books

Vector mechanics for Engineers, Ferdinand P.Beer, E.Russell Johnston
McGraw-Hill Education; 6Rev Ed edition (January 1, 2000), ISBN: 9780071311083

d- Web Sites

www.Google.com, www.vector mechanics for Engineers research.com
.

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies	
	A1	A3
Course Objective #1	√	√
Course Objective #2	√	√
Course Objective #3	√	√
Course Objective #4	√	
Course Objective #5	√	√
Course Objective #6	√	√
Course Objective #7	√	√

- Course Coordinator: Prof. Dr. Mohamed Akl **Signature:**

- Program Coordinator: Prof. Dr. Said Abdallah **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: CPE101
Course Title: **Computer Programming**
Semester/Level: Second / zero
Specialization: Energy Sustainable Engineering
Credit Hours: 3
Lecture: 2 **Tutorial:** 0 **Lab:** 3

2- Course Objectives

For students undertaking this course, they will be able to:

1. Provide an overview of computer history, structure, and applications.
2. Explain how to solve engineering problems.
3. Share ideas and work in a team in an effective manner.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying overview of programming languages (C++, Java)

A.4) Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

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.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.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Overview of programming concepts – object-oriented programming – Application on specific up to date programming language (C#, C++, C, JAVA, Visual Basic… etc.).

b) Topics to be Covered weekly & Matrix of Competencies.

Week	Topics	Course Competencies A1	A4	A6	A7	A9	A10
1 to 3	Overview of programming concepts	√	√			√	
3 to 6	object-oriented programming	√	√	√		√	
7	1st Midterm Exam	√					
8 to 11	Application on specific up to date programming language (C#, C++, C, Visual Basic… etc.)	√		√	√		√
12	2nd Midterm Exam	√	√	√	√		√
13 & 14	Application on specific up to date programming language (C#, C++, C, Visual Basic… etc.)	√			√		√
15	Final Exam	√					

5- a) Teaching and Learning Methods

Course Competencies		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Level A	A1	√	√	√		√					
	A4	√	√								
	A6								√		√
	A7				√			√		√	
	A9							√		√	
	A10	√	√	√							

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my timetable declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course 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	√	√	√	√	√					√
	A4	√	√								
	A6									√	
	A7							√	√		
	A9							√	√		
	A10	√	√								

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Mini project	-	0 %
Home assignments, and Reports	2, 4, 6, 9	10%
Oral exam	-	0 %
Total	-	**100 %**

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1- "Introduction to Computer Science", Dr.MazenSelim, Dr. AbdulwahabAlsammak, Dr. Adly Tag El-din

c- Recommended Books

1- "Computer Concepts", Dan Oja, June Parsons, 8th edition, 2011

d- Web Sites

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies					
	A1	**A4**	**A6**	**A7**	**A9**	**A10**
Provide an overview of computer history, structure, and applications.	√					√
Explain how to solve engineering problems.	√	√	√			√
Share ideas and work in a team in an effective manner.	√	√		√	√	

- Course Coordinator:

Signature:

- Program Coordinator: **Prof.Dr. Ahmed Reda Elshamy** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: MDP103
Course Title: Production Technology & Workshops
Semester/Level: Second/ Zero
Specialization: Mechanical Production Engineering
Credit Hours: 3
Lecture: 2 **Tutorial:-** **Lab:** 3

2- Course Objectives

1- Provide students with a solid foundation in the fundamental principles of production. Engineering.
2- Provide students to study the application of production method.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.2) Develop and conduct appropriate experimentation in the fundamental principles of production, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.
A.6) Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
A.9) Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.
.

4- Course Contents

a) **Course Description** (As indicated in program Bylaw)

Introduction to Engineering materials – Metallic and non-metallic materials – cast iron and steel furnaces – metal casting – metal forming – extrusion – bending – welding – turning – milling – shaping – drilling – simple measurement tools – production quality – practical hand skills in the workshop.

b) Topics to be Covered weekly & Matrix of Competencies.

Week	Topics	Course Competencies		
		A2	A6	A9
1	Introduction to Engineering materials		√	√
2	Metallic and non-metallic materials		√	
3	cast iron and steel furnaces	√	√	√
4	metal casting	√		√
5	metal forming	√		√
6	extrusion	√		√
7	bending	√		√
9	welding – turning	√		√
10	milling – shaping – drilling	√		√
11	simple measurement tools	√		
13	production quality		√	√
14	Practical hand skills in the workshop.	√		

5- a) Teaching and Learning Methods

Course Competencies		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Level A	A2	√				√			√	√	
	A6	√			√	√	√		√	√	√
	A9					√	√		√	√	

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A2	√		√		√	√	√		√	
	A6	√		√	√		√	√	√	√	
	A9					√		√	√	√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
Practical Exam.	12	20%
Final Examination	15	40 %
Quizzes	4, 6, 10	2.5%
Home assignments, and Reports	2, 5, 9, 11	2.5%
Oral exam	14	5 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- ■ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor and power Point presentation..

.

Course Objectives and Competencies

Course Objectives	Course Competencies		
	A2	A6	A9
Provide students with a solid foundation in the fundamental principles of production. Engineering	√	√	√
Provide students to study the application of production method	√		√

- Course Coordinator: Prof Dr. **Ibrahim mousa** **Signature:**

- Program Coordinator: **Prof.Dr. Ahmed Reda Elshamy** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: MDP102
Course Title: **Engineering Drawing (2)**
Semester/Level: Second / Zero
Specialization: Energy Sustainable Engineering
Credit Hours: 3
Lecture: 2 **Tutorial:**0 **Lab:** 3

2- Course Objectives

For students undertaking this course, they will be able to:

1. Recognize the dimensioning.
2. Recognize the Freehand sketching - Sectional views – Steel structure drawing.
3. Recognize the basic principles of AutoCAD- Drawing the various types of refrigeration system components.
4. Recognize the manipulation and modification of 2D drawings using Auto CAD.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.2) Develop and conduct appropriate experimentation using AutoCAD- Drawing and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

A.4) Utilize contemporary technologies, modification of 2D drawings using Auto CAD codes of practice and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

A.8) Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Dimensioning – Freehand sketching - Sectional views – Steel structure drawing- Basic principles of AutoCAD- Drawing, manipulation and modification of 2D drawings using Auto CAD.

b) Topics to be Covered weekly & Matrix of Competencies.

Week	Topics	Course Competencies		
		A2	A4	A8
1	Dimensioning	√	√	
2 & 3	Freehand sketching	√	√	
4, 5 & 6	Sectional views	√	√	
7	1st Midterm Exam	√		
8 & 9	Steel structure drawing	√		√
10 & 11	Basic principles of AutoCAD	√	√	√
12	2nd Midterm Exam			√
13 & 14	Drawing, manipulation and modification of 2D drawings using Auto CAD.	√		√
15	Final Exam	√		

5- a) Teaching and Learning Methods

Course 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	A2	√		√		√			√		
	A4					√			√		
	A8				√			√		√	

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my timetable declared for students from the beginning of the semester

7- Student Assessment

a- Student Assessment Methods

Course 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	A2	√			√	√					√
	A4				√			√			

	A8							√	√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Mini project	-	0 %
Home assignments, and Reports	2, 4, 6, 9	10%
Oral exam	-	0 %
Total	-	**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

• Colin H Simmons, Dennis E Maguire, â€oeManual of Engineering Drawing, Elsevier Newnes. ISBN 0 7506 5120 2 Recommended Books

c- Recommended Books

James H. Earle "Engineering Design Graphics", Eleventh Edition
ISBN-13: 978-0131425736 ISBN-10: 9780131425736

d- Web Sites

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies		
	A2	A4	A8
Recognize the dimensioning.			√
Recognize the Freehand sketching - Sectional views – Steel structure drawing.	√		√
Recognize the basic principles of AutoCAD- Drawing The various types of refrigeration system components.	√	√	√
Recognize the manipulation and modification of 2D drawings using Auto CAD.		√	√

- Course Coordinator:

Signature:

- Program Coordinator: **Prof.Dr. Ahmed Reda Elshamy** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Any Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: GEN102
Course Title: Engineering & Society
Semester/Year: Second / 2020-2021
Specialization: University Requirements
Credit Hours: 2
Lecture: 2 **Tutorial:** 0 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:

1. Understand the role of engineers in society.
2. Recognize the history of engineering and how engineering has evolved through the ages.
3. Understand the significance of globalization and the impact of the new economy.
4. Appreciate the importance of strong codes of ethics in their professional conduct and reflect of their actions on society and make more considered choices.
5. Understand the socio-politics of the countries in Egypt and the region and better appreciate the events taking place in these countries.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

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.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

History of engineering - Engineering ethics - Challenges of globalization and the new economy - Contribution of engineers in the new millennium - Economic and industrial development issues.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies	
		A3	A4
1	Introduction to Course	√	
2	What is Engineering?	√	
3	History of engineering	√	
4	History of engineering	√	
5	History of engineering	√	
6	Engineering disciplines	√	
7	Engineering ethics	√	√

8	Mid-Term Exam	√	
9	Engineering ethics	√	√
10	Globalization and the new economy	√	
11	Globalization and the new economy		
12	Engineers in the new millennium		√
13	Engineers in the new millennium		√
14	Engineers in the new millennium		√

5- a) Teaching and Learning Methods

Course 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	A3	√	√	√							
	A4			√					√	√	

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
		Assessment Methods									
Level A	A3	√	√		√						√
	A4			√				√	√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination	8	30 %
Final Examination	(As Schedule)	40 %
Quizzes (2 times)	5, 12	20 %
Home assignments, and Reports	2, 4, 8, 11	10%
Lab Exam	-	0 %
Total		**100 %**

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lectures Notes in PDF

https://bu.edu.eg/staff/mohamedtantawy3

b- Books

1. SF Johnston, J P Gostelow & W J King, "Engineering & Society", Prentice Hall Inc., USA, 2000.
2. Denard Lynch, "Engineering in Society", Pearson Prentice Hall, ISBN-10: 0536895791.

c- Recommended Books

1. Harris, Prichard & Rabins, “Engineering Ethics”, Wadsworth Cengage Learning, 4th Edition, 2009.
2. Charles B. Fleddermann, “Engineering Ethics”, 4th Edition, Prentice Hall, 2012.

d- Web Sites

https://bu.edu.eg/staff/mohamedtantawy3

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies	
	A3	A4
Course Objective #1	√	√
Course Objective #2	√	√
Course Objective #3	√	
Course Objective #4	√	
Course Objective #5	√	√

- Course Coordinator: Assoc. Prof. Mohamed Anwar **Signature:**

- Program Coordinator: Prof. Ahmed El Shami **Signature:**

توصيف مقررات المستوى الأول

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: EMP 201 **Course Title:** Engineering Mathematics (3)
Semester/Level: First / one **Specialization:** Energy Sustainable Engineering
Credit Hours: 3 **Lecture:** 2 **Tutorial:** 2 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:
1 Recognize the basic concepts of partial derivatives.
2 Recognize the fundamental concepts of vector functions and vectors analysis.
3 Recognize the basic concepts of complex functions and complex integral
4 Recognize fundamentals of Matlab program

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying engineering fundamentals in mathematics by studying theories for partial derivatives, vector, complex analysis and fundamentals of Fourier series.

A.8) Communicate effectively verbally and in writing by performing a power point presentation or writing a report about selected topic decided at the middle of the semester.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Periodic Functions-Implicit and Logarithmic Differentiation and for Parametric equations Vector algebra-Euler and demoivre formulas- Inverse trigonometric functions-introduction to Matlab in solving mathematical problems.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies	
		A1	A8
1	Partial derivatives (chain rule of parametric equation-homogeneous function – Euler theorem)	√	
2	Partial derivatives (chain rule of parametric equation-homogeneous function – Euler theorem)	√	
3	Applications in partial derivatives (Taylor expansion-Envelope – Maxima and Minima)	√	√
4	Vector analysis (Dot and vector products- vector operations)	√	
5	Vector analysis (Stoke, Divergence and Green theorems)	√	√
6	Complex analysis (polar and Cartesian form of complex numbers –Demoivre theorem – Euler)	√	

8	Complex analysis (Laurant theorem – Complex integration)	√	√
9	Fundamentals in Fourier series (even and odd functions)	√	
10	Fundamentals in Fourier transform	√	
11	Fundamentals in Matlab program	√	√
13	Fundamentals in Matlab program	√	
14	Solving Mathematical problems using Matlab program	√	

5- a) Teaching and Learning Methods

Course 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	√	√	√							
	A8				√	√		√			

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A1	√	√		√	√					√
	A8							√	√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination	7	30 %
Final Examination	(As Schedule)	40 %
Home assignments, and Reports	3, 5, 8, 11	10%
Matlab Mini Project	12	20 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lecture notes and training sheets

b- Books

1. Alan Jeffrey, "Advanced engineering Mathematics", University of new castle – upon-Tyne, 2002.
2. Robert C. Wrede Murray R. Spiegel "Schaums Outlines Advanced Calculus", 2nd edition

c- Recommended Books

-

d- Web Sites

www.Google.com
https://drive.google.com/drive/my-drive

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies	
	A1	A8
Course Objective #1	√	√
Course Objective #2	√	√
Course Objective #3	√	√
Course Objective #4	√	√
Course Objective #5	√	

- Course Coordinator: Dr. Khaled el Naggar **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda El Shami **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code: MPE201 **Course Title:** Thermodynamics
Level/Semester: Summer / 2020-2021 **Specialization:** Energy and Sustainable Energy
Prerequisite Course(s): EMP103 Physics (1)
Credit Hours: 3 **Lecture:** 2 **Tutorial:** -- **Lab:** 3
Course Instructor(s): Prof Ramadan Sakr Prof R Kh Ali
Course Evaluator(s):

2- Course Aims

The aim of this course is to identify the basic concepts of thermodynamics such as system, state, state postulate, equilibrium, process, and cycle. Define the concepts of heat and work, including the terminology connected with heat energy transfer, electrical work, and various types of mechanical work. Introduce the first law of thermodynamics, energy balances, and mechanisms of energy transfer to or from a system. Demonstrate the procedures for determining thermodynamic properties of pure substances and ideal gas from tables of property data. Identify valid processes as those that satisfy both the first and second laws of thermodynamics.

3- Course Contents (As indicated in the program Bylaw)

Introduction (some processes that occur in equipment; power plant, vapor compression refrigerator, …) – Fundamental concepts and definitions (Thermodynamic system and control volume – process and cycle – point and path function – specific properties) – Properties and state of a Substance (Pure substance – vapor, liquid, solid phase equilibrium – Independent properties table) – Work and Heat (work done at moving boundary – work system – Heat transfer modes) – First law of thermodynamics (control mass and control volumes and their conservations) – Internal energy and enthalpy – The second law of thermodynamics (heat engine and Refrigerators – reversible process – Carnot cycle – ideal gas) – Entropy system property – thermodynamic property relation – principle of increase of entropy) – Irreversibility and Availability Processes (available energy, reversible work, and availability and second-law efficiency) – Applications for steady state and steady flow – Uniform flow and some processes.

4- Program Competencies Served by The Course (A1, B1 and D1)

Level (A) Engineering Competencies

A.1 Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science, and mathematics.

Level (B) Mechanical Engineering Competencies

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

Level (D) Energy and Sustainable Energy Engineering Competencies

D.1 Model, Analyze, design, and operate internal combustion engines, pumps, turbines, and compressors according to current developments and technologies

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Identify the unique vocabulary associated with thermodynamics through the precise definition of basic concepts to create a sound foundation for the development of the principles of thermodynamics.
LO2	Recognize the compressibility factor, which accounts for the deviation of real gases from ideal-gas behavior to distinguish between them.
LO3	Demonstrate the procedures for determining thermodynamic properties and processes of ideal gas and pure substances from tables of property data to apply the first law of thermodynamics for both open and closed systems.
LO4	Discuss the first law of thermodynamics and mechanisms of energy transfer in form of heat or work to or from a system to solve energy balance problems for common steady-flow devices such as nozzles, compressors, turbines, throttling valves, mixers, heaters, and heat exchangers.
LO5	Identify valid processes as those that satisfy both the first and second laws of thermodynamics to determine the expressions for the thermal efficiencies and coefficients of performance for reversible heat engines, heat pumps, and refrigerators.
LO6	Define a new property called entropy to measure the second law effects.
Psychomotor Domain	
LO7	Demonstrate the operation of heat engine and refrigeration according to the second law of thermodynamic. .
Affective Domain	

6- Mapping Learning Outcomes (LO's) with Competencies

LO's / NARS	A1	B1	D1
Cognitive Domain			
LO1	■		
LO2		■	
LO3		■	
LO4			■
LO5			■
LO6	■		
Psychomotor Domain			
LO7			■
Affective Domain			

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes						
			LO1	LO2	LO3	LO4	LO5	LO6	LO7
W1	• Thermodynamics and Energy • Application Areas of Thermodynamics • Importance of Dimensions and Units - **LAB: Topic 1** Temperature measurements	**5**	■						
W1	• Thermodynamic Systems ✓ Closed systems ✓ Open systems • Properties of a System Thermodynamic State, Process, and Cycle - **LAB: Topic 1** Temperature measurements	**5**	■		■				
W2	• Working substance ✓ Ideal gas model ✓ Real gas model • Working substance ✓ Pure Substance Model ✓ (Phase change of a pure substance) - (Saturation Temperature and Saturation Pressure) - (Liquid to Water vapor phase change process) - **LAB: Topic 2** Pressure measurements	**5**	■	■					
W2	• Working substance ✓ Pure Substance Model (Property Diagrams for Phase-change Processes) - (Property Tables) • Energy Transfer by Heat • Energy Transfer by Work Work for a closed system **LAB: Topic 2** Pressure measurements	**5**	■		■				
W3	• Thermodynamic Processes ✓ Polytropic process ✓ Isentropic process ✓ Isothermal process ✓ Isobaric process ✓ Isochoric process -LAB: Topic 3 Demonstration of ideal gas laws	**5**				■	■		
W3	• Energy Balance • 1st law of thermodynamics for closed systems. • 1st law of thermodynamics for steady flow open systems • **30% exam**	**5**		■		■			■
W4	• Applications of the 1st law of thermodynamics for steady flow open systems	**5**			■	■			

	✓ Work applications (Turbine, compressor and Pump).								
W4	✓ Velocity applications (Nozzle and Diffuser). ✓ Heat applications (Boiler and Condenser). ✓ Throttling valve. **LAB: Topic 4 Demonstration of first law of thermodynamic**	**5**			■	■			
W5	• Introduce the second law of thermodynamics. • Perpetual motion machine equivalence of the statements, heat engines, heat pumps and refrigerators • LAB: Topic 5 Demonstration of second law of thermodynamic	**5**					■		■
W6	• Reversible and irreversible processes, Internal and external reversibility Reversible cycle, Carnot cycle	**5**					■		■
W7	• Entropy, entropy change in a system during irreversible process, the increase of entropy principle, loss of work, the second law for control volumes. • Isentropic Efficiencies of Turbines, Nozzles, Compressors and pumps, heat transfer and work in internally reversible, steady flow process • **20% exam**	**5**						■	■
Final Exam									

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●							●
	LO2	●		●		●					●
	LO3	●		●	●	●					
	LO4	●		●	●	●					●
	LO5	●		●							
	LO6	●		●							●
Psychomotor Domain	LO7	●		●							

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the timetable declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral and lab Exams	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Question
Cognitive Domain	LO1	●				●			●		●
	LO2	●		●		●			●		●
	LO3	●		●		●			●		●
	LO4	●		●		●			●		●
	LO5	●				●			●		●
	LO6	●				●			●		●
Psychomotor Domain	LO7	●				●			●		●

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	3	30 %
Second Midterm Examination	7	20%
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)		
Home assignments and lab exam	2, 3,4,5	10%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	□ Computer with software
□ Lecture Hall	■ White Board	□ MIS system
□ Sound and Microphone	■ Data Show	□ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

Lectures Notes in PDF (please click here)
https://fengbuedu-my.sharepoint.com/:f:/g/personal/mohamed_emam_feng_bu_edu_eg/EvRpy4Mbp2NFkZJO3DaNtYIB1Ok7ISsFpv6Tu3hIHXWAOA?e=t5GIMR

b- Books

1- Yunus A. Cengel, Michael A. Boles, Mehmet Kangogl , Thermodynamics: An Engineering Approach, McGraw-Hill, 9th Edition, 2018.
2- G Van Wylen, G. Sonntag R. and Borgnakke, C. Fundamentals of Classical Thermodynamics, John Wiley & Sons, Inc. 6th edition, 2003

c- Recommended Books

1- Yunus A. Cengel, Michael A. Boles, Mehmet Kangogl , Thermodynamics: An Engineering Approach, McGraw-Hill, 9th Edition, 2018.

- Course Coordinator: Prof. Dr. Ramadan Saker, **Signature: R. Saker,**

Prof Dr. Ragab Khalil Ali **Signature: R K Ali**

- Program Coordinator: Prof.Dr. Ahmed Reda Elshamy **Signature:**

University:	Benha University
Faculty:	Faculty of Engineering at Shoubra
Department offering the program:	Mechanical Engineering Department
Department offering the course:	Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code: MDP201 **Course Title:** Materials Science
Semester/ Academic year: First semester / 2020-2021
Prerequisite Course(s): EMP105
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

The aim of this course is to provide the students with the basic knowledge and skills of the fundamentals of materials science and engineering. In addition to understand the relationship between the structure, processing, and properties of metals. Moreover, identify the types of phase diagrams, diffusion mechanisms, and heat-treatments cycles.

3- Course Contents (As indicated in the program Bylaw)

Introduction to the types/classifications of the engineering materials: metals, polymers, ceramics, composite, electronic and biomaterials. Crystal structure, crystalline and amorphous materials, crystal systems, atomic packing factor, polymorphism, crystallographic directions and planes, X-ray diffraction. Metallography, types of microscopes. Binary solutions, types of solid solutions, Hume–Rothery rule. Phase diagrams: Cu-Zn, Ag-Sn, Fe-C. Basics of heat-treatments: annealing, normalizing, quenching, aus-tempering, and case hardening. Deformation of metals: dislocation, twinning, yielding and defects. Diffusion mechanisms: steady-state and non-steady-state, carburizing.

4- Program Competencies Served by The Course (A1, A2 and B1)

Level (A) Engineering Competencies

A1. Identify, formulate, and solve complex engineering problems related to metallurgy.
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.

Level (B) Mechanical Engineering Competencies

B.1 Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of Thermodynamics, Heat Transfer, solid mechanics, Material Processing, Material Properties, and heat-treatment cycles Design

5- Learning Outcomes (LO's)

At the end of this course, the student will be able to:

Cognitive Domain	
#1	Recognize engineering materials classifications, crystal systems, directions, and planes.
#2	Construct tie arm rule to calculate the weight percentage of phases present in a solid solution.
Psychomotor Domain	
#3	Select the proper heat-treatment cycle of carbon-steels to meet the customer needs.
#4	Design the diffusion time and temperature to control the thickness of a carburized layer.

Affective Domain	
#5	Discuss the solid solution formability by Hume–Rothery criterion.

6- Mapping Learning Outcomes (LO's) with Competencies

LO's / NARS	A1	A2	B1
Cognitive Domain			
#1	■		
#2	■		
Psychomotor Domain			
#3		■	■
#4			■
Affective Domain			
#5		■	

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes							
			#1	#2	#3	#4	#5			
W1	- Introduction to engineering materials.	2	■							
W2	- Crystal structure (cubic, hexagonal) - LAB: Topic 1: Introduction to the facilities of the laboratory and the expected testing to be performed	4	■							
W3	- Crystal structure (directions, planes, APC, density) - LAB: Topic 2: optical microstructure characterization: sample preparation	4	■							
W4	-Materials characterization using X-ray diffraction - LAB: Topic 2: optical microstructure characterization: sample polishing	4	■							
W5	- Solid Solutions - LAB: Topic 2: optical microstructure characterization: sample etching	4	■				■			
W6	- phase diagram (Cu-Ni, Ag-Sn) - LAB: Topic 2: optical microstructure characterization: sample polishing	4	■							
W7	- Midterm exam (30%)	4		■						
W8	- phase diagram (Pb-Sn, Fe-C) - LAB: Topic 2: optical microstructure characterization: usage of the optical microscope & capturing images	4		■						
W9	- Deformation of metals - LAB: Topic 3: Heat-treatment & furnaces	4	■							

Week	Topics	Planned Hours	Learning Outcomes							
			#1	#2	#3	#4	#5			
W10	- Heat treatment of carbon steels (annealing, normalizing, quenching) - LAB: Topic 3: Heat-treatment & furnaces	4			■					
W11	- Heat treatment of carbon steels (tempering) - LAB: Topic 3: Heat-treatment & furnaces	4			■					
W12	- Midterm exam (20%) - Diffusion (steady-state) - LAB: Topic 3: Heat-treatment & furnaces	4				■				
W13	- Diffusion (non-steady-state)	4				■				
W14	- Non-ferrous metals	4	■							

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	#1	●	●	●		●					●
	#2	●		●	●						
Psychomotor Domain	#3		●	●		●					
	#4	●		●	●						
Affective Domain	#5		●	●							●

Student Academic Counseling and Support

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	#1	●		●							●
	#2	●			●						●
Psychomotor Domain	#3	●		●		●					
	#4	●		●						●	
Affective Domain	#5	●		●							●

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
Midterm Examination	7	30 %
Second Midterm Examination	-	-
Final Examination	(As Scheduled)	40 %
Quizzes	-	-
Attendance	-	10 %
20% Exam	12	20 %
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	□ Computer with software
□ Lecture Hall	■ White Board	■ MIS system
□ Sound and Microphone	■ Data Show	■ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

Lectures Notes in PDF

https://bu.edu.eg/staff/mahmoud.abdellattif-courses/14861/files

b- Books

1. William D. Callister, David G. Rethwisch "Materials Science and Engineering (An Introduction)", 10th edition, John Wiley & Sons Ltd., 2018.
2. William F. Smith and Javad Hashemi, "Foundations of Materials Science and Engineering", McGraw Hill, 6th Edition, 2021.

c- Recommended Books

1. Donald R. Askeland and Pradeep P. Phule "The Science and Engineering of Materials" International Student Edition, 2006, Thomson Canada Limited.

- Course Coordinator: Dr. Elsayed Hamza, Dr. Mahmoud Khedr **Signature:**

- Program Coordinator: Prof. Ahmed Reda **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: MDP212
Course Title: **Manufacturing Technology**
Semester/Year: First / 2020-2021
Specialization: Energy Sustainable Engineering
Credit Hours: 2
Lecture: 1 **Tutorial:** 0 **Lab:** 3

2- Course Objectives

For students undertaking this course, they will be able to:

1. Know the manufacturing Processes - Engineering Materials – Metrology - Fundamentals of Metal Casting - Metal Casting Processes - Powder Metallurgy
2. Know the Forming (Hot and Cold Working of Metals) - Forming (Forging, Extrusion) - Forming (Sheet Metal Working).
3. Know the material Removal Processes (Turning, Drilling, Milling) - Material Removal Processes (Turning, Drilling, Milling) - Material Removal Processes (Cutting Tools) - Joining (Welding).

3- Course Contents As indicated in program Bylaw

Introduction to Manufacturing Processes - Engineering Materials – Metrology - Fundamentals of Metal Casting - Metal Casting Processes - Powder Metallurgy - Forming (Hot and Cold Working of Metals) - Forming (Forging, Extrusion) - Forming (Sheet Metal Working)- Material Removal Processes (Turning, Drilling, Milling) - Material Removal Processes (Turning, Drilling, Milling) - Material Removal Processes (Cutting Tools) - Joining (Welding).

4- Program Competencies Served by The Course (A.1, A.3, A.10, B.1 and D.4)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1 Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

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.10 Acquire and apply new knowledge and practice self-learning strategies.

Level (B) Sustainable Energy Competencies

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

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

Level (D) University of Edinburgh Competencies

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

D.4 Work in a variety of energy systems operations, maintenance and overhaul.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Recognize various types of elements of machines
LO2	Knowledge of all types of tools.
LO3	Determine the machining time.
Psychomotor Domain	
LO4	Execute the suitable machining operations
LO5	Perform the measuring devices to measure workpiece diameters and length
Affective Domain	
LO6	Perform some machining products in workshop Lab.

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A1	A3	A10	B1	D4
	Cognitive Domain				
LO1	√				√
LO2		√		√	
LO3			√		
		Psychomotor Domain			
LO4				√	
LO5	√				
		Affective Domain			
LO6	√				

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of Competencies.

Week	Topics	Course Competencies					
		LO1	LO2	LO3	LO4	LO5	LO6
1	**Introduction to Manufacturing Processes Lab (Workshop lab)** **Identify the components of a lathe**	√	√		√		√
2	**Engineering Materials** **Lab (Workshop lab)** **Identify the components of a drilling machine**	√	√	√			√
3	**Metrology** **Lab (Workshop lab)** **Identify the components of a milling machine**	√			√		
4 & 5	**Fundamentals of casting** **Lab (Workshop lab)** **Casting Workshop (pattern)**			√	√		

6	**Powder Metallurgy** **Lab (Workshop lab)** **Welding Workshop**		√			√	
8	**Forming (Hot and Cold Working of Metals)** **Lab (Workshop lab)** **Machining Workshop**		√	√			√
9	**Forming (Forging, Extrusion) - Forming (Sheet Metal Working)** **Lab (Workshop lab)** **Sheet Metal Working Workshop**	√		√			
10	Material Removal Processes (Turning, Drilling, Milling) **Lab (Workshop lab)** **Machining Workshop**	√				√	
12	Material Removal Processes (Turning, Drilling, Milling) **Lab (Workshop lab)** **Machining Workshop**	√	√		√		
13 & 14	Material Removal Processes (Cutting Tools) - Joining (Welding). **Lab (Workshop lab)** **Machining Workshop**			√	√	√	√

8) Teaching and Learning Methods

Learning Outcomes		**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
Cognitive Domain	LO1	√							√		
	LO2				√				√		√
	LO3	√				√		√		√	
Psychomotor Domain	LO4	√				√		√			√
	LO5	√		√		√		√	√		

Affective	LO6	√		√	√	√		√		√	

9- Student Assessment

a- Student Assessment Methods

Learning Outcomes		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Question
Cognitive Domain	LO1	√			√	√					√
	LO2							√			
	LO3					√			√	√	
Psychomotor	LO4				√	√		√	√		√
	LO5				√			√	√	√	
Affecti	LO6				√	√			√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Mini project	-	0 %
Home assignments, and Reports	2, 4, 6, 9	10%
Oral exam	-	0 %
Total	-	**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Smart Board
- ■ White Board
- ■ Computer with software
- □ MIS system

- ◻ Sound and Microphone ◼ Data Show ◻ Internet Access
- ◻ Other: …………………

11- List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1. Carolina Witchmichen Penteado Schmidt, Manufacturing Engineering, Springer Nature, 2021.
2. K. Hitomi, Manufacturing Systems Engineering, Taylor & Francis, 2017.

c- Recommended Books

d- Web Sites

1- http://www.modeling_and_simulation.com

- Course Coordinator: Prof. Dr. Sameh Habib Signature:

- Program Coordinator: Prof.Dr. Ahmed Reda Elshamy Signature:

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code: MDP203
Course Title: Computer Aided Mechanical Drawing
Semester/Year: First / 2020-2021
Specialization: Mechanical Engineering
Credit Hours: 3
Lecture: 2 **Tutorial:** **Lab:** 3

2- Course Aims

The aim of this course is to provide students with the basic's knowledge:

1. Developing programs (AutoCAD & Solid works).
2. The importance of Computer programs.
3. Machine members, assembly, working drawings and geometrical tolerances.
4. Fits and tolerances, surface texture and welding symbols.

3- Course Contents (As indicated in the program Bylaw)

Lecture and labs intended to enable students to use computer aided drafting and design software such as AutoCAD or Solid works…etc. The course Includes sections in machine members – Assembly and working drawings – fits and tolerances – geometrical tolerances – surface texture – welding symbols.

4- Program Competencies Served by The Course (A.9, A.10, B.1 and D.3)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.9 Use creative, innovative, and flexible thinking by new software tools.

A.10 Acquire and apply new knowledge and practice self-learning strategies.

Level (B) Sustainable Energy Competencies

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

B.1 Model analyze and design physical systems applicable to the power systems by applying the concepts of mechanical drawing.

Level (D) University of Edinburgh Competencies

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

D.3 Improve the ability to use computer programs across energy and sustainable energy engineering program.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Recognize various types of elements of machines
LO2	Knowledge of computer applications for mechanical drawing
LO3	Determine the types of fits between mechanical elements.
Psychomotor Domain	
LO4	Execute the limits of tolerances
LO5	Perform the assembly of different mechanical elements
Affective Domain	

LO6	Perform some applications using Computer Lab.

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A9	A10	B1	D3
	Cognitive Domain			
LO1	√			√
LO2		√		√
LO3			√	
	Psychomotor Domain			
LO4			√	
LO5	√			
	Affective Domain			
LO6	√			

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of Competencies.

Week	Topics	Course Competencies					
		LO1	LO2	LO3	LO4	LO5	LO6
1	Lecture and labs intended to enable students to use computer aided drafting and design software such as AutoCAD **Lab (Computer lab)** **Identify the components of a computer hardware system and prepare a program (AutoCAD)**	√	√		√		√
2	Lecture and labs intended to enable students to use computer aided drafting and design software such as Solid works **Lab (Computer lab)** **An overview of the Solid works program**	√	√	√			√
3	The course Includes sections in machine members **Lab (Computer lab)** **Selected exercises to draw some parts of machines**	√			√		
4 & 5	The course Includes sections in assembly **Lab (Computer lab)** **Selected exercises for some parts of**			√	√		

	assembled machines						
6	The course Includes sections in working drawings **Lab (Computer lab)** **Selected exercises to draw machine parts drawing and dimensioning**		√			√	
8	The course Includes sections in fits and tolerances **Lab (Computer lab)** **Selected exercises to draw machine parts with marking type of fits**		√	√			√
9	The course Includes sections in geometrical tolerances **Lab (Computer lab)** **Selected exercises to draw machine parts with marking tolerances**	√		√			
10	The course Includes sections in surface texture **Lab (Computer lab)** **Selected exercises to draw machine parts with marking surface finish symbols.**	√				√	
12	The course Includes sections in welding symbols. **Lab (Computer lab)** **Selected exercises to draw machine parts with marking welding symbols.**	√	√		√		
13 & 14	other important parts of the software package applied to machine elements **Lab (Computer lab)** **Principles of drawing using the Sold Work program**			√	√	√	√

8) Teaching and Learning Methods

r m n g O ut co	**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
Cognitive Domain	LO1	√		√					√		
	LO2				√					√	
	LO3			√	√	√				√	√
Psychomotor Domain	LO4	√		√		√		√			√
	LO5	√		√		√		√	√		
Affective	LO6	√		√	√	√		√		√	

9- Student Assessment

a- Student Assessment Methods

Learning Outcomes		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1				√	√					√
	LO2										
	LO3					√			√	√	

Psychomotor	LO4				√	√		√	√		√
	LO5				√			√	√	√	
Affecti	LO6				√	√			√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	11	20%
Final Examination	15	40 %
Mini project	9	5 %
Home assignments, and Reports	2, 4, 6, 9	5%
Oral exam	-	0 %
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	■ Computer with software
□ Lecture Hall	■ White Board	□ MIS system
□ Sound and Microphone	■ Data Show	□ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1- A Textbook of Mechanical Drawing, Vol. 3: Machine Drawing (Classic Reprint) Published January 16th, 2019, by Forgotten Books, ISBN 0282486887 (ISBN13: 9780282486884)

1. . c- Recommended Books

2- Technical Drawing 101 with AutoCAD 2018, **ISBN-13:** 978-1630570989

d- Web Sites

1- www.cncsimulator.com.
2- www.delcam.com.

- Course Coordinator: Prof. Dr. Hossam Eldein Mohamed **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: GEN201 **Course Title:** Technical Report Writing
Semester/Year: First / One **Specialization:**
Credit Hours: 2 **Lecture:** 2 **Tutorial:-** **Lab:** -

2- Course Objectives

For students undertaking this course, they will be able to:

1- Demonstrate an understanding of oral communication skills such as Power Point presentations.
2- Demonstrate an understanding of ethical decision making process.
3- Demonstrate an understanding of audience analysis, including tone and word choice, demographics, etc.
4- Demonstrate an understanding of document presentation, including layout/design and proper grammar/mechanics.
5- Demonstrate, through testing and performance, an understanding of the requirements for academic honesty
6- Ability to use formal research documentation, direct and indirect quotation, giving original sources proper credit in all cases.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

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.

.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

This course is an introduction to the managerial skills such as leadership, team Approach, planning, organization, control and communication Skills.

b) Topics to be Covered weekly & Matrix of Competencies.

Week	Topics	Course Competencies	
		A7	A8
1&2	Audience Analysis	√	√
3,4	Report Purposes	√	√
5,6	Data Gathering		√
7,9	Report Organization		√
10,11	Textual Report Elements	√	√
13	Writing Style, Grammar, Punctuation & Spelling		√
14	Appearance Elements.		√

5- a) Teaching and Learning Methods

Course 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	A7	√	√		√			√	√	√	
	A8	√	√						√	√	

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A7	√	√		√					√	
	A8	√	√		√					√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	8	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Quizzes	5, 7, 10	5%
Home assignments, and Reports	2, 3, 4, 6, 9, 11, 13	5%
Oral exam	-	0 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- ■ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1- Gurak, Laura J., and John M. Lannon. A Concise Guide to Technical Communication. 3rd ed. NY:Pearson/Longman, 2007. (ISBN 0-321-39168-3)

c- Recommended Books

1- A good dictionary would be helpful such as, The Elements of Style, by Strunk and White.

d- Web Sites

1- www.longma.com

.

Course Objectives and Competencies

Course Objectives	Course Competencies	
	A7	A8
1- Demonstrate an understanding of oral communication skills such as Power Point presentations.	√	√
2- Demonstrate an understanding of ethical decision making process.	√	√
3- Demonstrate an understanding of audience analysis, including tone and word choice, demographics, etc.	√	√
4- Demonstrate an understanding of document presentation, including layout/design and proper grammar/mechanics.		√
5- Demonstrate, through testing and performance, an understanding of the requirements for academic honesty		√
6- Ability to use formal research documentation, direct and indirect quotation, giving original sources proper credit in all cases.		√

- Course Coordinator: **Signature:**

- Program Coordinator: Prof.Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: EMP 202
Course Title: Engineering Mathematics (4)
Semester/Year: Second / 2020-2021
Specialization: Energy Sustainable Engineering
Credit Hours: 3
Lecture: 2 **Tutorial:** 2 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:
1) Solve ordinary differential equations.
2) Recognize the basic concepts of special functions and Laplace transformation.
3) Recognize the basic concepts of Probability theory.
4) Recognize the basic concepts of periodic functions, Fourier series and Fourier Transform.
5) Recognize fundamentals of Matlab program

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve complex engineering problems by applying engineering fundamentals in mathematics by studying Probability theories, Laplace transform and Fourier transform.

A.8) Communicate effectively verbally and in writing by performing a power point presentation or writing a report about selected topic decided at the middle of the semester.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

Differential Equations-Laplace Transform- Fourier Series and transform-Numerical Analysis-Matlab-Introduction to Statistics and Probability Theorems-Software Applications: Excel-SPSS.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies	
		A1	A8
1	Differential Equations (1^{st} order D.E)	√	
2	Differential Equations (1^{st} order D.E)	√	
3	Differential Equations (higher order D.E)	√	√
4	Differential Equations (higher order D.E)	√	
5	Laplace Transform	√	√
6	Inverse Laplace Transform	√	
8	Numerical Analysis	√	√
9	Introduction to Statistics and Probability theories	√	
10	Introduction to Statistics and Probability theories	√	
11	Fourier series (Fourier Transform)	√	√

13	Fundamentals in Matlab program	√	
14	Solving Mathematical problems using Matlab program	√	

5- a) Teaching and Learning Methods

Course 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	√	√	√		√					
	A8				√			√			

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A1	√	√		√						√
	A8							√	√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination	7	30 %
Final Examination	(As Schedule)	40 %
Home assignments, and Reports	3, 5, 8, 11	10%
Matlab Mini Project	12	20 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lecture notes and training sheets

b- Books

1. Alan Jeffrey, "Advanced engineering Mathematics", University of new castle – upon-Tyne, 2002.
2. Engineering Mathematics, Fifth Edition, K. A. Stroud, Industrial Press. Inc., New York 2001

c- Recommended Books

Advanced Engineering Mathematics, E. Kreyszig, John Wiley and Sons, New York 1999

d- Web Sites

www.Google.com

www.MathematicsResearch.com

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies	
	A1	A8
Course Objective #1	√	√
Course Objective #2	√	√
Course Objective #3	√	√
Course Objective #4	√	√
Course Objective #5	√	

- **Course Coordinator:** Dr. Khaled el Naggar **Signature:**

- **Program Coordinator:** Prof. Dr. Ahmed Reda El Shami **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy & Sustainable energy program

1– Course Data

Course Code: EMP 203 Physics (3) **Course Title:** Physics (3)
Semester/Year: Second / 2020–2021 **Specialization:** Energy Sustainable Engineering
Credit Hours: 4 **Lecture:** 2 **Tutorial:** 2 **Lab:** 0

2– Course Objectives

For students undertaking this course, they will be able to:

1. Study the basic theories of light.
2. Study the photoelectric effect.
3. Study the properties of X-Ray.
4. Study the phenomenon of Compton effect.
5. Study the wave nature of matter.
6. Study the basic principles solid-state physics.
7. Study the chemical bonds of materials.
8. Study band theory of solids.
9. Study the basic principles of nanotechnology, nanomaterials, and some of its applications.
10. Study polarization of light and different methods of polarizing light.
11. Study the different types of light Interference
12. Study the different types of diffraction and some of its applications

3– Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1) Identify, formulate, and solve engineering problems concerning light propagation (such as interference and polarization and diffraction) and light-material interaction (such as photoelectric effect, X-ray, Compton effect, x-ray) by applying engineering physics fundamentals.

A.8) Communicate effectively verbally and in writing by performing a PowerPoint presentations or writing a report about selected topic decided at the middle of the semester.

Level (B) Engineering Competencies

B.1 Design, choice, and design optical material structures for systems and applications based on their working principles on light propagation and light-materials interaction by applying the concepts of engineering physics and theories of light

B.3 Estimate and measure the performance of energy system need light to operate specific inputs and design limitations.

4– Course Contents

a) **Course Description** (As indicated in program Bylaw)

Theories of light - Photo electric effect - Properties of X-Ray. - Phenomenon of Compton effect - Wave nature of matter - Introduction to the solid-state physics - Chemical bonds of materials - Band theory of solids - Nanomaterials - Polarization of light and different methods of polarizing light - Polarization by double refraction - Interference of light - Theory of interference fringes

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies			
		A1	A8	B1	B3
1	Theories of light.	√		√	
2	Photoelectric effect.	√		√	
3	Properties of X-Ray.	√	√		
4	Phenomenon of Compton effect.	√		√	
5	Wave nature of matter.	√	√		
6	Chemical bonds of materials.	√	√	√	
7	Band theory of solids	√			
8	Thirty Exam				
9	Introduction to the solid-state physics.	√		√	√
10	Introduction to Nanotechnology.	√			
11	Polarization of light and different methods of polarizing light.	√		√	√
12	Interference of light.	√	√	√	√
13	Diffraction of light	√		√	√
14	Twenty Exam				

5) Learning Outcomes

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Explain the fundamental principles of different light propagation phenomena and related laws and theories to this phenomena
LO2	Determine the type of the chemical bond responsible of solid-state material formation
LO3	Identify the different light-material interaction mechanisms and the evaluating parameters.
Psychomotor Domain	
LO4	Carry out calculations needed to maximize or minimize light absorption, transmission, polarization, and interference of systems depends on light to functioning such as photovoltaics and solar energy harvester applications.
LO5	Adopt basic selection for the suitable solid-state materials and nanomaterials for some specific application use light-material interaction to operate.
Affective Domain	
LO6	Judge the suitable light propagation phenomenon and governing laws he should consider for a specific light propagation conditions and particular light-material interaction case.

6) Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A1	A8	B1	B3
Cognitive Domain				
LO1			■	■
LO2			■	■
LO3	■	■		
Psychomotor Domain				
LO4	■		■	■
LO5				
Affective Domain				
LO6		■	■	■

7) lecture Plan

a- Topics to be Covered weekly & Learning Outcomes

Week	Topics	Planned Hours	Learning Outcomes					
			LO1	LO2	LO3	LO4	LO5	LO6
1	Theories of light.	**4**	■			■		
2	Photoelectric effect.	**4**	■	■		■		
3	Properties of X-Ray.	**4**	■	■			■	
4	Phenomenon of Compton effect.	**4**		■			■	
5	Wave nature of matter.	**4**		■				
6	Chemical bonds of materials.	**4**						■
7	Band theory of solids	**4**		■	■			■
8	Introduction to the solid-state physics-part 1	**4**			■			
9	Introduction to the solid-state physics-part 2	**4**				■	■	■
10	Introduction to Nanotechnology.	**4**				■		
11	Polarization of light and different methods of polarizing light.	**4**		■	■	■		
12	Interference of light.	**4**		■	■	■		■
13	Diffraction of light	**4**				■	■	

8– a) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●				●		●	●
	LO2	●		●	●		●	●	●	●	●
	LO3	●	●	●				●			
Psychomotor Domain	LO4		●	●			●			●	
	LO5	●		●	●		●	●	●	●	
Affective Domain	LO6	●		●	●		●		●	●	●

8– b) Teaching and Learning Methods of Disables

None

9– Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

10– Student Assessment

a– Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●		●					●		●
	LO2	●		●		●			●		●
	LO3	●	●	●		●			●		
Psychomotor Domain	LO4	●	●					●			●
	LO5	●		●		●	●			●	●
Affective Domain	LO6	●			●	●	●	●		●	

b– Assessment Schedule and Weight

Assessment	Week	Weight
Thirty Examination 1	8	30 %
Final Examination	(As Schedule)	40 %
Twenty Examination	14	20%
Practical Examination	12	10 %
Total		**100 %**

11– Facilities

The following facilities are needed for this course:

- ■ Classroom
- ■ Lecture Hall
- □ Smart Board
- ■ White Board
- □ Computer with software
- ■ MIS system

- ■ Sound and Microphone ■ Data Show ■ Internet Access
- □ Other: …………………

12– List of References

1. Raymond A. Serway and John W. Jewett Jr , Physics for Scientists and Engineers with Modern Physics, 9th Edition, Brooks/Cole, 2014.
2. Hugh D. Young, Roger A. Freedman, and A. Lewis Ford, University Physics with Modern Physics, 13th Edition, Addison-Wisely, 2012.
3. Jearl Walker, David Halliday, Robert Resnick, Fundamentals of Physics, 10th Edition, Wiley, 2014

a– Course Notes

Lecture material and experimental sheets

b– Books

1. Fundamentals of Physics, 10th edition by David Halliday, Robert Resnick and Kenneth S. Krane, John Willey & Sons, Inc
2. University Physics, 13th edition by HUGH D. Young, ROGER A. Freedman

c– Recommended Books

1. Physics for Scientists and Engineers with modern physics, 10th edition by Raymond A. Serway and John W. Jewett, Jr.

d– Web Sites

www.physicsresearch.com , www.electrostaticResearch.com , https://ocw.mit.edu/index.htm

10– Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies			
	A1	A8	B1	B3
Course Objective #1	√	√	√	√
Course Objective #2	√	√	√	√

– Course Coordinator: Dr. Amr Hessein – Dr. Abdelnasser Saber **Signature:**

– Program Coordinator: Prof. Dr. Ahmed El Shami **Signature:**

University:	Benha University
Faculty:	Faculty of Engineering at Shoubra
Department offering the program:	Mechanical Engineering Department
Department offering the course:	Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: MPE202 Fluid Mechanics **Semester/Year:** Second / 2020-2021

Prerequisite Course(s): EMP103 **Core or Elective:** Core Course

Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

The aim of this course is to provide students with the basic knowledge of fluid properties and their effect on fluid dynamics. Moreover, student apply fluid momentum and Bernoulli's equations to determine the force produced by the fluid. Finally, identify fluid flow resistance due to flow through conduits.

3- Course Contents (As indicated in the program Bylaw)

Fluid properties, fluid statics, fluid motion, pressure variations in fluid flows, momentum principles, energy principles, dimensional analysis and similitude, surface resistance, flow in conduits, flow measurements, drag, and lift.

4- Program Competences Served by The Course (A1 and B1)

Level (A) Engineering Competences

A.1 Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

Level (B) Electrical Engineering Competences

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;

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Know the basic properties of fluids and understand the continuum approximation.
LO2	Understand the use and limitations of the Bernoulli's equation and the various kinds of forces and moments acting on a control volume.
Psychomotor Domain	
LO3	Determine the variation of pressure inside fluid at rest.
LO4	Analyze the rigid body motion of the fluids in containers during linear acceleration.
LO5	Apply the mass equation to balance the incoming and outgoing flow rates in a flow system.
LO6	Apply Bernoulli's equation to solve a variety of fluid flow problems.
LO7	Use control volume analysis to determine the forces and moments associated with fluid flow.
LO8	Calculate the major and minor losses associated with pipe flow in piping networks and determine the pumping power requirements.

6- Mapping Learning Outcomes (LO's) with Competences

LO's \ NARS	A1	B1
LO1	■	
LO2	■	
LO3		■
LO4		■
LO5		■
LO6		■
LO7		■
LO8		■

7- Lecture Plan

Please delete this blue text after updating the file.
There are 15 weeks per term. You should consider 14 weeks for teaching and one week for mid-term examination.

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes							
			LO1 A1	LO2 A1	LO3 B1	LO4 B1	LO5 B1	LO6 B1	LO7 B1	LO8 B1
W1	Fluid Properties LAB: Topic 1: Determination of different fluid viscosities experiment.	5	■							
W2	Surface tension LAB: Topic 2: Determination of fluid surface tension experiment.	5	■							
W3	Pressure determination inside static fluid LAB: Topic 3: Pressure variation with depth experiment	5			■					
W4	Pressure variation due to fluid motion as a single body LAB: Topic 3: Pressure variation with depth	5			■	■				
W5	Fluid forces on submerged bodies LAB: Topic 4: Force line of action determination on submerged body.	5			■					
W6	Fluid kinematics and differential form of continuity equation LAB: Topic 5: Rotational flow experiment	5					■			
W7	Reynolds transport theorem and integral form of continuity equation. LAB: Topic 6: Continuity equation experiment	5					■			
W8	Rate of change of fluid momentum applications LAB: Topic 7: Impact of jet determination on flat and hemisphere plate.	5					■			
W9	Rate of change of fluid moment of momentum applications LAB: Topic 8: Pelton wheel experiment	5					■		■	
W10	Derivation of Bernoulli's equation	5		■						
W11	Applications of Bernoulli's equation LAB: Topic 9: Venturi meter experiment	5						■		
W12	Friction losses determination inside pipes LAB: Topic 10: Major and minor losses experiments.	5								■
W13	Moody chart usage and pumping power determination	5								■

Week	Topics	Planned Hours	Learning Outcomes							
			LO1 A1	LO2 A1	LO3 B1	LO4 B1	LO5 B1	LO6 B1	LO7 B1	LO8 B1
W14	Dimensionless analysis	**5**	■							

b) Additional private study/learning hours expected for students per week is FIVE hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●							
	LO2		●	●							
Psychomotor Domain	LO3		●	●		●					
	LO4		●	●							
	LO5	●		●	●	●					
	LO6	●		●	●	●					
	LO7	●		●		●					●
	LO8	●		●						●	

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.

- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as Whatsapp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●					●				●
	LO2	●				●			●		
Psychomotor Domain	LO3	●					●				
	LO4	●		●		●					
	LO5	●					●				
	LO6	●				●					
	LO7	●		●			●				
	LO8	●							●		

(Assessment Methods)

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Second Midterm Examination	12	20%
Final Examination	(As Scheduled)	40 %
Quizzes	-	0 %
Attendance	-	10%
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

■	Classroom	□	Smart Board	□	Computer with software
□	Lecture Hall	■	White Board	■	MIS system
□	Sound and Microphone	■	Data Show	■	Internet Access
□	Other: …………………				

11- List of References

a- Course Notes

Lectures Notes in PDF

Mina Gamal Mourad Abd Elmalek|Course Files:Fluid Mechanics (A) (bu.edu.eg)

b- Books

1. Yunus A. Cengel and John M. Cimbala. "Fluid Mechanics Fundamentals and Applications", 3rd edition, McGraw Hill Education., New York, 2018.
2. Frank M. White. "Fluid Mechanics", 8th edition, McGraw Hill Education, New York, 2016.

- Course Coordinator: Prof. Dr. Samir Sobhy **Signature:**

Dr. Mina Gamal **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code: MDP204 **Course Title:** **Mechanics & Testing of Materials**
Semester/ Academic year: Second semester / 2020-2021
Prerequisite Course(s): MDP201
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

The aim of this course is to provide the students with the basic knowledge and skills of the fundamentals of stress analysis as well as mechanical testing of engineering materials. In addition to understand the relationship between the structure, processing, and properties of metals. Moreover, identify the types of stresses and mechanical testing of the materials.

3- Course Contents (As indicated in the program Bylaw)

Introduction to the types/classifications of the stresses: axial, shear, bending and cyclic stresses. Axial stresses: tension, compression, and normal strain. Shear stress: direct, torsion, and transverse. Bending stress: shear force diagram, bending moment diagram, neutral axis, and normal stress distribution over the cross section. Combined stresses, plane stress, stresses in 3D. Materials testing: tension, compression, torsion, bending, creep, hardness, and fatigue test.

4- Program Competencies Served by The Course (A1, A3, A10, B1 and B2)

Level (A) Engineering Competencies

A1. Identify, formulate, and solve complex engineering problems related to stress analysis.
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.
A10. Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

Level (B) Mechanical Engineering Competencies

B1. Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of solid Mechanics, Material Properties, Mechanical Design and Analysis.
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 support to energy and sustainable energy.

5- Learning Outcomes (LO's)

At the end of this course, the student will be able to:

Cognitive Domain	
#1	Recognize types of stresses and calculate reactions of the supports.

#2	Perform tension, compression, torsion, bending, creep, hardness, and fatigue tests.
Psychomotor Domain	
#3	Select the proper factor of safety based on the applied load on the members.
#4	Design of shafts to resist failure due to axial, shear and bending stresses.
Affective Domain	
#5	Discuss the fatigue life by Soderberg/Goodman criterion.

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A1	A3	A10	B1	B2
Cognitive Domain					
#1	■				
#2			■		
Psychomotor Domain					
#3		■		■	
#4					■
Affective Domain					
#5				■	

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes							
			#1	#2	#3	#4	#5			
W1	- Introduction to stresses.	2	■							
W2	- Normal stress and strain - LAB: topic1: visit the lab and discover testing machines	4	■	■						
W3	- Uniaxial loading - LAB: topic2: perform tension test	4	■	■						
W4	- Shear stress and strain - LAB: topic2: perform tension test	4	■	■						
W5	- Torsion - LAB: topic2: perform tension test	4	■	■						
W6	- Bending stress - LAB: topic3: perform hardness test	4	■	■						
W7	- Midterm 1 (30%)	1	■							
W8	- Bending stresses and shear stress in beams - LAB: topic3: perform hardness test	4	■							
W9	- Stress transformation - LAB: topic3: perform hardness test	4		■	■					

Week	Topics	Planned Hours	Learning Outcomes							
			#1	#2	#3	#4	#5			
W10	- Compound stresses - LAB: topic4: perform impact test	4		■		■				
W11	- Mechanical tests: tensile testing - LAB: topic4: perform impact test	4		■						
W12	- Midterm 2 (20%) - Mechanical tests: compression, shear testing - LAB: topic4: perform impact test	4		■						
W13	- Mechanical tests: hardness, creep testing	4		■						
W14	- Mechanical tests: fatigue testing	4					■			

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	#1	●		●							●
	#2	●		●	●	●					
Psychomotor Domain	#3			●							●
	#4	●		●	●						
Affective Domain	#5	●		●							●

Student Academic Counseling and Support

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	#1	●		●							●
	#2	●			●						●
Psychomotor Domain	#3	●		●		●					
	#4	●		●						●	
Affective Domain	#5	●		●							●

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
Midterm Examination	7	30 %
Second Midterm Examination	-	-
Final Examination	(As Scheduled)	40 %
Quizzes	-	-
Attendance	-	10 %
20% Exam	12	20 %
Total		**100** %

10- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	□ Computer with software
□ Lecture Hall	■ White Board	■ MIS system

- □ Sound and Microphone ■ Data Show ■ Internet Access
- □ Other: …………………

11- List of References

a- Course Notes

Lectures Notes in PDF

https://bu.edu.eg/staff/mahmoud.abdellattif-courses/14896/files

b- Books

1. R. C. Hibbeler "Mechanics of Materials", 10th edition, John Wiley & Sons Ltd., 2021.
2. William F. Smith and Javad Hashemi, "Foundations of Materials Science and Engineering", McGraw Hill, 6th Edition, 2021.

c- Recommended Books

1. Donald R. Askeland and Pradeep P. Phule "The Science and Engineering of Materials" International Student Edition, 2006, Thomson Canada Limited.

- Course Coordinator: Dr. Elsayed Hamza, Dr. Mahmoud Khedr **Signature:**

- Program Coordinator: Prof. Ahmed Reda **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: EPM201 Electrical Engineering I **Semester/Year: Second** / 2020-2021
Prerequisite Course(s): EMP103 Physics (1) **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to provide students with the basics fundamental knowledge of electrical circuits. Moreover, employ the methods of AC and DC electrical circuit analysis and determine the average and effective values for different functions. Finally, identify different applications in circuit analysis.

3- Course Contents (As indicated in the program Bylaw)

SI units, electrical potential, resistance, Electric current and Ohm's law, Resistance in series, Voltage divider rule, Kirchhoff's laws, Maxwell's loop current method, Mesh analyses, Nodal analyses, Superposition theorem, Thevenin equivalent circuit, Norton equivalent circuit, Star/delta transformation, Maximum power transfer theorem, Periodic functions, Sinusoidal functions, Time shift and phase shift, The average and effective values, No periodic functions, The unit step function, The unit impulse function, Damped sinusoids, random signals, Types of capacitors, capacitors, Charging and discharging of a capacitor with initial charge. Self-inductance, Mutual inductance, coefficient of coupling, inductances in series and parallel, Energy stored in magnetic field, rise of current in inductive circuit, Thevenin's and Norton's Theorms, Superposition of AC sources, AC Bridges, AC power, Complex power, Power factor improvement, maximum power transfer, Poly-phase circuits, Three phase systems, Y-Δ systems, High pass and Low pass filters networks, half power frequencies, Ideal and Practical filters, Exponential Fourier series, Applications in circuit analysis, Fourier transform of non-periodic waveforms, Two port networks.

4- Program Competencies Served by The Course (A.1, A.2 and B.3)

Level (A) Engineering Competencies

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.

Level (B) Mechanical Engineering Competencies

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.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Recognize various rules and components of electric circuits.

LO2	Analyze the DC electric circuits using different methods.
LO3	Determine the average and effective values of different signals.
LO4	Analyze the AC electric circuits using different methods.
Psychomotor Domain	
	Non
Affective Domain	
LO5	Develop the performance of AC circuit to obtain the power factor of single and three-phase circuits
LO6	Perform some applications in AC circuits

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A1	A2	B3
Cognitive Domain			
LO1	■		
LO2	■		
LO3		■	
LO4			■
Psychomotor Domain			
Non			
Affective Domain			
LO5			■
LO6		■	

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes					
			LO1 A1-1	LO2 A1-2	LO3 A2-3	LO4 B3-4	LO5 B3-5	LO6 A2-6
W1	SI units, electrical potential, resistance, Electric current and Ohm's law and Resistance in series	**4**	■					
W2	Voltage divider rule, Kirchhoff's laws, Maxwell's loop current method, Mesh analyses and Nodal analyses,	**4**		■				
W3	Superposition theorem, The venin equivalent circuit, Norton equivalent circuit and Star/delta transformation	**4**		■				
W4	Maximum power transfer theorem, Periodic functions and Sinusoidal functions	**4**		■				
W5	Time shift and phase shift, The average and effective values and	**4**			■			

	No periodic functions							
W6	The unit step function, The unit impulse function, Damped sinusoids and random signals	**4**			■			
W7	Types of capacitors, capacitors, Charging and discharging of a capacitor with initial charge	**4**					■	
W8	Self-inductance, Mutual inductance, coefficient of coupling and inductances in series and parallel	**4**					■	
W9	Energy stored in magnetic field, rise of current in inductive circuit, The venin's and Norton's Theorems	**4**					■	
W10	Superposition of AC sources, AC Bridges, AC power, Complex power and Power factor improvement	**4**					■	
W11	Maximum power transfer, Poly-phase circuits, Three phase systems and Y-Δ systems	**4**				■	■	
W12	High pass and Low pass filters networks, half power frequencies,	**4**		■	■	■		
W13	Ideal and Practical filters & Exponential Fourier series,	**4**		■	■	■		
W14	Applications in circuit analysis, Fourier transform of non-periodic waveforms and Two port networks.	**4**						■

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cogniti...	LO1	●		●			●				●

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
		Teaching and Learning Methods									
	LO2	●		●	●						●
	LO3	●	●	●				●			
	LO4	●		●						●	
Psycho motor Domain											
Affective Domain	LO5	●		●			●	●			●
	LO6	●			●		●		●		

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the timetable declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Assessment Methods: Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●			●			●			●
	LO2	●				●			●		●
	LO3	●			●						
	LO3	●			●						
Psycho motor Domain	Affective Domain										
Cognitive Domain	LO5	●						●			
	LO6			●	●			●	●	●	●

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Mini-project and reports	12	20%
Final Examination	(As Scheduled)	40 %
In class questions	All weeks	10 %
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Smart Board
- ■ Computer with software

□	Lecture Hall	■	White Board	■	MIS system
□	Sound and Microphone	■	Data Show	■	Internet Access
□	Other: …………………				

11- List of References

a- Course Notes

Lectures Notes in Microsoft team

b- Books

1. Mehdi Rahmani-Andebili, "DC Electrical Circuit Analysis Mehdi Rahmani-Andebili Practice Problems, Methods, and Solutions, "Springer2020.
2. William H. Hayt, Jr. , "ENGINEERING CIRCUIT ANALYSIS", ninth edition, 2018.
3. Ozgur Ergul, "Introduction to Electrical Circuit Analysis," Wiley-Blackwell, 2017.

c- Recommended Books

1. Allan Robbins and Wilhelm miller, "Circuit Analysis; Theory and practice", 4th Edition, Delamr Learning, 2007.
2. Mehdi Rahmani-Andebili, "AC Electrical Circuit Analysis: Practice Problems, Methods, and Solutions, " Springer International Publishing, Year: 2021.

- Course Coordinator: Prof. Dr. Mahmoud al-ahmar **Signature:**

Dr. Islam Mohamed **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: GEN 202 **Course Title:** Psychology & Organization Behavior
Semester/Level: Second/ One **Specialization:**
Credit Hours: 3 **Lecture:** 2 **Tutorial:** 2 **Lab:**

2- Course Objectives

For students undertaking this course, they will be able to know:

2.1 Apply the concepts and principles of the cost estimation and analysis.
2.2 Perform the basic principles of the supply chain management.
2.3 Investigate the different types of financial analysis.
2.4 Investigate factors affecting the company performance.
2.5 Apply practical skills in the fields of production management to increase ability for employment.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.3 Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, environmental and ethical aspects within the principles and contexts of sustainable design and development.
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.

4- Course Contents

a) **Course Description** (As indicated in program Bylaw)

This course is an introduction to the psychology behind the workplace. Subjects include job analysis, psychological testing, interviewing, performance appraisal, employment law, leadership, motivation, training, job satisfaction, organizational theory, and research methods.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Program Competencies			
		A3	A7	A8	A9
1	Introduction to the psychology behind the workplace		√		
2	Subjects include job analysis				√
3	Psychological testing		√		
4	Interviewing, performance appraisal and employment law		√	√	
5	Leadership		√		√
6	Motivation				√
8	Training		√	√	√
9	Job satisfaction				
10	Organizational theory	√		√	
11	Organizational theory	√		√	
13	Research methods			√	√
14	Research methods			√	√

5- a) Teaching and Learning Methods

Course 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	A3	√	√					√		√	
	A7	√			√			√	√	√	
	A8	√	√	√	√			√	√	√	
	A9	√	√								√

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester

7- Student Assessment

a- Student Assessment Methods

Course 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	A3	√	√		√				√		√
	A7	√								√	
	A8	√							√	√	√
	A9	√			√					√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Quizzes	5, 10	5 %
Home assignments, and Reports	2, 5, 9, 11, 13	5 %
Oral exam	-	0 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- ■ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor and power Point presentation.

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies			
	A3	A7	A8	A9
The concepts and principles of the cost estimation and analysis.	√			√
The basic principles of the supply chain management.		√	√	√
The different types of financial analysis.	√			√
The factors affecting the company performance.			√	√
Practical skills in the fields of production management to increase ability for employment.		√	√	√

- Course Coordinator: Prof. Dr. Abdallah Saad **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

توصيف مقررات المستوى الثانى

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

- Course Data (Basic Information)

Course Code & Title: MPE301 Heat and Mass Transfer **Semester/Year:** First/ 2020-2021
Prerequisite Course(s): MPE201 Engineering Mathematics (3) **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

The aim of this course is to provide students with the basic knowledge and fundamentals of heat and mass transfer. Moreover, provide the basic principles of heat transfer and its different modes. In addition, the course enables the students to solve the steady conduction heat transfer problems in one and two dimensions, as well solving the unsteady conduction heat transfer problems in one dimension.

3- Course Contents (As indicated in the program Bylaw)

Introduction to heat and mass transfer. Steady-state and unsteady-state heat transfer. Steady-state and unsteady-state mass transfer. Interphase transport and transfer coefficients. Convective heat and mass transfer. Internal and external forced convection. Heat transfer equipment. Natural convection. Boiling and condensation. Radiation heat transfer.

4- Program Competences Served by The Course (A1, A2, A10 and B1)

Level (A) Engineering Competences

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.10 Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

Level (B) Sustainable Energy Competences

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

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Define the different modes of heat transfer by conduction, convection and Radiation.
LO2	Compare the different modes of heat transfer by conduction, convection and Radiation
LO3	Understand the concentration gradient and the physical mechanism of mass transfer
Psychomotor Domain	
LO4	Assess and evaluate the steady and unsteady heat conduction
LO5	Solve engineering problems based on heat transfer by conduction and convection.
LO6	Select appropriate solutions for engineering heat transfer problems based on analytical thinking.
Affective Domain	
LO7	Present and share the collected information from research of a selected topic such as the

	different insulating materials and its applications.
LO8	Analyze the different modes of heat transfer and distinguish the analogy between heat and mass transfer

6- Mapping Learning Outcomes (LO's) with Competences

LO's \ NARS	A1	A2	A3	B1
Cognitive Domain				
LO1	■			
LO2		■		
LO3	■			
Psychomotor Domain				
LO4				■
LO5	■			
LO6		■		
Affective Domain				
LO7			■	
LO8		■		

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes							
			LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8
W1	-Introduction to Heat Transfer, Basics of Heat Transfer. -Heat Transfer modes and their laws, Thermal Conductivity -Lab: Conduction Heat Transfer Experiment	5	■		■		■			
W2	One-Dimensional, Steady State Heat Conduction Without Internal Generation in Plane Walls, Cylinders and Spheres, Thermal Resistance Concept -Lab: Thermal Conductivity Measurement Experiment	5		■		■				
W3	One-Dimensional, Steady State Heat Conduction Without Internal Generation in Multilayer Plane Walls, cylinders and Spheres, Thermal Resistance Concept -Lab: Thermal Resistance Experiment 1	5		■		■				
W4	-Thermal Contact Resistance Concept, -Good Conductors and Insulators, -Critical Radius of Insulation -Heat Transfer in Common Configuration. -Lab: Thermal Resistance Experiment 1	5					■		■	
W5	-Heat Generation in a Solid. -One-Dimensional, Steady State Heat Conduction Equation with Internal Heat Generation in Plane Walls. -Lab: Thermal Contact Resistance Experiment	5		■		■				
W6	One-Dimensional, Steady State Heat Conduction Equation with Internal Heat Generation in Cylinders and Spheres. -Lab: Critical Radius of Insulation Experiment	5		■		■				
W7	-Unsteady State Heat Conduction, One-Dimensional	5		■		■				

Week	Topics	Planned Hours	Learning Outcomes							
			LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8
	-Lumped System Analysis. -Lab: Unsteady State Heat Conduction Experiment 1									
W8	One-Dimensional Unsteady State Heat Conduction in Large Plane Walls, Long Cylinder and Spheres using Heisler Charts -Lab: Unsteady State Heat Conduction Experiment 2	5		■		■				
W9	Introduction to Convection Heat Transfer -Lab: Convection Heat Transfer Experiment	5	■							■
W10	-Forced Convection Heat Transfer- External Forced Flow. -Lab: Forced Convection "External Forced Flow " Experiment	5					■			■
W11	Forced Convection Heat Transfer- Internal Forced Flow -Lab: Forced Convection "Internal Forced Flow " Experiment	5					■	■		■
W12	Free Convection Heat Transfer- External Free Flow -Lab: Free Convection "External Free Flow " Experiment	5					■			■
W13	Free Convection Heat Transfer- Internal Free Flow -Lab: Free Convection "Internal Free Flow " Experiment	5					■	■		■
W14	Introduction to Mass Transfer, Basics of Mass Transfer, Mass Transfer Mechanisms and their laws. -Lab: Mass Transfer Experiment	5			■					■

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●	●	●				●	●
	LO3	●	●	●							
Psychomotor Domain	LO4		●	●			●			●	
	LO5	●		●	●	●	●		●	●	

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
	LO6		●	●	●						
Affective Domain	LO7	●		●	●			●	●		●
	LO8		●	●						●	

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as Whatsapp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●			●				●		●
	LO2	●				●	●		●		●
	LO3		●		●	●			●		
Psychomotor Domain	LO4		●			●		●			
	LO5	●			●	●	●			●	

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
	LO6	●							●		
Affective Domain	LO7							●	●	●	●
	LO8	●			●				●		

(The ten method columns are grouped under the heading "Assessment Methods".)

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	8	30 %
Second Midterm Examination	12	20%
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	5 %
Home assignments	3,4,5,8,10,11	5%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

Lectures Notes in PDF

b- Books

1. **Yunus A. Cengel, "Heat Transfer: A Practical Approach", McGraw-Hill, 3rd Edition, 2007.**
2. **Kreith, F. and Black, W. Z., Basic Heat Transfer, Harper and Row Publishers, New York (2000).**

c- Recommended Books

1. **Frank P. Incropera, David P. Dewitt. "Fundamentals of Heat and Mass Transfer", 7th Edition, 2011.**

2. **Yunus A. Cengel and Afshin J. Ghajar, "Heat and Mass Transfer: Fundamentals and Applications", McGraw-Hill, 6th edition, 2020**

- Course Coordinator: **Prof. Dr. Ahmed Reda** **Signature:**

Assoc. Prof. Hany Elsawy **Signature:**

- Program Coordinator: **Prof. Dr. Ahmed Reda** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: MPE302 Applied fluid Mechanics **Semester/Year:** Summer / 2020-2021
Prerequisite Course(s): MPE202 Fluid Mechanics **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to identify the basic concepts of stagnation state, speed of sound, and Mach number for compressible flows. The relationships between the static and stagnation fluid properties are developed for isentropic flows of ideal gases, and they are expressed as functions of specific heat ratios and the Mach number. The effects of area changes for one-dimensional isentropic subsonic and supersonic flows are discussed. These effects are illustrated by considering the isentropic flow through converging and converging–diverging nozzles. The concept of shock waves and the variation of flow properties across normal and oblique shock waves are discussed. Finally, we consider the effects of friction and heat transfer on compressible flows and develop relations for property changes.

3- Course Contents (As indicated in the program Bylaw)

The basic elements of compressible fluid flow for understanding high-speed aircraft and missile aerodynamics, gas turbine engines, rocket engines, re-entry vehicle design, supersonic wind tunnel design, understanding of the physics underlying these topics and mathematical tools necessary for solving compressible flow problems

4- Program Competencies Served by The Course (A1, B1 and D3)

Level (A) Engineering Competencies

A.1 Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science, and mathematics.

Level (B) Mechanical Engineering Competencies (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.

Level (D) Energy and Sustainable Energy Engineering Competencies

D.3 Carry out preliminary designs of sustainable energy sources including solar, wind, and geothermal energy, and biotechnology and solve their operational problems.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Recognize the consequences of compressibility in gas flow
LO2	Analyze and use the concepts of Mach Number, subsonic, sonic and supersonic flows in studying and identifying various gas dynamics relations.

LO3	Recognize why a nozzle must have a diverging section to accelerate a gas to supersonic speeds.
LO4	Solve problems in one-dimensional steady compressible flow including isentropic nozzle flow, constant area flow with friction (Fanno flow) and constant area flow with heat transfer (Rayliegh flow).
LO5	Detect the occurrence of shocks and calculate property changes across a shock wave.
LO6	Identify the effects of friction and heat transfer on compressible flows
Psychomotor Domain	
LO7	Compute and using gas dynamics tables to deal with some important engineering problems.
Affective Domain	

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A1	B1	D3
Cognitive Domain			
LO1	■		
LO2		■	
LO3		■	
LO4			■
LO5			■
LO6	■		
Psychomotor Domain			
LO7			■
Affective Domain			

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes						
			LO1 A1-1	LO2 B1-2	LO3 B1-3	LO4 D3-4	LO5 D3-5	LO6 A1-6	LO7 D3-7
W1	Compressible versus Incompressible Flow	**6**	■						
W2	Introduction to compressible flow. Speed of sound-Mach Number-Pressure disturbance in a compressible fluid	**6**	■		■				
W3	Isentropic compressible flow-Stagnation Conditions-Isentropic stagnation state	**6**	■	■					
W4	Effects of area variation on flow properties in isentropic flow.	**6**	■		■				
W5	Critical properties of a compressible fluid flow-Property Relations for Isentropic - Flow of Ideal Gases	**6**	■		■				
W6	Isentropic Flow Through Nozzles-Converging Nozzles-Converging-diverging Nozzles	**6**			■	■			
W7	Real flow through nozzles and diffusers-Performance of real nozzles-Performance of real diffusers	**6**				■	■		

W8	Definition of Normal Shock Waves-Governing equations for the flow across a Normal Shock Wave	**6**		■		■			■
W9	Mathematical description of the normal shock wave-The Fanno line-The Rayleigh line	**6**			■	■			
W10	Adiabatic Duct Flow with Friction (Fanno Flow)-Definition of Fanno Flow-Governing equations for Fanno flow	**6**			■	■			
W11	Mathematical description of the Fanno flow-The Fanno Line-Limiting point	**6**					■		■
W12	Property Relations for Fanno Flow Choked Fanno Flow-Combination of Fanno flow and normal chock	**6**					■		■
W13	Duct Flow with Heat Transfer And Negligible Friction (Rayleigh Flow)	**6**						■	■
W14	Property Relations for Rayleigh Flow-Choked Rayleigh Flow	**6**				■		■	■

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●								●	●
	LO2	●				●				●	●
	LO3	●			●	●					
	LO4	●	●		●						●
	LO5		●								
	LO6		●								●
Psychomotor Domain	LO7	●				●				●	

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.

- Regarding this course, Instructor and TA will be available two hours a week as indicated on the timetable declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Question
Cognitive Domain	LO1	●			●				●		●
	LO2	●				●			●		●
	LO3		●		●	●			●		
	LO4		●			●					●
	LO5	●			●				●		
	LO6	●					●				
Psychomotor Domain	LO7	●				●				●	

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
Midterm Examination	8	20 %
Final Examination	(As Scheduled)	60 %
Quizzes (3 times)	3, 5, 9	5 %
Home assignments	3, 5,10,11	5%
Semester Work		10%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	□ Computer with software
□ Lecture Hall	■ White Board	■ MIS system
□ Sound and Microphone	■ Data Show	■ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

Lectures Notes in PDF (please click here)

https://fengbuedu-my.sharepoint.com/personal/mohamed_emam_feng_bu_edu_eg/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fmohamed%5Femam%5Ffeng%5Fbu%5Fedu%5Feg%2FDocuments%2FTeaching%20Courses%2FApplied%20Fluid%20Mechanics%202020

b- Books

1- Yunus A. Cengel, JOHN M. CIMBALA. Fluid Mechanics: FUNDAMENTALS AND APPLICATIONS, McGraw-Hill, 3rd Edition, 2010.
2- Modern Compressible Flow with Historical Perspective by J.D. Anderson, McGraw-Hill, 3rd Edition, 2002.

c- Recommended Books

1- Yunus A. Cengel, JOHN M. CIMBALA. Fluid Mechanics: FUNDAMENTALS AND APPLICATIONS, McGraw-Hill, 3rd Edition, 2010.

- Course Coordinator: Prof. Dr. Ahmed Elshamy **Signature:**

Dr. Mohamed Emam **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: ELC301 Electronic Engineering **Semester/Level:** First / Two
Prerequisite Course(s): EPM301 **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to provide students with the basic knowledge related to the concepts and theories of sciences, appropriate to the Study of the characteristics and applications for electronic devices, such as Bipolar Junction Transistor (BJT), Field Effect Transistor (FET), Operational amplifiers, and digital gates.

3- Course Contents (As indicated in the program Bylaw)

Basic Depletion/Enhancement Mode MOSFETs – Biasing techniques of MOSFET, DC Analysis of MOSFET, (FET) Biasing, • MOS-Structure - Operation of MOSFET, • Depletion/Enhancement Mode MOSFETs, Biasing techniques of MOSFET, DC Analysis of BJT, AC Analysis of BJT, small signal operation, transistor amplifier, (Common Emitter, Collector, and Base Amplifiers), and multistage amplifiers,

4- Program Competencies Served by The Course (A1, A2 and B2)

Level (A) Engineering Competencies

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.

Level (B) Electrical Engineering Competencies

B.2 Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.

Level (D) (The University of Edinburgh Benchmark)

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Define concepts and theories of sciences, appropriate to the electronic circuits analysis.
LO2	Apply different techniques of solving biasing techniques electronic devices such as Bipolar Junction Transistor (BJT).
LO3	Construct the difference between BJT , JFET, and MOS-Structure and their applications.
Psychomotor Domain	
LO4	Select an intelligent method in different applications of electronic circuit.
LO5	Check the DC Analysis of BJT, AC Analysis of BJT and small signal operation.
Affective Domain	
LO6	Analyze and evaluate responses of transistor amplifier, (Common Emitter, Collector, and Base Amplifiers), and multistage amplifiers.

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A1	A2	B2
Cognitive Domain			
LO1	■		
LO2	■		
LO3			■
Psychomotor Domain			
LO4			■
LO5		■	
Affective Domain			
LO6		■	

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes					
			LO1 A1-1	LO2 A1-2	LO3 B2-1	LO4 B2-2	LO5 A2-1	LO6 A2-2
W1	Introduction to semiconductor materials and devices	**3**	■		■		■	
W2	DC Analysis of BJT	**3**					■	
W3	AC Analysis of BJT, small signal operation.	**3**		■				
W4	MOS-Structure - Operation of MOSFET	**3**					■	
W5	Biasing techniques of MOSFET	**3**						■
W6	DC Analysis of MOSFET	**3**		■				
W7	-Thirty Exam	**3**	■			■	■	
W8	bandwidth considerations	**3**	■					
W9	feedback and stability	**3**						■
W10	Operational amplifiers and applications in filter and oscillator circuit design	**3**	■			■		
W11	Voltage regulator and timer circuits	**3**				■		
W12	-Twenty Exam	**3**	■		■			■
W13	Switching properties of transistors and digital gates (Inverter, NAND/AND, NOR/OR);	**3**	■		■			
W14	overview of TTL and CMOS technologies.	**3**				■		

b) Additional private study/learning hours expected for students per week is three hours

8) Teaching and Learning Methods

	Teaching and Learning Methods

		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●	●					●	●
	LO3	●		●							
Psychomotor Domain	LO4			●			●			●	
	LO5	●		●	●		●	●	●	●	
Affective Domain	LO6	●		●	●						●

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cogniti ve Domai	LO1	●			●				●		●
	LO2	●				●			●		●

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
	LO3		●		●	●			●		
Psychomotor Domain	LO4		●					●			
	LO5	●			●	●	●			●	
Affective Domain	LO6	●			●						●

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
Midterm Examination 1	7	30 %
Mid-Term Exam 2 (written and oral)	12	20 %
Final Examination	(As Schedule)	40 %
Home assignments, and Reports	2, 4, 8, 11	5 %
Quizzes	6, 10	5 %
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

Lectures Notes in PDF

b- Books

1. FLOYD, Thomas L. "Electronic devices: conventional current version". Pearson, 9th Edition, 2012.
2. BOYLESTAD, Robert L.; NASHELSKY, Louis. "Electronic devices and circuit theory". Pearson, 11th Edition, 2013.
3. SEDRA, Adel S., et al. "Microelectronic circuits". New York: Oxford University Press, 7th Edition, 2016.

c- Recommended Books

1. Albert Malvino and David Bates, "Electronic Principles", 7th Edition.

- Course Coordinator: Prof. Dr. Hala Mansour **Signature:**

Dr. Said Emam **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: EMP311 Organic Chemistry **Semester/Year:** First/2020-2021
Prerequisite Course(s): none **Core or Elective:** Core Course
Credit Hours: 2 **Weekly Contact Hours: Lecture:** 1 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

This course aims to provide students with the basic information of organic chemistry and their compounds especially those are associated with engineering applications. In addition, the course helps in relating the reactivity of any organic compound to its chemical structure, thus, it should help in selecting suitable organic materials for suitable uses.

3- Course Contents (As indicated in the program Bylaw)

Molecular composition and structure of organic compounds: determination and calculation of empirical and molecular formulae, pictorial treatment of hybridization. Organic Reaction Mechanisms: Bond formation and fission, classification of reagents and reactions, reaction intermediates: Carbocations, free radicals, carbanions. Substitution, additional and elimination reaction. Stereochemistry Hydrocarbons: (aliphatic, alicyclic and aromatic), structure and nomenclature. Homologous series, and gradation of properties, preparation, reactions.

4- Program Competences Served by the Course (A1, A5, A10)

Level (A) Engineering Competencies

Upon completing this course, students will be able to:

A.1 Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

A.5 Practice research techniques and methods of investigation as an inherent part of learning.

A.10 Acquire and apply new knowledge, and practice self, lifelong and other learning strategies.

5- Learning Outcomes (LO's)

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

Cognitive Domain	
LO1	understand the basic principles of organic chemistry to be able to associated the materials with engineering applications.
LO2	differentiate between organic and inorganic compounds to deal with them in suitable ways
LO3	Understand the nomenclature roles to be able to name the organic compounds based on their chemical structure.
LO4	know the chemical and physical properties of hydrocarbons and their derivatives to relate each compound to its suitable uses.
LO5	Apply the suitable roles in stereochemistry to differentiate between different isomers
LO6	relate the reactivity of organic compounds to their structure to select suitable method for preparing them or converting them to another materials.
LO7	predict the organic reactions and evaluate their mechanism based on the hybridization and geometries of the reacting compounds.

6- Mapping Learning Outcomes (LO's) with Competences

LO's \ NARS	A1	A5	A10
Cognitive Domain			
LO1	■		
LO2	■		
LO3	■		
LO4	■		
LO5			■
LO6		■	
LO7	■		

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes						
			LO1 A1-1	LO2 A1-2	LO3 A1-3	LO4 A1-4	LO5 A10-5	LO6 A5-6	LO7 A1-7
W1	- Intro to the course: difference between organic & inorganic compounds. - showing the quality assurance related to the course.	**3**	■	■					
W2	Molecular composition and structure of organic compounds	**3**	■		■				
W3	Determination and calculation of empirical and molecular formula	**3**	■						
W4	Pictorial treatment of hybridization	**3**	■	■					
W5	Intro to Organic Reaction Mechanisms: Carbocation's & free radicals.	**3**			■				■
W6	Bond formation and fission, intermediates	**3**			■				■
W7	Substitution reactions and their types, S_N1,S_N2	**3**							■
W8	1st Midterm Exam								
W9	Additional & elimination reaction	**3**							■
W10	Hydrocarbon derivatives: alcohols	**3**			■	■		■	
W11	Hydrocarbon derivatives: carbonyl compounds	**3**			■	■		■	
W12	Intro to Stereochemistry: Chiral Molecules	**3**			■		■		■
W13	Intro to Stereochemistry: Fisher projection & nomenclature	**3**			■		■		■
W14	Enantiomers & Diastereomers Isomers	**3**			■		■		■

a) Additional private study/learning hours expected for students per week is three hours in which the students will fulfill the required assignments.

8) Teaching and Learning Methods

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	
	LO2		●				●				
	LO3	●		●							
	LO4		●						●		
	LO5	●							●		
	LO6		●		●						
	LO7	●		●	●			●		●	●

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Course coordinator will be available for students for two hours a week as indicated on the posted timetable declared for students from the beginning of the semester.
- In addition to the face to face contact (office hours), the course coordinators contact the student via other available online tools such as WhatsApp class group, Microsoft teams, and the university platform.
- There are no disable students in this course, so no special support is needed.

9- Students Assessment

a- Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1										●
	LO2										
	LO3	●	●		●	●	●				●
	LO4	●	●			●					
	LO5	●			●	●	●			●	●
	LO6				●			●			
	LO7	●						●			●

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	20 %
Report & Presentation	12, 13	10%
Oral discussions (class/online)/attendance	(As Scheduled)	10%
Home assignments, and Reports	6, 10	20%
Final Examination	15	40 %
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- ■ Other: molecular model kits
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- □ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor (as pdf).
https://bu.edu.eg/staff/hanaahmed3-courses/13602

microsoft teams:
https://teams.microsoft.com/l/team/19%3a18e9ef1f53894e9b822926951944ab47%40thread.tacv2/conversations?groupId=9ae3f9e1-fbe5-41f0-bb60-3d87c1d313fe&tenantId=49fec46f-5c8a-405f-8772-a755acd6364a

b- Books

1- Leroy G. Wade, Jan W. Simek, "Organic Chemistry", 9th Edition, Pearson, 2016

c- Recommended Books

1- Organic Chemistry: Structure, Mechanism, Synthesis, Robert J. Ouellette and J. David Rawn, 2nd edn, 2019

- Course Coordinator: Assoc. Prof. Dr. Hanaa Abulmagd **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University:	Benha University
Faculty:	Faculty of Engineering at Shoubra
Department offering the program:	Mechanical Engineering Department
Program offering the course:	Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: MDP301 | **Course Title:** Machine Design Components
Semester/Year: First/2021-2022 | **Specialization:** Mechanical Engineering
Credit Hours: 3 | **Lecture:**2 **Tutorial:** 2 **Lab:**

2- Course Objectives

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

1. Describe the concept, procedures, and data for stress analysis.
2. Recognize the machine elements in power transmission systems.
3. Acquire competency in sizing and selecting mechanical components for mechanical systems.
4. Utilizing programming technologies to model and design various products
5. Apply the design processes to optimize the product design.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

a.3- apply the designs concepts to implement various Products **(A3)**

a.4- Utilizing programming technologies to model and design various products **(A4)**

a.1- Establish a team work for developing matlab codes to implement various programs

Level (B) Mechanical Engineering Competencies

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

b.1- carry out designs of mechanical systems and machine elements using appropriate materials both traditional means and computer-aided tools. **(B1)**

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

b2- Prepare the process plan for design products using the latest CAD systems (**B2).**

4- Course Contents

a) **Course Description** (As indicated in program Bylaw)

This course is devoted to study the power transmission systems and analyze the stresses on each machine element in the transmission line. The course also deals with the selection of the right power source to drive such systems and the design of shafts, keys, belts, gears and bearings and all other elements involved with transmission line. Design projects for different mechanical systems applied.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies			
		A.3	A.4	B1	B2
1	Introduction to stress analysis-1	√	√		

2	stress analysis and modling	√	√		
3	Design of shafts & keys				
4	Design of shafts & keys			√	√
5	Design of Belts &chains			√	√
6	Design of Belts &chains			√	√
7	Design of bearings			√	√
8	Design of bearings	√	√	√	√
9	Study the different types of gear boxes	√	√		
10	Design of single reduction gear box			√	
11	Design Project			√	
12	Design Project			√	√
13	Design Project				√

5- a) Teaching and Learning Methods

Course 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	A.3	√	√						√		
	A.4	√	√						√		
Level B	B.2			√							
	B2			√					√		

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A3	√								√	
	A4	√								√	
Level B	B1	√		√	√					√	
	B2	√		√	√					√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination	7	20 %
Final Examination	(As Schedule)	60 %
Quizzes (4 times)	3, 5, 9, 12	10 %
Home assignments, and Reports	2, 4, 8, 11	10%
CNC Project	8	10 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- ■ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- □ White Board
- ■ Data Show
- ■ Computer with software
- □ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Weekly Power point file
Weekly Video file

b- Books

Matlab For Engineers By Holly Moore 2017

c-Recommended Books

Matlab For Engineers By Holly Moore 2017

d- Web Sites

https://www.mathworks.com/training

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies			
	A.3	A.4	B.1	B.2
Course Objective #1	√	√		
Course Objective #2			√	
Course Objective #3			√	√
Course Objective #4			√	√

- Program Coordinator: Dr. Tarik Tawfeek **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: EPM302 Electrical Engineering II **Semester/Year: First** / 2020-2021
Prerequisite Course(s): EPM201 Electrical Engineering I **Core or Elective:** Core Course
Credit Hours: 2 **Weekly Contact Hours**: **Lecture:** 1 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to provide students with the basics fundamental knowledge of AC electrical circuits. Moreover, employ the methods of AC circuit analysis and determine the average and effective values for different functions. Finally, design the appropriate components to improve the power factor and filters to eliminate harmonics .

3- Course Contents (As indicated in the program Bylaw)

Alternating voltages and currents, AC circuit theories, Ac power and power factor correction, polyphase circuits, Frequency response, Filters and Resonance, Two port networks, Fourier method.

4- Program Competencies Served by The Course (A.1, A.2 and B.3)

Level (A) Engineering Competencies

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.

Level (B) Mechanical Engineering Competencies

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.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Recognize various rules and components of AC electric circuits.
LO2	Analyze the AC electric circuits using different methods.
LO3	Determine the circuit power factor to can improve it .
LO4	Analyze the AC signals using fourier to can design the appropriate filters.
Psychomotor Domain	
	Non
Affective Domain	
LO5	Develop the performance of AC circuit using the frequency response.
LO6	Perform some applications using simulation programs.

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A1	A2	B3
Cognitive Domain			
LO1	■		
LO2			■
LO3		■	
LO4	■		
Psychomotor Domain			
Non			
Affective Domain			
LO5			■
LO6		■	

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes LO1 A1-1	LO2 B3-2	LO3 A2-3	LO4 A1-4	LO5 B3-5	LO6 A2-6
W1	Introduction	**3**	■					
W2	Alternating voltages and currents	**3**	■	■				
W3	AC circuit theories, part 1	**3**			■			
W4	AC circuit theories, part 2	**3**			■			
W5	Ac power calculation	**3**		■				
W6	Power factor correction	**3**		■				
W7	Poly phase circuits	**3**					■	
W8	Frequency response	**3**					■	
W9	Resonance circuits	3					■	
W10	Filters	3				■		
W11	Filers design	3				■		
W12	Two port network, part 1	3						■
W13	Two port network, part 2	3						■
W14	Fourier method	3						■

b) Additional private study/learning hours expected for students per week is Three hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●			●				●
	LO2	●		●	●						●
	LO3	●	●	●				●			
	LO4	●		●						●	
Psycho motor Domain											
Affective Domain	LO5	●		●			●	●			●
	LO6	●			●		●		●		

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the timetable declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●			●			●			●
	LO2	●				●			●		●
	LO3	●			●						
	LO3	●			●						
Psycho motor Domain Affective Domain											
Cognitive Domain	LO5	●						●			
	LO6			●	●			●	●	●	●

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Research and reports discussion	12	20%
Final Examination	(As Scheduled)	40 %
In-class questions	Every wek	10 %
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

■	Classroom	□	Smart Board	■	Computer with software
□	Lecture Hall	■	White Board	■	MIS system
□	Sound and Microphone	■	Data Show	■	Internet Access
□	Other: …………………				

11- List of References

a- Course Notes

Lectures Notes in Microsoft team

b- Books

1. 1.Mehdi Rahmani-Andebili, "AC Electrical Circuit Analysis: Practice Problems, Methods, and Solutions, " Springer International Publishing, Year: 2021.
2. William H. Hayt, Jr. , "ENGINEERING CIRCUIT ANALYSIS", ninth edition, 2018.

c- Recommended Books

1. Allan Robbins and Wilhelm miller, "Circuit Analysis; Theory and practice", 4th Edition, Delamr Learning, 2007.
2. Ozgur Ergul, "Introduction to Electrical Circuit Analysis," Wiley-Blackwell, 2017..

- Course Coordinator: **Dr. Islam Mohamed** **Signature:**

- Program Coordinator: **Prof. Dr. Ahmed Reda Elshamy** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: GEN301 **Course Title:** Leadership and Management Skills
Semester/Level: First / Two **Specialization:**
Credit Hours: 2 **Lecture:** 2 **Tutorial:-** **Lab:** -

2- Course Objectives

For students undertaking this course, they will be able to know:

1- - Perform the concepts and principles of the cost estimation and analysis.
2- - Investigate the basic principles of the supply chain management.
3- - Apply the different types of financial analysis.
4- - Investigate the factors affecting the company performance.
5- - Enhance practical skills in the fields of production management to increase ability for employment.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.3 Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for social, economic, and ethical aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.
A.6 Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.
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.

4- Course Contents

a) **Course Description** (As indicated in program Bylaw)

This course is an introduction to the managerial skills such as leadership, team Approach, planning, organization, control and communication Skills.

b) Topics to be Covered weekly & Matrix of Competencies.

Week	Topics	Course Competencies				
		A3	A6	A8	A9	A10
1&2	Introduction to the managerial skills				√	
3,4,5	Leadership	√	√	√	√	√
6,7	Team Approach	√	√	√	√	√
9,10	Planning		√			√
11,13	Organization	√	√	√	√	√
14	Control and communication Skills	√		√	√	

5- a) Teaching and Learning Methods

Course Competencies		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Level A	A3	√	√							√	
	A6	√	√							√	
	A8	√	√					√			
	A9	√	√								√
	A10	√	√								

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
		Assessment Methods									
Level A	A3	√			√		√			√	
	A6	√					√		√	√	
	A8	√			√					√	
	A9	√			√		√			√	
	A10	√							√	√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	8	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Quizzes	5, 7, 10, 11	5%
Home assignments, and Reports	all weeks except first and last ones	5%
Oral exam	-	0 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- ■ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor (Power Point & Case Studies).

b- Books

1- B. Kumar, "Industrial Engineering & Management", Khana Pub., 2004

c- Recommended Books

1- Max Kurtz "Hand Book of Engineering Economics", MacGrawHill, 1984

.

Course Objectives and Competencies

Course Objectives	Course Competencies				
	A3	A6	A8	A9	A10
Understand the concepts and principles of the cost estimation and analysis.	√			√	√
Understand the basic principles of the supply chain management.	√	√	√	√	√
Know the different types of financial analysis.	√	√		√	√
Know the factors affecting the company performance.	√	√		√	√
Enhance practical skills in the fields of production management to increase ability for employment.		√	√	√	√

- Course Coordinator: Dr. Sayed Zayan **Signature:**

- Program Coordinator: Prof.Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Program offering the course: Energy & Sustainable Energy Engineering Program

1- Course Data

Course Code: MPE303 Course Title : Measurements & Instrumentation Systems
Semester/Level: 2nd / Three **Specialization:** Mechanical Engineering
Prerequisite Course(s): EMP104 **Core or Elective:** Core Course
Credit Hours: 3 **Lecture:** 2 **Tutorial:**0 **Laboratory:** 3

2- Course Aims

The aim of this course is to provide students with the fundamental of measurement theory with statistics and uncertainty analysis. Students understand the basic Concepts of Design-Stage Uncertainty Analysis and how to use the conceptual design framework for selecting and specifying measuring equipment and test procedures, which it is necessary and common bases for the practice of test engineering. Students understand how to design the application of an RTD, thermistor, thermocouple, bimetal, and gas temperature sensors. Explain the operating principle of an LVDT, stain gauge, diaphragm, orifice, and pressure sensors.

3- Course Contents (As indicated in the program Bylaw)

Introduction to general concept and experimental results analysis, Instruments Quantities, Experimental Test Plan, Calibration, General Model for a Measurement System, Measurement Errors, Design-Stage Uncertainty Analysis, Error Propagation, Advanced-Stage Uncertainty Analysis, Temperature Standards and Definition, Pressure Measurement, Fluid Velocity Measuring Systems, Flow Rate Concepts, Force Torque power and Stress measurements, Length Displacement and Area measurements.

4- Program Competences Served by the Course (A and B)

Level (A) Engineering Competencies

A1-Identify, formulate, and solve complex thermal 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.5 Practice research techniques and methods of investigation as an inherent part of learning.

Level (B) Mechanical Engineering Competencies

B.1- Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of: Measurements, Instrumentation, Control Theory and Systems, Piping and Instrumentation Diagrams.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Explain how sensors are combined in instrumentation for some commonly encountered measurements.
LO2	Describe and evaluate sensors used with instrumentation in the measurement of pressure, temperature, flow, and liquid levels
Psychomotor Domain	
LO3	Describe and define the various error types
LO4	propagate uncertainties to understand their impact on the final statement of a result.
LO5	Read and interpret performance terminology used in the specifications of instrumentation.
LO6	Identify the major components of a general measurement system, and state the function of each.

6- Mapping Learning Outcomes (LO's) with Competences

LO's \ NARS	A1	A2	A5	B1
Cognitive Domain				
LO1	■			
LO2		■		
Psychomotor Domain				
LO3		■		
LO4		■		
LO5			■	
LO6				■
Affective Domain				

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes					
			LO1	LO2	LO3	LO4	LO5	LO6
1	Introduction to general concept and experimental results analysis	5		√				
2	Experimental Test Plan and calibration	5						√
3	Measurement system behavior	5					√	

4	Measurement Errors and design-Stage Uncertainty Analysis,	5	√					
5	Identifying error sources	5	√					
6	Error Propagation and Uncertainty Analysis	5				√		
7	Advanced-stage Uncertainty analysis	5				√		
8	Temperature Standards and measurements.	5		√				
9	Pressure Measurement,	5		√				
10	Pressure Transducer	5		√				
11	Fluid Velocity Measuring Systems.	5		√				
12	Flow Rate Concepts and measurements.	5		√				
13	Force Torque power and Stress measurements.	5		√				
14	Length Displacement and Area measurements.	5		√				

b) Additional private study/learning hours expected for students per week FIVE hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●							
	LO2	●		●						●	
Psychomotor Domain	LO3	●		●							●
	LO4	●	●	●							
	LO5	●		●	●						
	LO6	●		●	●						

Student Academic Counseling and Support

- Students are directed to contact teaching stafffor academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as Whatsapp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●		●					●		
	LO2	●			●	●					●
Psychomotor Domain	LO3	●				●					●
	LO4	●									●
	LO5	●			●			●			●
	LO6	●				●					

b- Assessment Schedule and Weight

Assessment	Week	Weight
Thirty Examination	7	30 %
Attendance	1 to 12	5%
Final Examination	15	40 %
Home assignments	2, 4, 6, 8,10,12	5 %
Reports	11	10 %
Twenty Exam	11	10%
Total		**100** %

10- Facilities

The following facilities are needed forthis course:

■ Classroom	□ Smart Board	□ Computer with software
□ Lecture Hall	□ White Board	□ MIS system
■ Sound and Microphone	■ Data Show	□ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

Lectures Notes in PDF

b- Books

William Bolton, Instrumentation and Control Systems, Newnes, Elsevier Science, 2021.

c- Recommended Books

Richard S. Figliola and Clemson University, "Theory and Design for Mechanical Measurements", 7th Edition, John Wiley & Sons, Inc., 2019.

d- Web Sites

http://www.bu.edu.eg/staff/

Course Coordinator: Prof. Ali A. Abd elaziz — Signature:
Assoc. Prof. Mohamed Reda Salem — Signature:

Program Coordinator:
Prof. Ahmed Reda Elshamy — Signature:

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Program Data

Program Title: Field Training Program
Specialization: Energy and Sustainable Energy Engineering Program

Course Code: ESE380	**Course Title:** Field training I
Semester/Year: Second / 2020-2021	**Specialization:** Energy and Sustainable Energy Eng.
Credit Hours: 1	**Lecture:** 1 **Tutorial:** 0 **Lab: 0**

Course Code: ESE480	**Course Title:** Field training II
Semester/Year: Second / 2020-2021	**Specialization:** Energy and Sustainable Energy Eng.
Credit Hours: 1	**Lecture:** 1 **Tutorial:** 0 **Lab: 0**

2- Program Objectives

The mission of the Energy and Sustainable Energy Engineering is to qualify students for successful and outstanding careers in Energy and Sustainable Energy fields. The Energy and Sustainable Energy Engineering program aims to develop an appreciation of the social and environmental requirements for the sustainable generation and distribution of energy in a rapidly growing world economy, and of the current and emerging technologies that can be applied to meet these requirements. Alternative technologies such as wind power, solar power, tidal power, geothermal power, hydro power, pumped storage, power transmissions and biomass are all covered, and the program aims at producing graduates who can design technologies that will support society in the future and for generations to come.

3- Program Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

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.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.

Level (B) Sustainable Energy Competencies

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

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.

Level (D) University of Edinburgh Competencies

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

D.1 Classification, construction design concepts, operation and characteristics of internal combustion engines, pumps, turbines and compressors according to current developments and technologies.

D.3 Carry out preliminary designs of sustainable energy sources including solar, wind, and geothermal energy, and biotechnology and solve their operational problems.

4- Curriculum Structure and Contents

Practical/Field Training: the students must carry out 3 weeks of field training after the freshman year and after the sophomore year.

5- Field training schedule and outcomes

Year of program 3 (Second Year) after Semester 2

Code	Course Title	No. of hours / week
ESE 380	Field training I	40

Year of program 4 (Third Year) after Semester 2

Code	Course Title	No. of hours / week
ESE 480	Field training II	40

6- Participants Assessment

Appraiser	Tool	Weight
The external trainer	Evaluation sheet	10 %
Participant report	Report inspection	50%
Department discussion	Oral investigation	40 %
Total		**100** %

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: MPE304
Course Title: Applied Thermodynamics
Semester/Level: Second / Two
Specialization: Mechanical Engineering
Credit Hours: 3
Lecture: 2 **Tutorial:** 2 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:

1. Basic concepts of thermodynamics.
2. Power cycles.
3. Applying thermodynamics to various professional fields.
4. The gas mixtures and combustion.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1 Identify, formulate, and solve complex thermodynamics engineering problems by applying engineering fundamentals, basic science, and mathematics.

A.8 Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

A.10 Acquire and apply new knowledge and practice self-learning strategies.

Level (B) Sustainable Energy Competencies

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

B.1 Model analyze and design physical systems applicable to the power systems by applying the concepts of thermodynamics.

B.3 Select, model, and analyze electrical power systems applicable to the thermodynamic discipline by applying the concept of generation of electrical power systems.

Level (D) University of Edinburgh Competencies

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

D.1 Model, Analyze, design and operate internal combustion engines, pumps, turbines, and compressors according to current developments and technologies

4- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1 **A1**	Identify the unique vocabulary associated with power thermodynamics cycles through the precise definition of the principles of thermodynamics.
LO2 **A8**	Plot the power thermodynamic cycles and find the enthalpies values
LO3 **A10**	Apply the first and second law of thermodynamic on the different thermal power cycles and gas mixtures
LO4 **B3**	Analyze the thermodynamic cycles applying the concept of generation of electrical power systems and calculate the thermal efficiency
Psychomotor Domain	
LO5 **B1**	Demonstrate the procedures for determining thermodynamic properties of pure substances from tables of property data to apply the first law of thermodynamics for power cycles
LO6 **D1**	View the moving boundary work or *PdV* work commonly encountered in reciprocating devices such as automotive engines and compressors.
Affective Domain	

5- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A1	A8	A10	B1	B3	D1
Cognitive Domain						
LO1	■					
LO2		■				
LO3			■			
Psychomotor Domain						
LO4					■	
LO5				■		
LO6						■
Affective Domain						

6- Course Contents

a) **Course Description** (As indicated in program Bylaw)

Introduction &Review: First law of thermodynamics- reversible thermodynamic processes- Second Law of Thermodynamics: Kelvin-Planck Statement- Calusius Statement- Heat engine – Reversed engine (Refrigerator-heat pump)- Carnot cycle-Entropy: Clausius inequality-Entropy-Entropy changes in reversible processes- principle of increase entropy -Availability &Irreversibility-Steam Cycle: Simple steam cycle (Rankine cycle)- Reheat cycle- Regenerative cycle-Air standard cycle: Otto cycle- Diesel Cycle- Dual Cycle-simple gas turbine cycle - Refrigeration cycle- Gas mixtures General considerations and mixtures of ideal gases--simplified model of mixture involving gases and vapor- the first law applied to gas-vapor mixture Thermodynamic relations: The Clapeyron

Equation- Maxwell relations-Some thermodynamic relation involving Enthalpy, internal energy and entropy- Chemical reaction: Fuels-Combustion process

b) Topics to be Covered weekly & Matrix of LOs.

Week	Topics	Course LOs					
		LO1	LO2	LO3	LO5	LO4	LO6
1	Entropy, Revisable work ,Irreversibility	√	√				
2	Analysis of Rankine cycle and comparing with Carnoy cycle.	√	√				
3	. modification of Rankine cycle	√			√		
4	Analysis of Reheat cycle and comparing with Carnoy cycle			√	√		
5	Analysis of regenerative cycle : open heaters		√			√	
6	Analysis of regenerative cycle : closed heaters		√	√			
30% Exam							
8	Otto cycle	√		√			
9	Diesel cycle	√		√		√	
10	Gas turbine cycle				√	√	√
12	Modification of gas turbine cycle	√	√		√	√	√
13	Gas mixtures	√			√		
14	Application on Gas mixtures	√			√		
15 Final Exam							

6- a) Teaching and Learning Methods

Course LOs		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
Cognitive Domain	LO1	√	√	√				√			
	LO2	√		√	√				√	√	√
	LO3	√		√	√				√	√	
Psychomotor Domain	LO5	√	√	√				√	√		
	Lo4	√		√				√	√		√
	LO6	√		√	√			√	√		√
				√							

6- b) Teaching and Learning Methods of Disables

None

7- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my timetable declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course LOs		Written Exams	Online Exams	Oral Discussion Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	√					√	√			√
	LO2	√					√	√	√	√	√
	LO3	√					√	√	√	√	
Psychomotor Domain	LO5	√					√	√	√	√	√
	LO4	√					√	√	√	√	
	LO6	√					√	√	√		

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
Attendance.	1 to 12	10%
Final Examination	15	40 %
Project Assignments	12	10 %
Research and Reporting assignments	2, 4, 6, 8,10,12	10%
Oral exam	-	0 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	□ Computer with software
□ Lecture Hall	■ White Board	□ MIS system
□ Sound and Microphone	■ Data Show	□ Internet Access
□ Other: …………………		

9- List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1. "Fundamentals of Engineering Thermodynamics", Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey, 8th edition, 2014.
2. "Fundamental of Classical Thermodynamics", Van Wylen & Richard E. Sonntag, 3rd edition, 1993.

c- Recommended Books

1. "Thermodynamics for Engineers", Schaum's Outlines, 3rd Edition, 2013.

d- Web Sites

1- https://www.learnthermo.com/

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies & LOs					
	LO1	LO2	LO3	LO5	LO4	LO6
Increase the basic skills of fluid machines.	√	√	√	√		
Specify the theoretical and practical skills.		√		√	√	
Increase the ability of design, installation and operating the Applied Fluid Mechanics.	√	√		√		√

- Course Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

Prof. Dr. Ragab Khalil **Signature:**

- Program Coordinator: Prof.Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: EPM301 (Electrical Power Engineering) **Semester/Year:** First / 2020-2021
Prerequisite Course(s): EPM 201 **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to identify different types of transmission line and also measure the transmission efficiency and voltage regulation for each type of transmission line and ability to calculate voltage drop on cables.

3- Course Contents (As indicated in the program Bylaw)

Transmission line parameters, short, medium and long transmission lines, the transmission line as two-port networks, Power flow on transmission lines, travelling wave, Underground cables construction, types, parameters and ampacity calculations, Cable testing and fault locating, Grounding systems.

4- Program Competencies Served by The Course (A6, B3, D4)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A6. Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

Level (B) Electrical Engineering Competencies

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

B3. Design and implement elements, modules, sub-systems, or systems in electrical engineering using technological and professional tools.

Level (D) University of Edinburgh Competencies

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

D.4 Work in a variety of energy systems operations and maintenance.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Apply the block-diagram algebra to obtain the system transfer function.
LO2	Construct signal flow graph to calculate system transfer function using Mason's formula
LO3	Create a model of physical system & its mechanical network to write its differential equations.
Psychomotor Domain	
LO4	Select the proper state variables to obtain the dynamic equation of LTI system and its state transition matrix and/or state transition equation.
LO5	Design the proper PID controller to meet specific time-domain specifications of LTI system

6- Mapping Learning Outcomes (LO's) with Competences

LO's \ NARS	A6	B3	D4
Cognitive Domain			
LO1	■		
LO2	■		
LO3		■	
Psychomotor Domain			
LO4		■	
LO5			■

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes				
			LO1 A6-1	LO2 A6-2	LO3 B3-3	LO4 B3-4	LO5 D4-5
W1	Transmission line parameters	**4**	■				
W2	Transmission line parameters	**4**	■				
W3	Transmission line parameters	**4**		■		■	
W4	Transmission line as Two-port networks,	**4**		■		■	
W5	Transmission line as Two-port Networks	**4**		■		■	
W6	Transmission line as Two-port Networks	**4**		■		■	
W7	Power flow on transmission lines	**4**	■				
W8	Mid-term exam						
W9	Power flow on transmission lines	**4**	■				
W10	Travelling wave	**4**	■				■
W11	Travelling wave	**4**			■		
W12	Underground cables construction, types, parameters and ampacity calculations	**4**					■
W13	Underground cables construction, types, parameters and ampacity calculations	**4**			■		■
W14	Grounding systems	**4**			■		■

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

i n g O n t	**Teaching and Learning Methods**

		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●	●					●	●
	LO3	●	●	●							
Psychomotor Domain	LO4		●	●			●			●	
	LO5	●		●	●		●	●	●	●	

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as WhatsApp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		**Assessment Methods**									
		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●			●				●		●
	LO2	●				●			●		●
	LO3		●		●	●			●		
Ps yc ho	LO4		●					●			

Learning Outcomes	Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Question
LO5	●			●	●	●			●	

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Second Midterm Examination	12	20%
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	5 %
Home assignments	3, 5,10,11	5%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

Lectures Notes in PDF
Handed out to the students' part by part.

b- Books

1. V. Y. Ushakov "Electrical Power Engineering", 1st edition, Springer, Cham 2018.
2. L.L.Grigsby "Electrical Power Generation, Transmission and distribution", 3rd edition, 2012.
3. V.K. Mehta. "Principles of Power System", 5th edition, 2005.
4. D.P. Kothari. "Modern Power System Analysis", 3rd edition, 2003.

c- Recommended Books

1. V. Y. Ushakov "Electrical Power Engineering", 1st edition, Springer, Cham 2018.

- **Course Coordinator:** **Prof. Dr. Mohamed Moenes** **Signature:**

Dr. Hosam Abdel Razzak **Signature:**

- **Program Coordinator:** **Prof. Dr. Ahmed Reda Elshamy** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code: MDP312 **Course Title:** Theory of Machines
Semester/ Academic year: Second semester / 2020-2021
Prerequisite Course(s): EMP107
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 1 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to provide the students with the basic knowledge and skills of the fundamentals of theory of machines. Study the gear trains, mechanisms, cams, flywheels and balancing.

3- Course Contents (As indicated in the program Bylaw)

Introduction to theory of machines, systems kinematics, velocity and acceleration of different mechanisms, analysis of dynamic forces, cams, balancing, flywheels and gear trains

4- Program Competences Served by The Course (A1, B1 and B3)

Level (A) Engineering Competencies

A1: Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science, and mathematics.

Level (B) Mechanical Engineering Competencies

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.

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

5- Learning Outcomes (LO's)

At the end of this course, the student will be able to:

Cognitive Domain	
#1	Explaining the working principles of gear trains, mechanisms, cams, flywheels and balancing.
#2	Analyze gear trains, mechanisms, cams, flywheels and balancing by equations.
#3	Apply the acquired knowledge for solving problems in gear trains, mechanisms, cams, flywheels and balancing.

Psychomotor Domain	
#4	Detect the gear trains velocities and number of teeth, velocity and acceleration of mechanisms, cams dimensions, flywheels masses and dimensions, and the necessary balanced masses.
#5	Design of gear trains, mechanisms, cams, flywheels and balancing.
Affective Domain	

6- Mapping Learning Outcomes (LO's) with Competencies

LO's / NARS	A1	B1	B3
Cognitive Domain			
#1	■		
#2		■	
#3	■		
Psychomotor Domain			
#4			■
#5		■	
Affective Domain			

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes				
			A1-1	B1-2	A1-3	B3-4	B1-5
W1	-Introduction – Mechanism & machine	3	■				
W2	-Types of mechanisms.	3	■				
W3	-Velocity diagram – four bar mechanism.	3		■			
W4	-Velocity diagram – Slider crank mechanism. & quick return mechanism (Home assignments)	3					■
W5	-Acceleration diagram – four bar mechanism. –& Slider crank mechanism.	3			■		
W6	-Acceleration diagram quick return mechanism	3					■
W7	- Gear trains (simple)	3	■				
W8	- Gear trains (compound) [Quiz]	3		■			
W9	- Flywheel working principles (Home assignments)	3	■				
W10	- Solved examples on flywheel	3			■		
W11	- Mass balancing (single mass in the same plane)	3				■	
W12	- Mass balancing (two masses in two different planes) [Quiz]	3					■

Week	Topics	Planned Hours	Learning Outcomes				
			A1-1	B1-2	A1-3	B3-4	B1-5
W13	- Working principles of cams (Home assignments)	3	■				
W14	-Came profile (Solved problems) [Quiz]	3			■		

b) Additional private study/learning hours expected for students per week is Six hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	#1	●	●	●				●			
	#2	●	●	●				●		●	
	#3	●	●	●				●	●		
Psychomotor Domain	#4	●	●	●				●		●	
	#5	●	●	●				●	●		
Affective Domain											

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.

https://chat.whatsapp.com/ExosjhSuERkKzKvS8ig7A5

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	#1	●			●			●		●	
	#2	●			●			●		●	
	#3	●			●			●		●	
Psychomotor Domain	#4	●			●			●		●	
	#5	●			●			●		●	
Affective Domain											

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
Midterm Examination	7	20 %
Second Midterm Examination	12	30 %
Final Examination	(As Scheduled)	40 %
Quizzes	8,12,14	5 %
Home assignments	4, 9. 13	5 %
Oral Exam	-	-
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

□ Other: …………………

11- List of References

a- Course Notes

Lectures Notes in PDF

b- Books

1. R. Khurmi and J. Gupta, "A Textbook of," ed: Garden, 2015.

c- Recommended Books

1. S Trymbaka Murthy, "Textbook of elements of mechanical engineering" (IK International Pvt Ltd, 2010).
2. https://bu.edu.eg/staff/mohamedabdelghani3-courses

- Course Coordinator: Prof. Ahmed Gaafar **Signature:**

Dr. Mohammed Gamil **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

Competence-Based Learning Outcomes Course Specifications (1st Semester 2020/2021)

University:	Benha University
Faculty:	Faculty of Engineering at Shoubra
Department offering the program:	Mechanical Engineering Department
Department offering the course:	Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: MPE305 Numerical Methods for Engineers **Semester/Year:** First / 2020-2021
Prerequisite Course(s): EMP202 Engineering Mathematics (4) **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

The aim of this course is to identify the various numerical methods used to model and solve engineering equations and systems. Moreover, the application of Linear Algebra in linear systems to solve the ordinary and partial differential equations of energy problems. Finally, to apply the knowledge of these methods to solve practical problems with MATLAB.

3- Course Contents (As indicated in the program Bylaw)

Quantitative Engineering Activities: Analysis and Design Selected Categories of Numerical Methods and Applications – Linearization – Finding Roots of Functions – Solving Systems of Equations – Optimization – Numerical Integration and Differentiation – Selected Additional Applications – MATLAB Example: Fixed Point Iteration – MATLAB Example: Numerical Integration.

4- Program Competencies Served by The Course (A1, B2 and D2)

Level (A) Engineering Competencies

A.1 Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science, and mathematics.

Level (B) Mechanical Engineering Competencies

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.

Level (D) Energy and Sustainable Energy Engineering Competencies

D.2 Apply quantitative methods and computer software relevant to energy and sustainable energy engineering, in order to solve engineering problems.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Identify the fundamental principles of mathematical modeling, roots of equations and curve fitting to formulate mathematical problems with arithmetic operations and find the ways to solve it.
LO2	Recognize the numerical methods to solve non-linear equations, simultaneous linear algebraic equations, eigenvalue problems, using numerical methods.
LO3	Use the finite difference technique to solve the ordinary and partial differential equations.
LO4	Apply numerical differentiation and integration whenever and wherever routine methods are not applicable.
Psychomotor Domain	

LO5	Practice manipulating experimental data by using curve fitting to theoretically describe experimental data with a model (function or equation) and to find the parameters associated with this model.
LO6	Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
LO7	Implement numerical methods in MATLAB to obtain approximate solutions to mathematical problems.
LO8	Write efficient, well-documented MATLAB code and present numerical results in an informative way.
Affective Domain	

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A1	B2	D2
Cognitive Domain			
LO1	■		
LO2	■		
LO3		■	
LO4		■	
Psychomotor Domain			
LO5			■
LO6			■
LO7			■
LO8			■
Affective Domain			

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes							
			LO1 A1-1	LO2 A1-2	LO3 B2-3	LO4 B2-4	LO5 D2-5	LO6 D2-6	LO7 D2-7	LO8 D2-8
W1	Introduction to numerical techniques	5	■							
W2	Roots of equations (Graphical methods)	5	■	■						
W3	Roots of equations (The bisection method and the false-position method)	5	■	■						
W4	Curve fitting (Least-Squares Regression, Interpolation)	5	■				■			
W5	- Linear algebraic equations (Direct Methods) Gauss elimination - Gauss Jordan - LU factorization - MATLAB application	5		■	■			■		
W6	Linear algebraic equations (Indirect Methods) Jacobi Method- Gauss-Seidel- SOR method.	5		■	■			■		
W7	Solution of ordinary differential equations: initial value problems - First-order ODE's	5	■	■	■					

	Euler, midpoint methods									
W8	Solution of ordinary differential equations: initial value problems - First-order ODE's Heun's Runge-Kutta methods - ODE MATLAB application	**5**		■	■			■		
W9	Solution of systems of ODE's and higher-order ODE's.	**5**			■	■		■		
W10	Introduction of partial differential equation solution and boundary value problems.	**5**	■		■			■		
W11	Finite Difference: Elliptic Equations (The Laplace equation), PDE MATLAB application.	**5**		■	■		■		■	
W12	Optimization-one-dimensional unconstrained optimization, multidimensional unconstrained optimization	**5**					■		■	
W13	Numerical Integration and Differentiation	**5**				■		■		
W14	MATLAB applications	**5**							■	■

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●								●	●
	LO2	●				●				●	●
	LO3	●	●			●					
	LO4	●	●		●						
Psychomotor Domain	LO5					●				●	
	LO6	●				●					
	LO7					●					

Learning Outcomes	Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
	Teaching and Learning Methods									
LO8					●			●		

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the timetable declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
		Assessment Methods									
Cognitive Domain	LO1	●			●				●		●
	LO2	●				●					●
	LO3		●		●	●					
	LO4		●			●					●
Psychomotor Domain	LO5	●				●					
	LO6	●			●						
	LO7	●					●				
	LO8						●			●	

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Second Midterm Examination	12	20%
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	5 %
Home assignments	3, 5,10,11	5%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

Lectures Notes in PDF (please click here)
https://fengbuedu-my.sharepoint.com/:f:/g/personal/mohamed_emam_feng_bu_edu_eg/EgyaZawt-GtFovfr_fWCbd0BYOdZVWEdU8vKbcPGzbvqiA?e=mdxiGe

b- Books

1- Numerical Methods, for Mathematics, Science, and Engineering, by John H. Mathews, 2nd Edition, Prentice Hall. 2018
2- R. Hosking, D. Joyce and J. Turner, First Steps in Numerical Analysis, Hodder, and Stoughton

c- Recommended Books

1- Numerical Methods, for Mathematics, Science, and Engineering, by John H. Mathews, 2nd Edition, Prentice Hall.2018

- Course Coordinator: Dr. Khalid Elnagar **Signature:**

Dr. Mohamed Elsayed Mohamed Emam **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: GEN302
Course Title: **Professional Ethics**
Semester/Year: Second / 2020-2021
Specialization: Energy Sustainable Engineering
Credit Hours: 2
Lecture: 2 **Tutorial:** 0 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:

1. Know the career ethics, which related to their future work.

2. 3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

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.9 Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

4- Course Contents

a) **Course Description** (As indicated in program Bylaw)

Overview of professional Ethics for engineers in the different fields and Egyptian benchmarking.

b) **Topics to be Covered weekly & Matrix of Competencies**

Week	Topics	Course Competencies		
		A6	A7	A9
1, 2 & 3	Professional ethics definition	√	√	
4, 5, & 6	Sorts of issues are likely to come up during the career of an OHS professional	√		√
7	1st Midterm Exam			
8, 9 & 10	Resolve of ethical dilemmas			√
11	Professional code of ethics		√	
12	2nd Midterm Exam			
13 & 14	Professional code of ethics		√	√
15	Final Exam			

5- a) Teaching and Learning Methods

Course Competencies		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Level A	A6	√			√					√	
	A7	√									√
	A9	√						√			

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my timetable declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A6	√			√						√
	A7	√							√		
	A9	√					√				√

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Mini project	-	0 %
Home assignments, and Reports	2, 4, 6, 9	10 %
Oral exam	-	0 %
Total	-	**100 %**

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1-

c- Recommended Books

1- -

d- Web Sites

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies		
	A6	A7	A9
Know the career ethics, which related to their future work.	√	√	√

- Course Coordinator: **Signature:**

- Program Coordinator: **Prof.Dr. Ahmed Reda Elshamy** **Signature:**

توصيف مقررات المستوى الثالث

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

- Course Data (Basic Information)

Course Code & Title: ESE 411 Sustainable Energy Utilization **Semester/Year:** Summer/ 2020-2021
Prerequisite Course(s): MPE 201 **Core or Elective:** Core Course
Credit Hours: 2 **Weekly Contact Hours**: **Lecture:** 1 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to provide students with the basic knowledge and fundamentals of sustainable energy utilization. In addition, the course improves the student's skills to reduce negative impacts on the environment, minimize consumption of non-renewable resources, minimize waste and create healthy and productive environments.

3- Course Contents (As indicated in the program Bylaw)

Selected topics of current interest in energy engineering & Sustainable Energy.

4- Program Competences Served by The Course (A3, A6, B2 and D3)

Level (A) Engineering Competences

A.3 Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, economic and environmental aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

A.6 Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

Level (B) Sustainable Energy Competences

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

Level (D) Sustainable Energy Competences (The University of Edinburgh Benchmark)

D3. Carry out preliminary designs of sustainable energy sources including solar, wind, and geothermal energy, and biotechnology and solve their operational problems.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Define the sustainability and the sustainable energy
LO2	Compare the different renewable energy sources
LO3	Understand the principles of sustainable design for buildings
Psychomotor Domain	
LO4	Assess and evaluate the principles, opportunities and resources of the sustainable design
LO5	Employ high-efficiency and renewable energy sources.
Affective Domain	
LO6	Present and share the collected information from research of a selected topic such as the green buildings and LEED.

6- Mapping Learning Outcomes (LO's) with Competences

LO's \ NARS	A3	A6	B2	D3
Cognitive Domain				
LO1	■			
LO2		■		
LO3	■			
Psychomotor Domain				
LO4		■		
LO5			■	■
Affective Domain				
LO6				■

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes					
			LO1	LO2	LO3	LO4	LO5	LO6
W1	-Defining Sustainability and Sustainable Energy -The basic objectives of sustainability -Principles of Sustainable Design for Buildings	**6**	■					
W2	-The Sustainable Design Challenge -Principles, opportunities and Resources of the sustainable design -Optimization of site potential -Optimizing energy use	**6**			■	■		
W3	--Protection and conservation of water -Selection and use of environmentally preferable products -Enhancement of indoor environmental quality -Optimization of operations and maintenance practices	**6**				■		
W4	-Sustainable energy and renewable energy sources, such as: Hydroelectricity, Solar energy, Wind energy, Wave power, Geothermal energy, Bioenergy, Tidal power.	**6**		■			■	
W5	-Employ High-Efficiency and Renewable Energy Sources: Solar water heating, Photovoltaic devices, Biomass, Geothermal heat pumps, and Consider purchasing electricity from renewable and low-pollution sources	**6**		■			■	
W6	-Green Building -Sustainable Site for Green Building	**6**			■			■
W7	-LEED: LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN	**6**						■

b) Additional private study/learning hours expected for students per week is Three hours

8) Teaching and Learning Methods

n g O n	**Teaching and Learning Methods**

		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●	●					●	●
	LO3	●	●	●							
Psychomotor Domain	LO4		●	●			●			●	
	LO5	●		●	●		●		●	●	
Affective Domain	LO6	●		●	●			●	●		●

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as Whatsapp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		**Assessment Methods**									
		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Doma	LO1	●			●				●		●
	LO2	●				●	●		●		●

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
	LO3		●		●	●			●		
Psychomotor Domain	LO4		●			●		●			
	LO5	●			●	●	●			●	
Affective Domain	LO6							●	●	●	●

(Assessment Methods)

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	5	30 %
Second Midterm Examination	7	20%
Final Examination	(As Scheduled)	40 %
Quizzes (2 times)	2, 4	5 %
Home assignments	2,3,5,6,7	5%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

Lectures Notes in PDF

b- Books

1. **Charles F. Kutscher, Jana B. Milford, Frank Kreith, "Principles of Sustainable Energy Systems", CRC Press, 3rd Edition, 2019.**

- Course Coordinator: **Assoc. Prof. Hany Elsawy** **Signature:**

- Program Coordinator: **Prof. Dr. Ahmed Reda** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code: MDP401 **Course Title:** Vibration & dynamics
Semester/Year: Second / 2020-2021 **Core or Elective:** Core Course
Prerequisite Course(s): MDP302 Theory of Machines
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

The aim of this course is to provide students with the basic knowledge and skills to differentiate the different types of vibration systems to identify the application of mechanical vibration and dynamics. Moreover, know the solid foundation and the fundamental principles of mechanical vibration and dynamics. Finally, analysis of free and forced for both undamped and damped vibration of single degree of freedom vibration systems as well as multi-degree freedom system.

3- Course Contents (As indicated in the program Bylaw)

Introduction to Mechanical Vibration: Study and analysis of single and multi-degree of freedom systems (transverse and torsional), Free undamped, Free damped and forced vibration, Whirling of shafts, Design of vibration absorber, Dynamic stresses, Critical speed of shafts, Vibration isolation, Vibration of two degree of freedom systems (free, forced), Vibration absorber, Torsional vibrations (free, forced), Dynamic stresses, Equivalent torsional systems: Geared system, Crank system, Vibration of multi ‹degree of freedom systems (free, forced), Critical speeds of shafts: Shafts with lumped masses, Shafts with distributed masses.

4- Program Competences Served by The Course (A1, A2, B4 and D1)

Level (A) Engineering Competencies

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 objective engineering judgment to draw conclusions.

Level (B) Mechanical Engineering Competencies

B.1 Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of dynamics and vibrations

Level (D) Energy & Sustainable Energy Competencies

D.1 Model, analyze and design and operate of rotary mechanical system according to current developments and technologies.

5- Learning Outcomes (LO’s)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Identify the types of vibration system and describe the basic elements of vibrational systems.
LO2	Apply equivalent energies method to calculate the equivalent springs, damper and mass for single degree of freedom SDF of vibrational systems.

LO3	Select the appropriate position to locate the equivalent spring, damper and mass
Psychomotor Domain	
LO4	Recognise the different method to derive equation of motion of vibrational system
LO5	Demonstrate and practice fundamental laws to derive the equation of motion for free and forced of (damped and undamped) SDF vibrational system.
Affective Domain	
LO6	Analysis the performance of harmonically excited vibration to design safe and stable vibrational systems.
LO7	Describe Multi-degree vibrational system and compute the mass, damping and stiffness matrices, the natural frequencies and the mode shapes.

6- Mapping Learning Outcomes (LO's) with competencies

LO's \ NARS	A1	A2	B1	D1
Cognitive Domain				
LO1	■			
LO2	■			
LO3		■	■	
Psychomotor Domain				
LO4	■			
LO5		■	■	
LO6		■		■
Affective Domain				
LO7			■	

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes						
			LO1	LO2	LO3	LO4	LO5	LO6	LO7
W1	- Quality requirements for the course - Introduction to mechanical vibration	**2**	■						
W2	- Degree of freedom, - Basic elements of mechanical vibrational system	**5**	■	■					
W3	- Springe connected in series and parallel - damper connected in series and parallel, - Lumped masses and equivalent mass	**5**		■	■				
W4	- Equivalent spring elements - Methods to determine equation of motion	**5**		■					
W5	- Free undamped single degree of freedom system - Applying Newton's second law to determine equation of motion - Determine the natural frequency, period of oscillation of simple harmonic motion - Lab. Topic 1: Determining the natural frequency of un-damped free vibrations of a simple pendulum	**5**		■	■				
W6	- Free damped single degree of freedom system - Applying energy and Lagrange method to determine equation of motion - Determine the natural frequency, period of	**5**		■	■				

Week	Topics	Planned Hours	Learning Outcomes						
			LO1	LO2	LO3	LO4	LO5	LO6	LO7
	oscillation of simple harmonic motion. - Lab. Topic 2: Determining the time period and frequency of free undamped vibrations of a spring-dashpot system.								
W7	- Revision on the previous parts - Describe and determine the Logarithmic decrement - **Midterm Exam (30% exam)**	**5**				■			
W8	- Equivalent torsional systems: Geared - Whirling of shafts	**5**				■			
W9	- Vibration isolation - system Torsional vibrations (free, forced) - Lab. Topic 3: Universal vibration system and develop an understanding of free and forced & damped and un-damped vibrations	**5**			■		■		
W10	- Forced damped and undamped single degree of freedom system - Applying fundamental laws to determine equation of motion, natural frequency, period of oscillation of forced vibration system - Lab. Topic 4: Determine the damping ratio(ζ), actual damping co-efficient (C) and critical damping co-efficient(Cc) for free damped vibrations of spring-dashpot system	**5**			■			■	
W11	- Vibration of multi-degree of freedom systems (free, forced) - Determine the mass, stiffness, and damping matrices	**5**							■
W12	- Revision on the previous parts - **Evaluation Exam (20% exam)**	**5**							■
W13	- The natural frequency and mode shape of multi-degree freedom systems - Eigen values of multi-degree freedom systems - Lab. Topic 5: Determine the range of frequency ratio for region of vibration amplification and vibration isolation for forced vibrations	**5**			■				■
W14	- Critical speeds of shafts: Shafts with lumped masses - Shafts with distributed masses.	**5**				■			
W15	**Final term examination**	**2**	■	■	■	■	■	■	■

b) Additional private study/learning hours expected for students per week is three hours

8) Teaching and Learning Methods

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●							
	LO2	●		●						●	●
	LO3	●		●	●	●					●
Psychomotor Domain	LO4	●		●		●	●			●	
	LO5	●		●	●		●	●	●	●	
	LO6		●	●	●	●					
Affective Domain	LO7	●		●	●						●

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as Whatsapp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●									
	LO2	●				●					●
	LO3	●			●	●			●		●
Psychomotor Domain	LO4		●					●	●		
	LO5	●			●	●				●	
	LO6	●							●		
Affective Domain	LO7	●			●				●		●

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Second Midterm Examination	12	20 %
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	2 %
Home assignments	3,4,5,8,10,11	5 %
Lab	5, 8	3 %
Total		**100** %

10- Facilities

The following facilities are needed for this course:

■	Classroom	□	Smart Board	□	Computer with software
□	Lecture Hall	■	White Board	■	MIS system
□	Sound and Microphone	■	Data Show	■	Internet Access
□	Other: …………………				

11- List of References

a- Course Notes

Lectures Notes in PDF
https://bu.edu.eg/staff/mohamedsokar3-courses (Last access: Sep 1st, 2020)

b- Books

1. Singiresu S. Rao, Mechanical Vibrations", Prentice Hall, 5th edition., 2011
2. Francisco Beltran-Carbajal, Vibration Analysis and Control in Mechanical Structures and Wind Energy Conversion Systems, InTech open, 2018.
3. Hamid Reze karimi, Vibration Control and Actuation of Large-Scale Systems, AP, 2020

c- Recommended Books

1. Derek Norfield, Practical Balancing of Rotating Machinery, Elsevier, 2016.

- Course Coordinator: Dr. Mohamed Saber Sokar **Signature:** M. Saber Sokar

- Program Coordinator: Prof. dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: EPM401 Electrical Machines **Semester/Year: First** / 2020-2021
Prerequisite Course(s): EPM301 Electrical Engineering II **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

The aim of this course is to provide students with the basics knowledge of DC machines, AC machines, and transformer. Moreover, employ the methods of speed control of DC motors and induction motor. Finally, determine the performance and efficiency of different electrical machines.

3- Course Contents (As indicated in the program Bylaw)

D.C. Generators (Types and Characteristics), Open Circuit Characteristic of a D.C. Generator, Characteristics of a Separately Excited D.C. Generator, Voltage Build-Up in a Self-Excited Generator, Critical Field Resistance for a Shunt Generator, Critical Resistance for a Series Generator, Characteristics of Series Generator, Characteristics of a Shunt Generator, Critical External Resistance for Shunt Generator, Critical Speed (NC), Compound Generator Characteristics, Voltage Regulation, Parallel Operation of D.C. Generators, D.C. Motors, Back E.M.F., Voltage and power equations of D.C. Motor, Condition For Maximum Power, Types of D.C. Motors, Armature and shaft Torque of D.C. Motor, Brake Horse Power, Speed of a D.C. Motor, Efficiency of a D.C. Motor, Speed Control of D.C. Motors, Transformer, Theory of an Ideal Transformer, Practical Transformer, Practical Transformer on Load, Equivalent circuit, Voltage Regulation, Transformer Tests, Efficiency of a Transformer, Condition for Maximum Efficiency, All-Day Efficiency, Types of Transformers, Cooling of Transformers, Autotransformer, Parallel Operation of Single-Phase Transformers, Three-Phase Transformer. Three-phase synchronous machines: types, characteristics phasor diagram, power, torque, voltage regulation and efficiency, modes of operation. Three-phase induction machines: theory and principles, equivalent circuit and phasor diagram, characteristics, power, torque, efficiency, stability and dynamic behavior, modes of operation.

4- Program Competencies Served by The Course (A.2, A.3 and B.3)

Level (A) Engineering Competencies

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.

Level (B) Mechanical Engineering Competencies

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.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Recognize various types of electrical machines
LO2	Analyze the equivalent circuits of different electrical machines.
LO3	Determine the performance and efficiency of the electrical machines.
Psychomotor Domain	
LO4	Execute the speed and torque control of Motors
LO5	Perform the several tests of the machines to determine the machine parameters
Affective Domain	
LO6	Perform some applications using Lab.

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A2	A3	B3
Cognitive Domain			
LO1			■
LO2			■
LO3		■	
Psychomotor Domain			
LO4		■	
LO5	■		
Affective Domain			
LO6	■		

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes					
			LO1 B3-1	LO2 B3-2	LO3 A3-3	LO4 A3-4	LO5 A2-5	LO6 A2-6
W1	• DC Machines Construction, • Magnetic circuit and Windings, Armature Reaction and commutation, • **Lab: Simulation Videos for the construction of DC machines and the operation of armature reaction.**	**2** **3**	■					
W2	• Principles and Types of DC Machines, • DC Machines Applications, E.M.F. Equation, • **Lab: No-load and rated load Characteristics of a DC generator.**	**2** **3**	■	■				
W3	• Torque Equation of DC	**2**			■			

	machines, Modeling and Characteristic of DC machines. • **Lab: No-load and rated load Characteristics of a DC motor.**	**3**						
W4	• Energy Losses, Power flow, Efficiency, Speed control and Direction control of DC machines. • **Lab: performance of a DC motor at different speed.**	**2** **3**			■			
W5	• What is a transformer – Its construction – Its classifications, • Principle of operation, Ideal transformer, Equivalent circuit of 1-φ real transformer, • **Lab: Simulation Videos for the construction of a transformer**	**2** **3**		■	■			
W6	• Performance characteristics and voltage regulation of single-phase transformer • Transformer losses and Efficiency, • **Performance ch/s of a single-phase transformer.**	**2** **3**		■	■			
W7	• Tests of Transformer, Auto transformer • **Lab: Performance ch/s of an auto- transformer.**	**2** **3**					■	
W8	• 3-φ transformers • Parallel operation of 3-φ transformers, Load sharing of 3-φ transformers • **Lab: Performance ch/s of a three-phase transformer.**	**2** **3**					■	
W9	• Three-phase synchronous machines: types, characteristics phasor diagram, • **Lab: Simulation Videos for the construction of a synchronous machines**	**2** **3**					■	
W10	• power, torque, voltage regulation and efficiency, • **Lab: Performance ch/s of a**	**2**				■		

	synchronous generator.	**3**						
W11	• Modes of operation. • **Lab: Performance ch/s of synchronous machine at different modes.**	2 **3**				■		
W12	• Three-phase induction machines: theory and principles, equivalent circuit and phasor diagram, • **Lab: Simulation Videos for the construction of a Three-phase induction machines.**	2 **3**	■					■
W13	• Characteristics, power, torque, efficiency, • **Lab: Performance ch/s of an induction motor.**	2 **3**						■
W14	• Stability and dynamic behavior, modes of operation • **Lab: Performance ch/s of induction machine at different modes.**	2 **3**						■

b) Additional private study/learning hours expected for students per week is Three hours

8) Teaching and Learning Methods

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●			●				●
	LO2	●		●	●						●
	LO3	●		●				●			
Psychomotor Domain	LO4	●				●			●		
	LO5	●				●					

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Affective Domain	LO6			●		●			●		

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the timetable declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●			●			●			●
	LO2	●				●			●		●
	LO3	●			●						
Psychomotor Domain	LO4	●							●		
	LO5	●							●		
Affective Domain	LO6	●		●				●		●	

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Research and reports discussion	12	20%
Final Examination	(As Scheduled)	40 %
In class questions	All weeks	10 %
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1- Sahdev, S. K, “Electrical machines”, Cambridge University Press, Year: 2018.
2- Vibhav Kumar Sachan, “Electrical Machines: Principles, Designs & Applications”, Smt. Jay Devi Sachan Memorial Publication House, Year: 2019.

c- Recommended Books

1- Electrical Machine Design, SAY, 2005.

d- Web Sites

1- www.electrical.edu.eg

- Course Coordinator: **Prof. Dr. Mhmoud Al-ahmar** **Signature**

Dr. Islam Mohamed **Signature:**

- Program Coordinator: **Prof. Dr. Ahmed Reda Elshamy** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: ESE402
Course Title: Fuel and Advanced Combustion
Semester/Level: Second / Three
Specialization: Mechanical Engineering
Credit Hours: 3
Lecture: 2 **Tutorial:** 0 **Lab:** 3

2- Course Aims

The aim of this course to make student familiar with the fundamental operating principles and practices used in internal combustion engines. Solve problems related to old and up to date internal combustion engines through the achievement of the following objectives.

3- Course Content

Basic principles of combustion highlighting the role of chemical kinetics, fluid mechanics, and molecular transport in determining the structure of flames. Students will become familiar with laminar and turbulent combustion of gaseous and liquid fuels including the formation of pollutants. They will also be briefly introduced to various applications such as internal combustion engines, gas turbines, furnaces, and fires. This course will cover equilibrium compositions, flammability limits, simple chemically reacting systems, detailed chemical kinetics, and the basic theory underlying laminar and turbulent combustion for both premixed and non-premixed cases. An introduction to droplet combustion, the concept of mixture fraction for non-premixed flames, combustion in engines and gas turbines as well as the formation of pollutants. Fire ignition, growth and spread will also be covered with respect to safety in buildings including the hazards related to the formation of smoke and toxic products.

4- Program Competencies Served by The Course (A7, A10 and B1)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1 Identify, formulate, and solve complex engineering problems by applying Engineering fundamentals, basic science, and mathematics.

Level (B) Mechanical/ Electrical Power Engineering Competencies

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

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.

Level (D) Sustainable Energy Competencies (University of Edinburgh Competencies)

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

D.1 Model, Analyze, design and operate internal combustion engines, pumps, turbines, and compressors according to current developments and technologies

D.4 Work in a variety of energy systems operations, maintenance, and overhaul.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Recognize fuels type and properties, types of engines, flame's structure parts
LO2	Discuss the effect of different characteristics of fuels and their effect on combustion process
LO3	Distinguish the controlled parameters of power cycles and air pollution.
Psychomotor Domain	
LO4	Select proper operating fuel for combustion system.
LO5	Estimate the engines performance at different operating conditions
LO6	Check the value of different operating parameters of combustion and engines.
Affective Domain	
LO7	Describe combustion phenomena in different application
LO8	Analyze and discuss combustion process performance

6- Mapping Learning Outcomes (LO's) with Competencies

LO's / NARS	A1	D1	D4
LO1	■		
LO2			■
LO3			■
LO4		■	
LO5		■	
LO6		■	
LO7	■		
LO8		■	

7- lecture Plan

a- Topics to be Covered weekly & Learning Outcomes

Week	Topics	Planned Hours	Learning Outcomes							
			LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8
Lectures										
1	Structure of flames	2	■						■	
2 & 3	Laminar and turbulent combustion of gaseous and liquid fuels	2		■		■				
4	Internal combustion engines	2		■			■			
5	Gas turbines	2			■					
6	Furnaces and fires	2								

7	SI engine combustion chambers	2				■			■	
9	Fuel/Air ratio requirements	2								
10	Carburetion and Carburetors	2								
11	Combustion in CI engines	2				■			■	■
13	IC engines testing and performance	2						■		
14	Air pollution from IC Engines and its control	2			■					
Lab (Virtual Experiments) E1-E3: https://vcal-iitk.vlabs.ac.in/list.html										
E.1	Measurement of laminar burning velocity	3	■						■	
E.2	Characterization of laminar premixed flame using chemiluminescence sensor	3	■						■	
E.3	Observations on flame height of a laminar jet diffusion flame	3	■						■	
E.4	PV Diagram of a SI Engine http://vlabs.iitkgp.ernet.in/rtvlas/exp1/index.html	3					■	■		■
E.5	Load Test on a SI Engine http://vlabs.iitkgp.ernet.in/rtvlas/exp3/index.html	3					■	■		■
E.6	Mechanical Efficiency of a SI Engine http://vlabs.iitkgp.ernet.in/rtvlas/exp4/index.html	3					■	■		■
E.7	Determination of Cylinder Mean Effective Pressure http://vlabs.iitkgp.ernet.in/rtvlas/exp5/index.html	3					■	■		■

8- Teaching and Learning Methods

8-a Teaching and Learning Methods

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory/Virtual lab.	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●		●					●
	LO2	●		●						●	●
	LO3	●	●	●							
Psychomotor Domain	LO4		●	●			●			●	
	LO5	●		●	●	●	●	●	●	●	
	LO6		●	●	●	●					
Affective Domain	LO7	●		●	●	●					●
	LO8		●	●		●				●	

Student Academic Counseling and Support

- in addition to the teaching and learning methods assigned throughout the course (section 5a), extra office hours will be provided to deal with the academic needs of students.

9- Assessment Methods

a) Student Assessment Methods

n g O n	Assessment Methods

Domain	LO	Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Question
Cognitive Domain	LO1	●			●				●		●
	LO2	●				●			●		●
	LO3		●		●	●			●		
Psychomotor Domain	LO4		●					●			
	LO5	●			●	●	●			●	
	LO6	●							●		
Affective Domain	LO7	●			●						●
	LO8	●							●		

b- Assessment Schedule and Weight

Assessment	Week	Weight
Assignments	3,5,11,13	10%
midterm Examination	8	30%
Quizzes	5,13	10%
Final exam	(As Scheduled)	40%
Oral exam/ Design Project	7, 14	10%
Total	15	**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

11- List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Engineering Fundamentals of the Internal Combustion Engine. Willard W Pulkrabek, 2004.
2- Introduction to Internal Combustion Engines, 4th edition, Richard Stone, 2012.

c- Recommended Books

3- Internal Combustion Engines, Colin R. Ferguson, 2nd edition, 2001.

d- Web Sites

1- https://www.nrel.gov/transportation/fuels-combustion-research.html

- Course Coordinator: Prof. Dr Ramadan Yousef Sakar Signature:

Prof. Dr Ahmed Attia Abd Elatief Signature:

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy Signature:

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code: ESE410 **Course Title:** Elective (1) Hydraulic &pneumatic systems
Semester/Year: First / 2020-2021 **Core or Elective:** Core Course
Prerequisite Course(s): MDP302 Theory of Machines
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to provide students with the basic knowledge and skills to recognize the modern industrial application of fluid power system and standard symbols different types of hydraulic components. Moreover, introduce different types of pumps, actuators and valves as well as accessories used in hydraulic and pneumatic systems. Finally, design, build, and investigate fluid power circuits, examine the characteristics of components and apply troubleshooting method for fluid power components and systems.

3- Course Contents (As indicated in the program Bylaw)

This course introduces the basic components and functions of hydraulic and pneumatic systems. Topics include standard symbols, pumps, control valves, control assemblies, actuators, FRL, maintenance procedures, and switching and control devices. Upon completion, students should be able to understand the operation of a fluid power system, including design, application, and troubleshooting.

4- Program Competences Served by The Course (A1, A4, B1, B4 and D4)

Level (A) Engineering Competencies

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.9 Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

Level (B) Mechanical Engineering Competencies

B.1 Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of 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.

Level (D) Energy & Sustainable Energy Competencies

D.1 Model, design and operate, pumps and compressors according to current developments and technolgies.

D.4 Work in a variety of energy systems operations, maintenance and overhaul.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Identify the notation and symbols of pneumatic and hydraulic components.
LO2	Read and interpret pneumatic and hydraulic fluid power diagrams.
Psychomotor Domain	
LO3	Understand the construction, function, characteristics and operation of fluid power components, equipment and units.
LO4	Design, and construct of pneumatic and hydraulic circuits applied in practical equipment.
Affective Domain	
LO5	evaluate and justify industrial applications of pneumatics and hydraulics
LO6	Understand the general safety rules, perform basic maintenance and troubleshooting techniques for hydraulic and pneumatic systems.

6- Mapping Learning Outcomes (LO's) with competencies

LO's / NARS	A3	A4	A9	B1	B2	D1	D4
Cognitive Domain							
LO1		■					
LO2		■			■		
Psychomotor Domain							
LO3	■					■	
LO4	■			■			
Affective Domain							
LO5						■	■
LO6			■		■		■

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes					
			LO1	LO2	LO3	LO4	LO5	LO6
W1	- Quality requirements for the course - Introduction to fluid power systems	**2**	■					
W2	- Standard fluid power symbols - The function and operation of a given fluid power circuit diagram.	**4**	■	■				
W3	- Types of positive displacement pumps	**4**			■			
W4	- Characteristic, performance and control of positive displacement pumps.	**4**			■	■		
W5	- Types of fluid power actuators (cylinders and motors)	**4**			■	■		
W6	- Directional control valves (types and operations)	**4**			■	■		
W7	- Revision on the previous parts - **Midterm Exam (30% exam)**	**4**		■				
W8	- Flow control valves (types and operations)	**4**			■	■		

Week	Topics	Planned Hours	Learning Outcomes					
			LO1	LO2	LO3	LO4	LO5	LO6
W9	- Pressure control valves (types and operations) Part I	**4**			■	■		
W10	- Pressure control valves (types and operations) Part II	**4**			■	■		
W11	- Accessories of pneumatic and hydraulic systems (Filters, FRL, Tanks, … etc.)	**4**			■	■		
W12	- Revision on the previous parts - Types of compressors and their performance. - **Evaluation Exam (20% exam)**	**4**				■		
W13	- Calculation and design of fluid power circuits	**4**				■	■	
W14	- Investigation, maintenance and troubleshooting of fluid power systems	**4**						■
W15	**Final term examination**	**2**	■	■	■	■	■	■

b) Additional private study/learning hours expected for students per week is three hours

8) Teaching and Learning Methods

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●	●						●
Psychomotor Domain	LO3	●		●		●	●			●	
	LO4	●		●	●		●	●	●	●	
Affective Domain	LO5		●	●	●	●					
	LO6	●		●	●						●

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.

- Social media communication such as Whatsapp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Doma	LO1	●							●		●
	LO2	●			●	●			●		●
Psychomotor Domain	LO3	●				●			●		●
	LO4	●			●				●		●
Affective Domain	LO5		●			●			●	●	●
	LO6	●		●	●			●			●

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Second Midterm Examination	12	20 %
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	5 %
Home assignments	2,3,4,5,8,10,11	5 %
Lab	-	0 %
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	□ Computer with software
□ Lecture Hall	■ White Board	■ MIS system
□ Sound and Microphone	■ Data Show	■ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

Lectures Notes in PDF
https://bu.edu.eg/staff/mohamedsokar3-courses (Last access: Sep 1st, 2020)

b- Books

1. Andrew Parr, Hydraulics and Pneumatics: A Technician's and Engineer's Guide, Elsevier Science & Technology, 3rd edition., 2011
2. Anthony Esposito, Fluid Power With Applications, Pearson (2014)
3. Peter Chapple, Principles of Hydraulic System Design, coxmoor publishing company, 1st ed, 2020

c- Recommended Books

1. Anthony Esposito, Fluid Power With Applications, Pearson (2014)

- Course Coordinator: Dr. Mohamed Saber Sokar **Signature:** M. Saber Sokar

- Program Coordinator: Prof. dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: GEN401 **Course Title:** **Legislations, Contract and Procurement Management**
Semester/Year: First / 2020-2021 **Specialization:** Energy Sustainable Engineering
Credit Hours: 2 **Lecture:** 2 **Tutorial:** 0 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:

1. Provide students with personal skills to be able to deal with legislations and contracts at their career.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.6 Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

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.

4- Course Contents

a) **Course Description** (As indicated in program Bylaw)

This course is an introduction to the legislations and contract concept, contract elements, and types of contracts, procurement management and supply chains.

b) Topics to be Covered weekly & Matrix of Competencies.

Week	Topics	Course Competencies		
		A6	A9	A10
1, 2, 3 & 4	Legislation Management	√	√	
5 & 6	Contracts Management	√	√	
7	1st Midterm Exam			
7 & 8	Contracts Management	√		
9, 10, & 11	Procurement Management	√		
12	1st Midterm Exam			
13 & 14	Procurement Management		√	
15	Final Exam			

5- a) Teaching and Learning Methods

Course Competencies		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Level A	A6	√			√						
	A9										√
	A10	√						√		√	

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my timetable declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A6	√			√						√
	A9			√				√			
	A10								√	√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Mini project	-	0 %
Home assignments, and Reports	2, 4, 6, 9	10%
Oral exam	-	0 %
Total	-	**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1- c- Recommended Books

d- Web Sites

1-

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies		
	A6	A9	A10
Provide students with personal skills to be able to deal with legislations and contracts at their career.	√	√	√

- Course Coordinator:

Signature:

- Program Coordinator: **Prof.Dr. Ahmed Reda Elshamy** **Signature:**

University:	Benha University
Faculty:	Faculty of Engineering at Shoubra
Department offering the program:	Mechanical Engineering Department
Program offering the course:	Energy and Sustainable Energy Engineering Department

1- Course Data

Course Code & Title: ESE403 Energy Conservation Management **semester/Year: 1st / 2020-2021**
Prerequisite Course(s): ESE401 **Core or Elective:** Compulsory
Total Credit Hours: 3 **Lecture**: 2 Tutorial**:** 2 **Laboratory:** 0

2- Course Aims

2.1 **The aim of this course is to provide** students with Knowledge and skills for the energy conservation with different methods and the energy conservation with different methods to save energy

3- Course Contents (As indicated in the program Bylaw)

This course deals with the Energy management, Fuels and utilities, Electricity, Natural gas and Fuel oil, Steam and Fuel comparison methods, Energy accounting, Calculating the Energy Use Index, Analyzing consumption & evaluating, Energy Conservation Opportunities, Common measures, Basic Test Instruments, Operation and Maintenance, and Energy Management Planning/Strategies & Identify operation, maintenance, and conservation priorities.

4- Program Competences Served by the Course (A, B, D)

Level (A) Engineering Competencies

a.1- Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics. **[A.1]**

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.2]**

Level (B) Mechanical Engineering Competencies

b.1- 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.2]**

Level (D) Mechanical Power Engineering Competencies

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

d.1- Model, Analyze, design and operate internal combustion engines, pumps, turbines, and compressors according to current developments and technologies. **[D.1]**

d.2- Work in a variety of energy systems operations, maintenance and overhaul. **[D.4]**

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Compare between the energy conservation systems with different methods.
LO2	Analyze the energy conservation systems and the different methods to save energy
Psychomotor Domain	
LO3	Draw block diagram for the typical energy system of plant level utilities.
LO4	Construct the energy management cycle
LO5	Use data collection format for boiler performance assessment.
LO6	Calculate the boiler efficiency by direct and indirect methods.
LO7	Determine the furnace efficiency by direct and indirect methods.
LO8	Measure the operating conditions inside the boiler and furnace.

6- Mapping Learning Outcomes (LO's) with Competences

LO's / NARS	$A_{1,2}$	B2	$D_{1,4}$
LO1	■		
LO2	■		
LO3		■	
LO4		■	
LO5		■	
LO6			■
LO7			■
LO8			■

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Cred. Hours	Learning Outcomes							
			LO1 A1	LO2 A2	LO3 B2	LO4 B2	LO5 B2	LO6 D4	LO7 D1	LO8 D1
1	Energy management.	3	√	√						
2	Fuels and utilities	3		√						
3	Electricity, Natural gas and Fuel oil	3			√	√				
4	Steam -Fuel comparison methods	3				√				
5	Energy accounting	3					√			
6	Calculating the Energy Use Index	3					√			
7	Analyzing consumption & evaluating	3						√		
8	Energy Conservation Opportunities	3						√		
9	Common measures	3								√
10	Basic Test Instruments	3						√		√
11	Operation and Maintenance	3								√

12	Energy Management Planning/Strategies	3								√
13	Energy Management Identify operation	3							√	√
14	Energy Management maintenance and conservation priorities	3							√	√

b) Additional private study/learning hours expected for students per week FIVE hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	
	LO2		●	●						●	
Psychomotor Domain	LO3	●		●							●
	LO4	●	●	●							
	LO5	●		●	●						
	LO6	●		●	●						
	LO7	●		●	●						●
	LO8	●		●							

Student Academic Counseling and Support

- Students are directed to contact teaching stafffor academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as Whatsapp groups, Microsoft teams chat, … etc
- Collaborate effectively within multidisciplinary team

9- Student Assessment

a) Student Assessment Methods

Domain	Learning Outcomes	Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●		●	●				●		
	LO2	●		●			●				●
Psychomotor Domain	LO3	●			●	●					●
	LO4	●				●					
	LO5	●			●						
	LO6	●				●					●
	LO7	●			●		●				
	LO8	●							●		●

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination	7	30 %
Research & report	12	20 %
Semester work	weekly	10 %
Final Term Exam.	15	40 %
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	□ Computer with software
□ Lecture Hall	□ White Board	□ MIS system
■ Sound and Microphone	■ Data Show	□ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

Lectures Notes in PDF

b- Books

1. A. Sethuraman, Practical Guide to Energy Conservation & Management, Notion Press, 2020.
2. Anil Kumar, Om Prakash, Prashant Singh Chauhan, Samsher, Energy Management: Conservation and Audits, 1st Edition, Taylor and Francis, 2020.
3. S. S. Thipse, "Energy Conservation and Management", Alpha Science, January 30, 2014

c- Recommended Books

1. G. Kaur, PEM Fuel Cells: Fundamentals, Advanced Technologies, and Practical Application, 1st Edition, Elsevier Inc, 2021.
2. R.G. A.A.B. Yurtcan, Direct Liquid Fuel Cells: Fundamentals, Advances and Future, 1st Edition, Kindle Edition, Academic Press, 2020.
3. Arun Solanki, Anand Nayyar, "Green Building Management and Smart Automation", Engineering Science Reference, Year: 2019

d- Web Sites

http://www.bu.edu.eg/staff/

Course Coordinator: Prof. Dr. Ali A. AbdElaziz Signature:
Prof. Dr. Reda Ibrahim Afify Signature:

Program Coordinator:
Prof. Ahmed Reda Elshamy Signature:

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

- Course Data (Basic Information)

Course Code & Title: MPE401 Applied Heat and Mass Transfer **Semester/Year:** Second/ 2020-2021
Prerequisite Course(s): MPE301 Heat and Mass Transfer **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

The aim of this course is to provide students with the fundamentals and applications of heat transfer from extended surfaces “fins”, boiling & condensation heat transfer and mass transfer. Moreover, provide the basic principles of radiations heat transfer and its applications. In addition, the course enables the students to solve the heat exchanger heat transfer problems, as well solving the mass transfer problems.

3- Course Contents (As indicated in the program Bylaw)

Fourier conduction equation, cylindrical and spherical surfaces, application on simple and compound walls. Critical radius of insulation. Extended surfaces (fins), Unsteady conduction for lumped and un-lumped systems. General conduction equations for two and three dimensional for steady and unsteady cases. Study of parameters affecting convection, relations for free and forced convection for inner and outer surfaces. Heat exchangers. Plank's theory for thermal radiation, view factors and surface properties to identify surface resistance. Draw equivalent electric circuits. Radiation from gases and emissivity charts for H_2O and CO_2. Mass transfer.

4- Program Competences Served by The Course (A1, A2, A10 and B1)

Level (A) Engineering Competences

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.10 Acquire and apply new knowledge; and practice self, lifelong and other learning strategies.

Level (B) Sustainable Energy Competences

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

5- Learning Outcomes (LO’s)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Define the extended surfaces “fins”, and different modes of boiling & condensation heat transfer.
LO2	Compare the different types of heat exchangers.
LO3	Understand the physical mechanism of mass transfer and the radiation exchanger between surfaces.
Psychomotor Domain	
LO4	Assess and evaluate the fins and heat exchangers performance.

LO5	Solve engineering problems based on heat transfer by conduction, convection and radiation, as well mass transfer problems.
LO6	Select appropriate solutions for engineering heat transfer problems based on analytical thinking.
Affective Domain	
LO7	Present and share the collected information from research of a selected topic such as the heat exchanger types & Extended surfaces "Fins" types and their applications.
LO8	Analyze the different modes of boiling and condensation heat transfer

6- Mapping Learning Outcomes (LO's) with Competences

NARS / LO's	A1	A2	A3	B1
Cognitive Domain				
LO1	■			
LO2		■		
LO3	■			
Psychomotor Domain				
LO4				■
LO5	■			
LO6		■		
Affective Domain				
LO7			■	
LO8		■		

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes							
			LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8
W1	-Heat transfer from Extended Surfaces "Fins", -Different Boundary Condition at the Fin Tip. -Lab: Heat transfer from The Fin Experiment	**5**	■			■	■			
W2	-Fin Configuration, Fin Efficiency, Fin Effectiveness, Fin Charts. -Lab: Fin Effectiveness Experiment	**5**	■			■		■	■	
W3	-Introduction to Boiling Heat transfer. -Pool Boiling Heat Transfer -Lab: Pool Boiling Experiment	**5**	■							■
W4	-Flow Boiling Heat Transfer -Lab: Flow Boiling Experiment	**5**	■				■			■
W5	-Introduction to Condensation Heat transfer. -Film Condensation Heat Transfer -Lab: Film Condensation Experiment	**5**	■							■
W6	-Dropwise Condensation Heat Transfer -Lab: Dropwise Condensation Experiment	**5**	■				■			■
W7	- Introduction to Heat Exchangers and their applications. -Heat Exchangers Classifications. -Lab: Heat Exchanger Experiment 1	**5**		■		■		■	■	
W8	-The Overall Heat Transfer Coefficient -Heat Exchanger Analysis: Use of the Log Mean Temperature Difference	**5**		■		■	■			

Week	Topics	Planned Hours	Learning Outcomes							
			LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8
	-Lab: Heat Exchanger Experiment 2									
W9	-Heat Exchanger Analysis: Use of The Effectiveness–NTU Method -Lab: Heat Exchanger Experiment 3	**5**		■		■				
W10	-Introduction to Radiation and Fundamental Concepts. -Radiation processes and properties. -Plank's theory for thermal radiation -Lab: Radiation Experiment 1	**5**			■		■			
W11	-Emission from Real Surfaces. -Absorption, Reflection, and Transmission by Real Surfaces -Lab: Radiation Experiment 2	**5**			■			■		
W12	-Radiation exchange between surfaces. -View factors and surface properties -Lab: Radiation Experiment 3	**5**			■		■			
W13	-Mass Transfer -Mass Diffusion Equation -Lab: Mass Transfer Experiment 1	**5**			■		■	■		
W14	-Mass Transfer in Nonstationary Media -Lab: Mass Transfer Experiment 2	**5**			■		■			

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face	Online Lectures	Tutorial /	Group	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●	●	●				●	●
	LO3	●	●	●							
Psychomotor Domain	LO4		●	●			●			●	
	LO5	●		●	●	●	●		●	●	
	LO6		●	●	●						
Affective Domain	LO7	●		●	●			●	●		●
	LO8		●	●						●	

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as Whatsapp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●			●				●		●
	LO2	●				●	●		●		●
	LO3		●		●	●			●		
Psychomotor Domain	LO4		●			●		●			
	LO5	●			●	●	●			●	
	LO6	●							●		
Affective Domain	LO7							●	●	●	●
	LO8	●			●				●		

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	8	30 %
Second Midterm Examination	12	20%
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	5 %
Home assignments	3,4,5,8,10,11	5%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	□ Computer with software
□ Lecture Hall	■ White Board	■ MIS system
□ Sound and Microphone	■ Data Show	■ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

Lectures Notes in PDF

b- Books

1. **Yunus A. Cengel and Afshin J. Ghajar, "Heat and Mass Transfer: Fundamentals and Applications", McGraw-Hill, 6th edition, 2020**
2. **Yunus A. Cengel, "Heat Transfer: A Practical Approach", McGraw-Hill, 3rd Edition, 2007.**
3. **Kreith, F. and Black, W. Z., Basic Heat Transfer, Harper and Row Publishers, New York (2000).**

c- Recommended Books

1. **Frank P. Incropera, David P. Dewitt. "Fundamentals of Heat and Mass Transfer", 7th Edition, 2011.**

- Course Coordinator:	**Prof. Dr. Ahmed Reda**	**Signature:**
	Assoc. Prof. Hany Elsawy	**Signature:**
- Program Coordinator:	**Prof. Dr. Ahmed Reda**	**Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: ESE404 Bioenergy **Semester/Year:** Second/2020-2021
Prerequisite Course(s): EMP311 Organic Chemistry **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours: Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

This course aims to provide students with different resources of bioenergy, and the technological ways to convert any biomass to a suitable biofuel, and the energetic and economic factors related to this conversion.

3- Course Contents (As indicated in the program Bylaw)

Introduction: renewable and non-renewable energy advantages and disadvantages of fossil fuels. Bioenergy resources: origin, types, production, characteristic, cost, applications. Different biomass resources: agricultural energy crops, woody & nonwoody crops and animal waste. Technologies for producing biofuels such as ethanol, biodiesel, biogas, and syngas. Pyrolysis of fibrous biomass. Costs, uses and markets for biofuels. Technology and Applications (Thermal, Chemical and Biochemical Conversion). Technologies for producing biopower, including combustion and/or gasification – steam or gas turbines, fuel cells, and anaerobic digestion of manures to produce methane.

4- Program Competences Served by the Course (A1, A3, A5, A10, D3)

Level (A) Engineering Competencies

Upon completing this course, students will be able to:

A.1 Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

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.5 Practice research techniques and methods of investigation as an inherent part of learning.

A.10 Acquire and apply new knowledge, and practice self, lifelong and other learning strategies.

Level (D) University of Edinburgh Competencies

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

D.3 Carry out preliminary designs of sustainable energy sources including bioenergy and solve their operational problems.

5- Learning Outcomes (LO's)

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

Cognitive Domain	
LO1	differentiate between non-renewable and renewable energy recourses to be able to solve the reduction in energy.
LO2	define different types of biomass, their chemical structure to determine their ability to produce energy.
LO3	recognize the types, advantages, disadvantages, and applications of different biofuels to be able to solve any related energetic problems.
LO4	design a suitable setup of synthesis of biodiesel, bioalcohol, and biogas from different biomass to maximize the use of any available waste.
LO5	Search about the different types of digestive systems used in biogas production to learn how to select a suitable one based on the environmental and the field conditions.
LO6	understand the processes and the engineering products related to the syngas biofuel in order to utilize these information in the related discipline.
LO7	differentiate between thermal, chemical, and biological conversion in the biofuel production to select a suitable conversion process to a suitable biofuel and applications
LO8	relate the cost of biofuel production to its benefits, and energetic values to know how to produce cost-effective solutions in this area.

6- Mapping Learning Outcomes (LO's) with Competences

LO's / NARS	A1	A3	A5	A10	D3
Cognitive Domain					
LO1	■				
LO2	■				
LO3		■			
LO4					■
LO5			■		
LO6				■	
LO7					■
LO8		■			

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes							
			LO1 A1-1	LO2 A1-2	LO3 A3-3	LO4 D3-4	LO5 A5-5	LO6 A10-6	LO7 D3-7	LO8 A3-8
W1	- Introduction to the course: renewable and non-renewable energy resources. - showing the quality assurance related to the course	4	■							■
W2	fossil fuels (origin, uses and disadvantages).	4	■							■
W3	- Types of Bio-resources. Biomass: Origin, types, uses, advantages, and disadvantages.	4	■	■						
W4	Agricultural energy crops, woody & nonwoody crops, crop, and animal waste	4	■	■						
W5	Biofuels: generations, types, advantages, disadvantages	4			■				■	
W6	Technologies for producing biofuels: biodiesel and their characteristics and applications	4			■	■			■	■
W7	Technologies for producing biofuels: bioalcohol and their characteristics and applications	4			■		■		■	■
W8	1st Midterm Exam									
W9	Biogas (anaerobic digestion of manures to produce methane).	4					■		■	■
W10	Syngas, technological conversion (Thermal, Chemical and Biological Conversion)	4						■	■	■
W11	Technologies for producing bio power, including combustion and/or gasification	4			■			■	■	■
W12	Steam or gas turbines, fuel cells	4			■			■	■	■
W13	Energy values calculation for biomass conversion	4			■			■		■
W14	Economic conversion of biomass to biofuel	4			■				■	■

a) Additional private study/learning hours expected for students per week is FOUR hours in which the students will fulfill the required assignments, and watching the suggested videos that related to the course.

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●			●		●				
	LO2		●	●	●			●			
	LO3	●			●			●		●	
	LO4	●				●			●		
	LO5	●							●		
	LO6		●								
	LO7		●		●			●		●	●
	LO8	●		●	●		●	●		●	●

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Course coordinator will be available for students for two hours a week as indicated on the posted timetable declared for students from the beginning of the semester.
- In addition to the face to face contact (office hours), the course coordinators contact the student via other available online tools such as WhatsApp class group, Microsoft teams, and the university platform.
- There are no disable students in this course, so no special support is needed.

9- Students Assessment

a- Student Assessment Methods

Learning Outcomes		Written Exams (MCQ)	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1		●			●					●
	LO2		●								
	LO3		●								●
	LO4					●			●		
	LO5	●							●		●
	LO6	●						●			
	LO7	●					●	●	●		●
	LO8	●					●	●	●		

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	8	20 %
Report & Presentation	11, 13, 14	10%
Oral discussions (class/online)/attendance	(As Scheduled)	10%
Home assignments, and Reports	6, 10	20%
Final Examination	15	40 %
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- □ MIS system
- ■ Internet Access

- Other: laboratory

9- List of References

a- Course Notes

1- Course notes prepared by instructor (as pdf).
https://bu.edu.eg/staff/hanaahmed3-courses/14515
Join conversation (microsoft.com)
University platform-eLearning https://elearning.bu.edu.eg/course/view.php?id=8238

b- Books

Introduction to Bioenergy, Vaughn C. Nelson, Kenneth L. Starcher, 1st edn, 2016 by CRC Press.

c- Recommended Books

Biofuel and Bioenergy Technology, Wei-Hsin Chen, Keat Teong Lee and Hwai Chyuan Ong, MDPI, 2019

- Course Coordinator: Assoc. Prof. Dr. Hanaa Abulmagd **Signature:**

Prof. Ahmed Attia **Signature:**

Assoc. Prof. Dr. Khairy Husseein **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: ESE405 Solar Energy **Semester/Year:** Second / 2020-2021
Prerequisite Course(s): ESE401 **Core or Elective:** Core
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

Know more about solar energy, solar intensity effect on solar collectors , Solar Collectors types and design

3- Course Contents (As indicated in the program Bylaw)

Study of solar thermal energy: Its intensity in outer space and the calculation of the solar intensity on earth with different models. Availability and usability of solar energy. Study of solar angles, Shades and the equation of time. Theory of the flat plate collector, transmission through glass, heat loss calculations and definitions of all parameters involved in collector performance. Solar concentrators: Solar I (Heliostat), Point concentrators, Parabolic through, Fresnel concentrators. Thermal performance, heat transfer coefficients, efficiencies. System design and energy conversion.

4- Program Competencies Served by The Course (A, B and D)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1 Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

A.2 Develop and conduct appropriate 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, economic, environmental, ethical aspects as appropriate to the Solar Energy and within the principles and contexts of sustainable design and development.

A.5 Practice research techniques and methods of investigation as an inherent part of learning.

Level (B) Sustainable Energy Competencies

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

B.1 Model analyze and design physical systems applicable to the specific discipline by applying the concepts of: Heat Transfer, Fluid Mechanics.

B.2 Plan, manage and carry out designs of mechanical systems using traditional means and computer-aided tools and software contemporary to the mechanical engineering field support to energy and sustainable energy

Level (D) University of Edinburgh Competencies

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

D.2 Apply quantitative methods and computer software relevant to energy and sustainable energy engineering, in order to solve engineering problems.
D.4 Work in a variety of energy systems operations, maintenance and overhaul.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Identify the solar thermal intensity in outer space and the calculation of the solar intensity on earth with different models.
LO2	Discuss the solar angles, Shades and the equation of time.
LO3	Classify the different types of solar collector panels and systems
Psychomotor Domain	
LO4	Select the proper solar collector type and system
LO5	Design a solar collector system to meet the consumer usage
LO6	Check the solar collector performance by its thermal performance .

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A	B	D
Cognitive Domain			
LO1			■
LO2			■
LO3		■	
Psychomotor Domain			
LO4	■		
LO5			■
LO6		■	

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes							
			A1	A2	A3	A5	B1	B2	D2	D4
W1& W2	Study of solar thermal energy: Its intensity in outer space and the calculation of the solar intensity on earth with different models.	**8**	■	■		■	■	■	■	■
W3& W4	Availability and usability of solar energy	**8**			■	■		■		■
W5& W6	Study of solar angles, Shades and the equation of time	**8**	■	■		■	■	■	■	
W7& W8	Theory of the flat plate collector, transmission through glass, heat loss calculations and definitions of all parameters involved in collector performance.	**8**	■	■			■	■	■	

W9& W10	Solar concentrators: Solar I (Heliostat), Point concentrators, Parabolic through, Fresnel concentrators.	**8**	■	■			■	■	■	
W11 & W12	Thermal performance, heat transfer coefficients, efficiencies.	**8**	■	■	■		■	■	■	■
W13 & W14	System Design	**8**	■	■		■	■			■

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●	●					●	●
	LO3	●	●	●							
Psychomotor Domain	LO4		●	●			●			●	
	LO5	●		●	●		●	●	●	●	
	LO6		●	●	●						

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Domain	Learning Outcomes	Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●			●				●		●
	LO2	●				●			●		●
	LO3		●		●	●			●		
Psychomotor Domain	LO4		●					●			
	LO5	●			●	●	●			●	
	LO6	●							●		

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Quizzes	4, 11	5 %
Home assignments, and Reports	2, 5, 6, 8, 11, 13	5%
Oral exam	-	0 %
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	■ Computer with software
■ Lecture Hall	■ White Board	■ MIS system
□ Sound and Microphone	■ Data Show	■ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

1- Course notes prepared by instructor and power Point presentations.

b- Books

1. "The Solar Electricity Handbook" – 2015 edition.
2. "Renewable Energy Handbook – solar power world", 2016.
3. "Research on Solar Collector" – Energies 2020

c- Recommended Books

1. "The Solar Electricity Handbook" – 2015 edition.
2. "Renewable Energy Handbook – solar power world", 2016.
3. "Research on Solar Collector" – Energies 2020

- Course Coordinator: Dr. Aly Soliman **Signature:**

- Program Coordinator: Prof. Ahmed Reda **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: ESE 412 (Elective2)
Course Title: **Air Conditioning & Refrigeration and Environmental Control**
Semester/Year: Second / 2020-2021
Specialization: Energy Sustainable Engineering
Credit Hours: 3
Lecture: 2 **Tutorial:** 2 **Lab:** 0

2- Course Aims

The aim of this course to make student familiar with the fundamental operating principles and practices used in refrigeration and air conditioning systems and environmental protection through the achievement of the following objectives.

1. Illustrate the principles and applications of refrigeration machines and air conditioning systems
2. Identify the various types of refrigeration system components.
3. List the various types of cold stores and air conditioning systems.
4. Perform the calculations of various loads for cold stores and air-conditioned space.
5. Select the suitable refrigeration/air conditioning systems.

3- Program Competencies Served by The Course (A.1, A.3, B.1, D.1, D.4)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1 Identify, formulate, and solve complex engineering problems by applying Engineering fundamentals, basic science, and mathematics.

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.

Level (B) Mechanical/ Electrical Power Engineering Competencies

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

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.

Level (D) Sustainable Energy Competencies (University of Edinburgh Competencies)

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

D.1 Model, Analyze, design, and operate internal combustion engines, pumps, turbines, and compressors according to current developments and technologies

D.4 Work in a variety of energy systems operations, maintenance, and overhaul.

5- Course Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Explain the operating principles of different refrigeration and air conditioning systems
LO2	Determine the coefficient of performance for different refrigeration systems
LO3	Identify the components of different refrigeration and air conditioning systems
Psychomotor Domain	
LO4	Carry out designs of HVAC systems using appropriate both traditional means and computer-aided tools and software contemporary to the air conditioning and ventilation field.
LO5	Adopt suitable national and international standards and codes such as ASHRAE standards: and integrate financial aspects to design the mechanical HVAC systems
Affective Domain	
LO6	Judge the optimal refrigeration and air conditioning system according to the constraints of operation, costs, safety, reliability, and environmental impacts.

6- Mapping Learning Outcomes (LO's) with Competencies

LO's / NARS	A1	A3	B1	D1	D4
Cognitive Domain					
LO1			■		
LO2			■	■	
LO3		■			■
Psychomotor Domain					
LO4	■				■
LO5			■		
Affective Domain					
LO6		■		■	

7- lecture Plan

a- Course Content

Heating, Ventilating, Air Conditioning and refrigeration technology. Psychrometric analysis: moist air properties, psychrometric chart, unit and HVAC processes in conditioned spaces and equipment. Requirements for a comfortable and healthy indoor environment: thermal comfort models, air quality, air contaminants and their control, noise. Design requirements. HVAC systems: their selection and application. Air cleaning and filtration, air distribution and duct systems, air supply and removal from conditioned spaces. Environmental controlled systems including heating, ventilation, air conditioning and refrigeration (HVACR) emphasizing residential, - Commercial and industrial applications. Maintenance personnel, application engineering, sales, supervision, electronic temperature controls specialists and environmental systems designers. New indoor air quality requirements increased residential and commercial construction, phase-outs of CFC refrigerants, global competition within developing countries, and the popularity of computerized controlled electronic refrigeration systems. Construction of additional agricultural food storage and processing facilities.

b-Topics to be Covered weekly & Learning Outcomes

Week	Topics	Planned Hours	Learning Outcomes					
			LO1	LO2	LO3	LO4	LO5	LO6
1	Introduction, Applications, Survey of Refrigeration Systems	4	■					
2	Vapor Compression System	4	■	■				
3	Actual Refrigeration System	4	■	■				
4	Multi-stage of Compound Compression	4		■				
5	Multi-Evaporator Systems	4		■				
6	Cascade Systems, Defrost Methods – Refrigerants Thermal Insulation	4						
7	Mid-term	4						
8	Main Components of Vapor Compression System	4			■			
9	Main Components of Vapor Compression System (cont.)	4				■	■	■
10	Cold Store Design & Cooling load calculations	4				■		
11	Introduction of Air Conditioning - Human Comfort - Comfort Chart - Effective temperature, Survey of Air Conditioning Applications	4		■	■	■		
12	Psychometric Process	4		■	■	■		■
13	Psychometric Cycles	4				■		
14	Cooling Load					■	■	

7- Teaching and Learning Methods

	Teaching and Learning Methods

		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Learning	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	√									√
	LO2	√		√							√
	LO3	√		√							√
Psychomotor Domain	LO4	√	√	√							√
	LO5			√			√	√			
Affective Domain	LO6	√					√	√			

Student Academic Counseling and Support

- in addition to the teaching and learning methods assigned throughout the course (section 5a), extra office hours will be provided to deal with the academic needs of students.

9- Assessment Methods

a) Student Assessment Methods

Learning Outcomes	Assessment Methods									
	Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions

Cognitive Domain	LO1	√			√						
	LO2	√			√						
	LO3	√			√						
Psychomotor Domain	LO4					√			√		
	LO5					√			√		
Affective Domain	LO6								√		

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

11- List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- Arora, C.P., “Refrigeration and Air-conditioning”, 3rd edition, TATA-McGraw Hill, 2009.
2- Gupta, J.K. and Khurmi, R.S., “Textbook of Refrigeration and Air Conditioning”, Distributed by S. Chand & Company Ltd., New Delhi, 2007.
3- Roger Legg, “Air conditioning system design”, Elseiver, 2017.

c- Recommended Books

1- ASHRAE Handbook, Refrigeration, American Society of Heating, Refrigerating and Air Conditioning Engineers. 2014.
2- ASHRAE Handbook, Systems &Equipment’s, American Society of Heating, Refrigerating and Air Conditioning Engineers, Atlanta, 2016.
3- ASHRAE Handbook, Fundamentals, American Society of Heating, Refrigerating and Air Conditioning Engineers, Atlanta, 2017.
4- ASHRAE Handbook, Applications, American Society of Heating, Refrigerating and Air Conditioning Engineers, Atlanta, 2019.

d- Web Sites

https://www.epa.gov/iaq-schools/heating-ventilation-and-air-conditioning-systems-part-indoor-air-quality-design-tools

- Course Coordinator: **Prof. Dr Ramadan Yousef Sakar** **Signature:**

Prof. Dr Hany Elsawy Abdelrahman **Signature:**

- Program Coordinator: **Prof. Dr. Ahmed Reda Elshamy** **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Program Data

Program Title: Field Training Program
Specialization: Energy and Sustainable Energy Engineering Program

Course Code: ESE380 — **Course Title:** Field training I
Semester/Year: Second / 2020-2021 — **Specialization:** Energy and Sustainable Energy Eng.
Credit Hours: 1 — **Lecture:** 1 **Tutorial:** 0 **Lab:** **0**

Course Code: ESE480 — **Course Title:** Field training II
Semester/Year: Second / 2020-2021 — **Specialization:** Energy and Sustainable Energy Eng.
Credit Hours: 1 — **Lecture:** 1 **Tutorial:** 0 **Lab:** **0**

2- Program Objectives

The mission of the Energy and Sustainable Energy Engineering is to qualify students for successful and outstanding careers in Energy and Sustainable Energy fields. The Energy and Sustainable Energy Engineering program aims to develop an appreciation of the social and environmental requirements for the sustainable generation and distribution of energy in a rapidly growing world economy, and of the current and emerging technologies that can be applied to meet these requirements. Alternative technologies such as wind power, solar power, tidal power, geothermal power, hydro power, pumped storage, power transmissions and biomass are all covered, and the program aims at producing graduates who can design technologies that will support society in the future and for generations to come.

3- Program Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

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.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.

Level (B) Sustainable Energy Competencies

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

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.

Level (D) University of Edinburgh Competencies

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

D.1 Classification, construction design concepts, operation and characteristics of internal combustion engines, pumps, turbines and compressors according to current developments and technologies.

D.3 Carry out preliminary designs of sustainable energy sources including solar, wind, and geothermal energy, and biotechnology and solve their operational problems.

4- Curriculum Structure and Contents

Practical/Field Training: the students must carry out 3 weeks of field training after the freshman year and after the sophomore year.

5- Field training schedule and outcomes

Year of program 3 (Second Year) after Semester 2

Code	Course Title	No. of hours / week
ESE 380	Field training I	40

Year of program 4 (Third Year) after Semester 2

Code	Course Title	No. of hours / week
ESE 480	Field training II	40

6- Participants Assessment

Appraiser	Tool	Weight
The external trainer	Evaluation sheet	10 %
Participant report	Report inspection	50%
Department discussion	Oral investigation	40 %
Total		**100** %

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University:	Benha University
Faculty:	Faculty of Engineering at Shoubra
Department offering the program:	Mechanical Engineering Department
Department offering the course:	Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: GEN 402
Course Title: Human Resources Management
Semester/Year: First / second
Specialization: University requirement
Credit Hours: 2
Lecture: 2 **Tutorial:** 0 **Lab:** 0

2- Course Objectives

For students undertaking this course, they will be able to:

1. Supply graduates with knowledge and information about Human Resources Management.
2. Deal with emergence and development of human resources management.
3. Appreciate the importance of strong codes of ethics in their professional conduct and reflect of their actions on society and make more considered choices.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

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.

4- Course Contents

a) Course Description (As indicated in program Bylaw)

This course is an introduction to the labor management motivation rules, manpower planning, and labor performance evaluation.

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course Competencies						
		A4	A5	A6	A7	A8	A9	A10
1	• Introduction to Human Resources ManagementPole-Zero Map,	√	√					
2	• The emergence and development of human resources management	√	√					

	• The birth of human resources management • The historical development of human resources management								
3	• actors affecting the development of human resource management • Human Resource Management • Defining human resource management and the factors affecting it	√	√						
4	• Importance and objectives of human resources management • Human resource management functions • Human resources management in the organization	√	√						
5	• The site of human resources management in the organizational structure of the institution • The impact of the human resource function on the success of the organization • Building competitive advantage through human resources	√	√						
6	• Strategic management of human resources • Managing human resources in the future	√	√	√	√				
7	• public employment • Definition of public office • The evolution of the civil service	√	√	√	√				
8	• The concept of employment • Conditions of employment	√	√			√	√		
9	• Recruitment sources • Employment procedures	√	√					√	√
10	• Concept of running a professional life • The importance of running a professional life	√	√			√	√		
11	• Goals and policy for managing professional life • Career management goals • Career management policy	√	√						
12	• Assessment Definition. • Assessment Purposes.	√	√					√	√
13	• Assessment Methods • Good Assessment Characteristics	√	√			√	√		
14	• Work out and Death	√	√					√	√

5- a) Teaching and Learning Methods

Course Competencies		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Level A	A4	√	√	√							
	A5			√	√				√	√	
	A6				√			√			
	A7				√					√	√
	A8	√	√	√					√		
	A9	√	√	√					√		
	A10	√	√		√				√	√	

5- b) Teaching and Learning Methods of Disables

None

6- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

7- Student Assessment

a- Student Assessment Methods

Course Competencies		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Level A	A4	√	√		√						√
	A5			√	√				√		√
	A6			√					√		
	A7								√		√
	A8	√	√	√	√				√		
	A9	√	√	√	√				√		
	A10	√	√		√				√	√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
Midterm Examination	7	30 %
Final Examination	(As Schedule)	40 %
Quizzes (4 times)	5,12	10 %
Home assignments, and Reports	2, 4, 8, 11	10%
Oral Exam	8	10 %
Total		**100** %

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

9- List of References

a- Course Notes

Lectures Notes in PDF

b- Books

1. Human Resources Management, Ahmed Maher, Alex. 2006
2. Human Resources Management, Mohamed Elserafy, Alex., Egypt 2007.

c- Recommended Books

1. Human Resources Management, Khaled Abd Elreheem, Oman, Orden, 2^{nd} Edition, 2005

d- Web Sites

http://ar.wikipedia.org/wiki

10- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies						
	A4	A5	A6	A7	A8	A9	A10
Course Objective #1	√	√			√	√	√
Course Objective #2	√			√		√	
Course Objective #3			√				

- Course Coordinator: Prof. Dr. Mahmoud Ali Refaey **Signature:**

- Program Coordinator: Prof. Dr. Ahmed El shami **Signature:**

Competence-Based Learning Outcomes Course Specifications (2nd Semester 2020/2021)

University:	Benha University
Faculty:	Faculty of Engineering at Shoubra
Department offering the program:	Mechanical Engineering Department
Department offering the course:	Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: EPM402 (Power System Analysis) **Semester/Year:** Second / 2020-2021
Prerequisite Course(s): EPM 301 **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to analyze the Electric power systems, sources of energy and power plants, design with many methods the appropriate component to improve the power factor and measure the transmission efficiency and voltage regulation for each type of transmission line also Kelvin's Law and its graphical Illustration and its Limitations

3- Course Contents (As indicated in the program Bylaw)

Alternating voltages and currents, AC circuit theories, Electric Power generation, sources of energy, fuels, power plants and outline design, constants of transmission line, types of transmission lines, power plants and insulators, Kelvin's Law, three phase four wire system, DC Distributor fed at one end, DC Distributor fed at both ends, AC Distributor fed at one end and AC distributor fed at both ends.

4- Program Competencies Served by The Course (A3, B1, D4)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A3. Define Principles of design including elements design, process and a system related to power system analysis

Level (B) Electrical Engineering Competencies

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

B.1 Select appropriate mathematical and computer-based methods (MATLAB) for modeling and analyzing problems

Level (D) University of Edinburgh Competencies

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

D.4 Work in a variety of energy systems operations and maintenance.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Apply the block-diagram algebra to obtain the system transfer function.
LO2	Construct signal flow graph to calculate system transfer function using Mason's formula
LO3	Create a model of physical system & its mechanical network to write its differential equations.
Psychomotor Domain	
LO4	Select the proper state variables to obtain the dynamic equation of LTI system and its state transition matrix and/or state transition equation.
LO5	Design the proper PID controller to meet specific time-domain specifications of LTI system

6- Mapping Learning Outcomes (LO's) with Competences

LO's / NARS	A3	B1	D4
Cognitive Domain			
LO1	■		
LO2	■		
LO3		■	
Psychomotor Domain			
LO4		■	
LO5			■

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes				
			LO1 A3-1	LO2 A3-2	LO3 B1-3	LO4 B1-4	LO5 D4-5
W1	Alternating voltages and currents	**4**	■				
W2	AC circuit theories	**4**	■				
W3	Electric Power generation, sources of energy, fuels, power plants	**4**		■		■	
W4	constants of transmission line	**4**		■		■	
W5	Types of transmission lines	**4**		■		■	
W6	Power plants and insulators	**4**		■		■	
W7	Kelvin's Law	**4**	■				
W8	Mid-term exam						
W9	Three phase four wire system	**4**	■				
W10	DC Distributor fed at one end	**4**	■				■
W11	DC Distributor fed at both ends	**4**			■		
W12	AC Distributor fed at one end	**4**					■
W13	AC distributor fed at both ends	**4**			■		■
W14	Ring Distributor	**4**			■		■

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

ingOut	**Teaching and Learning Methods**

		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●	●					●	●
	LO3	●	●	●							
Psychomotor Domain	LO4		●	●			●			●	
	LO5	●		●	●		●	●	●	●	

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as WhatsApp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Question
Cognitive Domain	LO1	●			●				●		●
	LO2	●				●			●		●
	LO3		●		●	●			●		

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Psychomotor Domain	LO4		●					●			
	LO5	●			●	●	●			●	

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Second Midterm Examination	12	20%
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	5 %
Home assignments	3, 5,10,11	5%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

Lectures Notes in PDF
Handed out to the students' part by part.

b- Books

1. V. Y. Ushakov "Electrical Power Engineering", 1st edition, Springer, Cham 2018.
2. L.L.Grigsby "Electrical Power Generation, Transmission and distribution", 3rd edition, 2012.
3. V.K. Mehta. "Principles of Power System", 5th edition, 2005.
4. D.P.Kothari. "Modern Power System Analysis", 3rd edition, 2003.

c- Recommended Books

1. V. Y. Ushakov "Electrical Power Engineering", 1st edition, Springer, Cham 2018.

- Course Coordinator: Prof. Dr. Mohamed Moenes **Signature:**

Dr. Hosam Abdel Razzak **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

توصيف مقررات المستوى الرابع

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: ESE511
Course Title: Energy Economics
Semester/Year: First / 2020-2021
Specialization: Mechanical Engineering
Credit Hours: 2
Lecture: 1 **Tutorial:** 2 **Lab:** 0

2- Course Aims

The aim of this course to make student familiar with economic principles and their applications on the energy sector through the achievement of the following objectives.

1. Apply the principles of economics and engineering economy to energy systems.
2. Perform economic analysis and feasibility studies for renewable energy projects and choose between alternatives.

3- Course Content

Principles of economical science and engineering economy – Cost estimating and cost terminology – Interacting between markets and the environment – Economics of renewable resources – Feasibility of projects - Environmental impacts - Economics of carbon – Economics of alternatives and their relationship to sustainability energy - Economic analysis of a transmission system, tariffs, power factor, all ‹thermal generation allocation problem, hydro ‹thermal coordination, new energy resources. Transmission access fees assessment and calculations. Computer Applications using Microsoft Excel and Mat lab.

4- Program Competencies Served by The Course (A3, A8 and D2)

Level (A) Engineering Competencies

On completing this course, students will be able to:

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.8 Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools.

Level (D) Energy & Sustainable Energy Competencies

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

D.2 Apply quantitative methods and computer software relevant to energy and sustainable energy engineering, to solve engineering problems.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Demonstrate knowledge of the methodologies of economic science and engineering economy.
LO2	Estimate the economic parameters for energy systems
LO3	Assess environmental impacts which energy and sustainable energy engineers must judge to reach at an optimum solution.
Psychomotor Domain	
LO4	Perform feasibility studies for different energy systems
LO5	Prepare and present technical reports that used in energy economic field
LO6	Use a wide range of analytical tools, techniques, and software packages such as Microsoft excel and MATLAB to solve energy economic problems.
Affective Domain	
LO7	Select between alternatives based on different economic parameters.
LO8	Exchange knowledge of economical science and engineering economy with energy engineering community and energy economic.

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A3	A8		D2
Cognitive Domain				
LO1	■			
LO2	■			
LO3	■			
Psychomotor Domain				
LO4	■			
LO5		■		
LO6				■
Affective Domain				
LO7	■			
LO8	■			

7- lecture Plan

a- Topics to be Covered weekly & Learning Outcomes

Week	Topics	Planned Hours	Learning Outcomes							
			LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8
1	Introduction to Energy Economics	3	■							
2	Cost estimating and cost terminology	3	■	■						
3	Breakeven Analysis	3		■		■			■	

4	Time value of Money	3				■				
5	Feasibility of projects using (PW, FW)	3				■			■	
6	Feasibility of projects (AW, Payback, MARR)	3				■		■	■	
7	Feasibility of projects (Cost-Benefit analysis)	3				■		■	■	
8	Economics of renewable resources	3		■			■			■
9	Environmental Economics	3			■					
10	Economic analysis thermal power plant	3		■			■			
11	Economic analysis thermal power plant	3		■						
12	Computer Applications using Microsoft Excel	3						■		

8- Teaching and Learning Methods

8-a Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-learning	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●							●
	LO2	●		●							●
	LO3	●		●							●
Psychomotor Domain	LO4	●		●							●
	LO5	●		●						●	●
	LO6	●		●			●				●

Affective Domain	LO7	●		●							●
	LO8	●		●						●	●

Student Academic Counseling and Support

- in addition to the teaching and learning methods assigned throughout the course (section 5a), extra office hours will be provided to deal with the academic needs of students.

9- Assessment Methods

a) Student Assessment Methods

Learning Outcomes		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●									
	LO2	●									
	LO3	●									
Psychomotor Domain	LO4	●							●		
	LO5	●									
	LO6	●								●	
Affective Domain	LO7	●			●						
	LO8	●							●		

b- Assessment Schedule and Weight

Assessment	Week	Weight
Assignments	3,5,11,13	10%
midterm Examination	8	30%
Quizzes	5,13	10%
Final exam	(As Scheduled)	40%
Oral exam/ Design Project	7, 14	10%
Total	15	**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

11- List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1. W. G. SULLIVAN, E. M. WICKS, C. P. KOELLING, ENGINEERING ECONOMY, Sixteenth Edition
2. Subhes C. Bhattacharyya, Energy Economics, Concepts, Issues, Markets and Governance, Springer, 2011.

c- Recommended Books

3. Peter Zweifel, Aaron Praktiknjo, Georg Erdmann, Energy Economics: Theory and Applications, Springer, 2017.
4. Ahmed M. Hussen, Principles of Environmental Economics, Second edition, Taylor & Francis e-Library, 2004.

d- Web Sites

1-

- Course Coordinator: **Prof. Dr Ramadan Yousef Sakar** **Signature:**

- Program Coordinator: **Prof. Dr. Ahmed Reda Elshamy** **Signature:**

University:	Benha University
Faculty:	Faculty of Engineering at Shoubra
Department offering the program:	Mechanical Engineering Department
Department offering the course:	Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: ESE502 Wind Energy **Semester/Year:** First / 2020-2021
Prerequisite Course(s): MPE302 **Core or Elective:** Core
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

For students undertaking this course, they will be able to:

1. Recognize wind energy sources.
2. Learn the statistical analysis of wind distribution (Weibull distribution).
3. Calculate the new wind velocity at specific height.
4. Recognize wind turbine velocity triangle and angles.
5. Perform a simple design of blade and calculate the generated power.

3- Course Contents (As indicated in the program Bylaw)

Windmills and Wind Turbines, Global Installations, Wind Energy System Components, Blades, hub, nacelle, Gearbox, generator, brakes, Tower, foundation, control system, Turbine Design, Drivetrain Components, General Principles Primer (stress, strain, vibrations), Rotor Dynamics, Power Converters and Ancillary Equipment, Wind Turbine Control, Wind Farm Feasibility Studies, Wind Turbine Siting, Noise Issues.

4- Program Competencies Served by The Course (A, B and D)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1 Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

A.2 Develop and conduct appropriate 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, economic, environmental, ethical aspects as appropriate to the Solar Energy and within the principles and contexts of sustainable design and development.

Level (B) Sustainable Energy Competencies

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

B.1 Model analyze and design physical systems applicable to the specific discipline by applying the concepts of: Heat Transfer, Fluid Mechanics.

B.2 Plan, manage and carry out designs of mechanical systems using traditional means and computer-aided tools and software contemporary to the mechanical engineering field support to energy and sustainable energy

Level (D) University of Edinburgh Competencies

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

D.2 Apply quantitative methods and computer software relevant to energy and sustainable energy engineering, in order to solve engineering problems.

D.4 Work in a variety of energy systems operations, maintenance and overhaul.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Identify wind energy resources and statistical distribution
LO2	Recognize wind and blade velocity triangles and angles.
LO3	Classify different types of wind turbines.
LO4	Recognize the main aerodynamic theories of wind turbines.
LO5	Identify the methods of wind turbines performance improvement.
Psychomotor Domain	
LO6	Analyze the statistical distribution of wind energy.
LO7	Select the suitable site for wind farm.
LO8	Design simple blade.

6- Mapping Learning Outcomes (LO's) with Competencies

LO's / NARS	A	B	D
Cognitive Domain			
LO1	■		
LO2	■		
LO3	■		
LO4	■	■	
LO5	■	■	
Psychomotor Domain			
LO6	■	■	■
LO7		■	■
LO8		■	■

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes						
			A1	A2	A3	B1	B2	D2	D4
W1	Windmills and Wind Turbines	4	■	■			■		
W2	Global Installations	4	■	■			■		
W3	Wind Energy System Components	4	■			■			■
W4	Blades, hub	4			■	■			
W5	Nacelle, Gearbox	4		■				■	■
W6	Generator, brakes	4		■	■		■		
W7	Tower, foundation	4	■		■		■		■
W8	Control system	4	■		■			■	
W9	Turbine Design, Drivetrain Components	4		■		■		■	■
W10	General Principles Primer (stress, strain, vibrations), Rotor Dynamics	4	■	■		■			■
W11	Power Converters and Ancillary	4	■			■	■		

	Equipment								
W12	Wind Farm Feasibility Studies, Wind Turbine Siting, Noise Issues	**4**	■		■		■	■	
W13	Windmills and Wind Turbines	**4**	■	■			■		

8) Teaching and Learning Methods

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●							
	LO2	●		●							
	LO3	●		●							
	LO4	●		●							
	LO5	●		●							
Psychomotor Domain	LO6	●		●							●
	LO7	●		●						●	
	LO8	●		●	●		●		●		●

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●									
	LO2	●			●						●
	LO3	●									
	LO4	●									●
	LO5	●			●						
Psychomotor Domain	LO6	●					●				
	LO7	●					●	●			
	LO8	●			●		●	●	●	●	

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.	12	20%
Final Examination	15	40 %
Quizzes	4, 11	5 %
Home assignments, and Reports	2, 5, 6, 8, 11, 13	5%
Oral exam	-	0 %
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

■ Classroom   □ Smart Board   ■ Computer with software

■ Lecture Hall	■ White Board	■ MIS system
□ Sound and Microphone	■ Data Show	■ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

1- Course notes prepared by instructor and power Point presentations.

b- Books

1. Wind Energy for the Rest of Us: A Comprehensive Guide to Wind Power and How to Use It Paperback – November 17, 2016.
2. Wind Energy Design by Thomas Corke, Robert Nelson, 1st Edition.

c- Recommended Books

1. Wind Energy for the Rest of Us: A Comprehensive Guide to Wind Power and How to Use It Paperback – November 17, 2016.
2. Wind Energy Design by Thomas Corke, Robert Nelson, 1st Edition.

- Course Coordinator: Dr. Aly Soliman **Signature:**

- Program Coordinator: Prof. Ahmed Reda **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code: MDP501 **Course Title:** Control Systems Analysis & Design
Semester/Year: Fall / 2020-2021 **Core or Elective:** Core Course
Prerequisite Course(s): MDP401 Vibration & Dynamics
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

The aim of this course is to provide students with the basic knowledge and skills to identify the type of control system, model different physical electrical, mechanical, hydraulic, thermal systems and obtain their transfer functions by using block diagram technique. Moreover, employ time domain analysis to diagnose transient performance parameters of 2nd order system under different standard test signals and apply basic principles and stability of control systems. Finally, solid understanding of controller designs and compensation techniques, identify the needs for different types of controllers to ascertain the required response and stability.

3- Course Contents (As indicated in the program Bylaw)

Introduction - what is a system? - system fundamentals - types of systems – the study of systems analysis - preparing for a career in systems analysis – formal organization structure - tools of the systems analyst - system modeling - traditional design tools - the planning phase – project management – project concepts - need for project management - the analysis phase – quantitative assessments - fact-finding techniques - the design phase – input design and control – output system design – system development – system implementation – system evaluation and optimization. Computer applications using MATLAB packages.

4- Program Competences Served by The Course (A1, A2, B1 and D1)

Level (A) Engineering Competencies

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 objective engineering judgment to draw conclusions.

Level (B) Mechanical Engineering Competencies

B.1 Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of control theory and systems

Level (D) Energy & Sustainable Energy Competencies

D.1 Model, analyze and design and operate of mechanical system according to current developments and technologies.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Identify the types of control systems and create a model of physical systems to write its differential equations to find transfer function.
LO2	Apply the block-diagram algebra to obtain the system transfer function.
Psychomotor Domain	
LO3	employ time response analysis of first and second order systems to diagnose transient performance parameters of 2nd order system under different standard test signals
LO4	Check the control system performance by its steady-state error.
Affective Domain	
LO6	Discuss the system stability by Routh-Hurwitz criterion/ Analyze the performance of the control system by root locus method
LO7	Design the proper PID controller to meet specific time-domain specifications of LTI system

6- Mapping Learning Outcomes (LO's) with competencies

LO's / NARS	A1	A2	B1	D1
Cognitive Domain				
LO1	■			
LO2	■			
Psychomotor Domain				
LO3	■			
LO4		■	■	
Affective Domain				
LO5		■	■	
LO6		■		■

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes					
			LO1	LO2	LO3	LO4	LO5	LO6
W1	- Quality requirements for the course - Introduction to control systems	2	■					
W2	-Laplace Transform and its properties, -Inverse Laplace Transform, -Pole-Zero Map	5	■					
W3	-Block Diagram Representation, -Calculation of the system Transfer Function (TF) -Multi Input Single Output (MISO) systems	5		■				
W4	- Modeling of Linear mechanical systems - Modeling of Rotary mechanical systems - Modeling of Electrical circuits & DC machines	5	■	■				
W5	- Modeling of Electromechanical systems - Modeling of hydraulic systems - Modeling of thermal systems	5	■	■				
W6	-Error coefficients at step, ramp and parabolic inputs	5			■	■		

Week	Topics	Planned Hours	Learning Outcomes					
			LO1	LO2	LO3	LO4	LO5	LO6
	-Calculation of Steady-State Error for unity & non-unity feedback systems - Lab. Topic 1: Determining the output measured value for different input signals.							
W7	- Revision on the previous parts - **Midterm Exam (30% exam)**	**5**	■	■	■	■		
W8	- Transient Response of 1st order Systems - Transient Response of 2nd order Systems - Parameters calculation of transient response - Lab. Topic 2: Determining response of second order systems.	**5**			■	■		
W9	- The Concept of Stability - The Routh–Hurwitz Stability Criterion - Design the range of system gain for stability	**5**					■	
W10	- Design the system gain to give certain performance. Lab. Topic 3: Determine the damping ratio(ζ), actual damping co-efficient (C) and critical damping co-efficient(Cc) for free damped system.	**5**					■	
W11	- Computer applications using MATLAB packages	**5**				■		
W12	- Revision on the previous parts - **Evaluation Exam (20% exam)**	**5**			■	■	■	
W13	-P, PD, PI and PID controllers -PID controller using Matlab - Lab. Topic 4: Determine the range of PID controllers.	**5**						■
W14	-The Root Locus (R.L.) Concept -Steps required to draw R. L. -Effect of adding pole and zero on R.L	**5**						■
W15	**Final term examination**	**2**	■	■	■	■	■	■

b) Additional private study/learning hours expected for students per week is three hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cogni tive Doma	LO1	●		●							
	LO2	●		●	●					●	●
Psychom otor Domain	LO3	●		●		●	●			●	
	LO4	●		●	●	●					●
Affective Domain	LO5	●		●	●	●				●	●
	LO6	●		●	●			●			●

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as Whatsapp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●				●			●		
	LO2	●			●	●			●		●
Psychomotor Domain	LO3	●				●		●	●		●
	LO4	●			●	●			●		●
Affective Domain	LO5	●			●	●			●		●
	LO6					●		●			

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Second Midterm Examination	12	20 %
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	2 %
Home assignments	3,4,5,8,10,11	5 %
Lab	5, 8	3 %
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

■ Classroom	□ Smart Board	□ Computer with software
□ Lecture Hall	■ White Board	■ MIS system
□ Sound and Microphone	■ Data Show	■ Internet Access
□ Other: …………………		

11- List of References

a- Course Notes

Lectures Notes in PDF
https://bu.edu.eg/staff/mohamedsokar3-courses (Last access: Sep 1st, 2020)

b- Books

1. William C. Dunn, Fundamentals of Industrial Instrumentation and Process Control, Prentice Hall, 2nd edition, 2018
2. Katsuhiko Ogata, Modern Control Engineering, 5th edition, Pearson, 2010.
3. Nise, N. S., Control System Engineering, 7th edition, John Wiley & Sons Ltd., UK, 2016.
4. F. Golnaraghi and B. C. Kuo, "Automatic control Systems", 10th ed., John Wiley & Sons, Inc. 2017.
5. Andrea Bacciotti, "Stability and Control of Linear Systems" Volume 185, Springer, 2019

c- Recommended Books

1. R. C. Dorf and R. H. Bishop, "Modern Control Systems", Addison-Wesley, 11th Edition, 2014

- Course Coordinator: Dr. Mohamed Saber Sokar **Signature:** M. Saber Sokar

- Program Coordinator: Prof. dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: ESE503 Solar Cells Fundamentals **Semester/Year:** First / 2020-2021
Prerequisite Course(s): ESE405 Solar Energy **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to provide students with fundamental knowledge and skills in photovoltaic systems, specifically: fundamentals of solar energy and energy conversion; characteristics of solar cells and their materials; and principles of solar cell operation. Furthermore, recognize the various factors affecting solar cells performance (reasons and solutions). Finally, obtain a working knowledge of off-grid and on-grid photovoltaic systems (principles and design).

3- Course Contents (As indicated in the program Bylaw)

Sunlight energy, photovoltaic devices, energy conversion, solar radiation measurement, Applications, Principles of solar cell operation, structure, electrical and optical characteristics, equivalent circuit, Crystalline silicon solar cells, Thin film technologies for PV, Energy production by a PV array, Energy balance in stand ،alone PV systems, Standards, calibration and testing of PV modules and solar cells, PV system monitoring, Safety considerations in PV Systems, Site assessment, System design. Maximizing cell efficiency, Solar cell construction, Types and adaptations of photovoltaics, Photovoltaic circuit properties, Applications and systems, Social and environmental aspects.

4- Program Competencies Served by The Course (B1, B3 and D3)

Level (A) Engineering Competencies

-

Level (B) Mechanical Engineering Competencies

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.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

Level (D) Energy and Sustainable Energy Engineering Competencies

D.3 Carry out preliminary designs of sustainable energy sources including solar, wind, and geothermal energy, and biotechnology and solve their operational problems.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Define solar cells basic technology to classify the theoretical and implementation approach for photovoltaic cells.
LO2	Recognize the principles of solar cells operation and electrical characterization to judge its electric performance.

LO3	Identify the various factors negatively affecting solar cells performance to recommend effective solutions.
LO4	Demonstrate the principles of solar cells structure to design effective solar cell systems.
Psychomotor Domain	
LO5	Design both off-grid and on-grid photovoltaic systems to construct a sustainable system for energy generation.
LO6	Conduct a case study for solar water pumping system Design.
Affective Domain	

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	B1	B3	D3
Cognitive Domain			
LO1	■		
LO2		■	
LO3		■	
LO4			■
Psychomotor Domain			
LO5			■
LO6	■		
Affective Domain			

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes					
			LO1 B1-1	LO2 B3-2	LO3 B4-3	LO4 D3-4	LO5 D3-5	LO6 B1-6
W1	- Energy problem. - Renewable energies as a solution. - Solar energy.	4	■					
W2	- Solar irradiance spectrum. - Photovoltaic technology (Fundamentals and history).	4	■					
W3	- Semiconductors. - Pure silicon. - Doping process. - N and P-type semiconductors. - P-N junction and photovoltaic effect.	4	■	■				
W4	- Other semiconductor materials. - Band gap energy. - Multi-junction technology	4		■				
W5	- Photovoltaic cells manufacturing technologies. - Photovoltaic cell, module, and array. - Photovoltaic module full layers.	4				■		
W6	- Wiring of solar cells. (Series and parallel wiring) - Photovoltaic technology classifications.	4	■			■		
W7	- (I-V) and (P-V) curves. - Short circuit current, Open circuit voltage, Fill factor and electrical conversion efficiency. • Solar cells standards.	4		■				

Week	Topics	Planned Hours	Learning Outcomes LO1 B1-1	LO2 B3-2	LO3 B4-3	LO4 D3-4	LO5 D3-5	LO6 B1-6
	• Calibrating and testing of solar cells							
W8	- Factors affecting solar cells performance (reasons and solutions). ✓ Solar incident irradiance. ✓ Cell operating temperature	**4**			■			
W9	- Factors affecting solar cells performance (reasons and solutions). ✓ Dust deposition. ✓ Shading (shading physics and analysis).	**4**			■		■	
W10	- Off-grid photovoltaic system. ✓ Lay out and main components. ✓ Design procedures of each component.	**4**					■	
W11	- Off-grid photovoltaic system. ✓ Mounting structures. ✓ Site survey procedures. ✓ Azimuth angle and tilt angle.	**4**					■	
W12	- Case study for standalone system Design.	**4**					■	■
W13	-Solar water pumping System ✓ Lay out and main components ✓ Case study for solar water pumping system Design.	**4**					■	■
W14	- On-grid photovoltaic system. ✓ Lay out and main components. ✓ Mega Scale Projects Steps. ✓ Grid connected photovoltaic studies	**4**					■	

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods: Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●						●	●
	LO3	●		●	●						●
	LO4	●	●		●						●
Psycho	LO5		●	●			●			●	

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
		Teaching and Learning Methods									
	LO6		●	●					●		

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the timetable declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
		Assessment Methods									
Cognitive Domain	LO1	●			●				●		●
	LO2	●				●			●		●
	LO3		●		●	●			●		
	LO4		●		●	●			●		
Psychomotor Domain	LO5	●				●	●			●	
	LO6					●				●	

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Second Midterm Examination	12	20%
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	5 %
Home assignments	3, 5,10,11	5%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

Lectures Notes in PDF (please click here)
(https://fengbuedu-my.sharepoint.com/:f:/g/personal/mohamed_emam_feng_bu_edu_eg/EikpXBFHdeNNp463gnnbTPQBzBGnuNwr1vmYvTjBc3iKnQ?e=qnlXq0)

b- Books

1. Austin, Thermal application in renewable energy, 2005, Springer.
2. G. N. Tiwari and Swapnil Dubey (2010). Fundamentals of Photovoltaic Modules and Their Applications latest edition. The Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge CB4 0WF, UK
3. Tushar K. Ghosh Mark A. Prelas, (2010), Energy Resources and Systems (Volume 2: Renewable Resources), Springer Dordrecht Heidelberg London New York

c- Recommended Books

1. G. N. Tiwari and Swapnil Dubey (2010). Fundamentals of Photovoltaic Modules and Their Applications latest edition. The Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge CB4 0WF, UK

- Course Coordinator: Dr. Mohamed Elsayed Mohamed Emam **Signature:**

Dr. Hossam Adalrazek **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: ESE510
Course Title: Energy Management
Semester/Year: First / 2020-2021
Specialization: Energy Sustainable Engineering
Credit Hours: 3
Lecture: 2 **Tutorial: 2** **Lab:** -

2- Course Objectives

For students undertaking this course, they will be able to know:

1. Concepts and basics of industrial engineering and management.
2. Project cycle life, cost estimation, industrial organization.
3. Analysis of cost and value analysis, project management, system design and management.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.3 Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, economic and environmental aspects 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.9 Use creative, innovative and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

Level (B) Sustainable Energy Competencies

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

B.1 Model, analyze and design physical systems applicable to the Energy Management by applying the concepts of: Thermodynamics, Heat Transfer, Fluid Mechanics,

B.2 Plan, manage and carry out designs of mechanical systems both traditional means and computer-aided tools and software contemporary to the mechanical engineering field support to energy and sustainable energy

Level (D) University of Edinburgh Competencies

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

D.1 Classification, construction design concepts, operation and characteristics of internal combustion engines, pumps, turbines and compressors according to current developments and technologies

D.4 Work in a variety of energy systems operations, maintenance and overhaul.

4- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Identify and discuss the main definitions and concepts and basics of industrial engineering and management.
LO2	Recognize environmental issues and risk management principles
LO3	Discuss the different ways in managing the energy wastes using flexible thinking
Psychomotor Domain	
LO4	Change and redesign in physical systems applicable to the Energy Management and evaluate the modified performance
LO5	carry out designs of mechanical systems conjugate with operating energy systems
LO6	Select alternative saving energy systems

5- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A3	A4	A9	B1	B2	D1	D4
Cognitive Domain							
LO1	■						
LO2		■					
LO3			■				
Psychomotor Domain							
LO4				■			
LO5					■	■	
LO6							■
Affective Domain							

6- Course Contents

a) **Course Description** (As indicated in program Bylaw)

General and detailed energy auditing procedures, audit pentagon, level of responsibilities - Climatic conditions - Kyoto Protocol and the use of Carbon Based Levies - Analysis of energy use, use of cost and consumption based indices - Financial considerations - Price relationships and economics - Risk and sensitivity - The role of the Energy Manager - Monitoring and targeting techniques - Cusum plots - Contract Energy Management - The use of CHP - The effect of Company Structure on the Role of Energy Management - Energy Policy.

b) Topics to be Covered weekly & Matrix of LOs

Week	Topics	Learning outcomes (Course Competencies)					
		LO1	LO2	LO3	LO4	LO5	LO6
1	General and detailed energy auditing procedures				√	√	√
2	Climatic conditions		√			√	√
3	Kyoto Protocol and the use of Carbon-Based Levies	√	√		√		
4	Analysis of energy use	√	√	√	√	√	
5	Financial considerations	√	√	√			
6	Price relationships and economics	√	√				√
8	Risk and sensitivity	√	√				
9	The role of the Energy Manager		√	√		√	√
10	Monitoring and targeting techniques		√	√		√	√
11	Cusum plots		√				
13	Contract Energy Management	√	√	√			√
14	Energy Policy	√	√				

6- a) Teaching and Learning Methods

Course Competencies		Face-to-face Lecture	Online Education	Tutorial / Exercise	Group Discussions	Laboratory	Site Visit	Presentation	Mini Project	Research and Reporting	Brain Storming
Cognitive Domain	LO1	√	√	√	√				√	√	√
	LO2	√	√	√	√				√	√	
	LO3	√		√	√			√	√	√	
Psychomotor Domain	LO4	√	√	√					√	√	
	LO5	√	√	√	√			√	√	√	√
	LO6	√		√	√			√	√	√	√

6- b) Teaching and Learning Methods of Disables

None

7- Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

8- Student Assessment

a- Student Assessment Methods

Course LOs		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
		Assessment Methods									
Cognitive Domain	LO1	√					√	√	√		√
	LO2	√					√	√	√		√
	LO3	√						√			√
Psychomotor Domain	LOk4	√					√	√	√		√
	LO5	√					√	√	√		√
	LO6	√						√	√		√

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
2nd Midterm Exam.		0%
Final Examination	15	40 %
Mini project	-	0 %
Home assignments, and Reports	2, 4, 6, 8, 10, 13, 14	20%
attendance	-	10 %
Total		**100 %**

9- Facilities

The following facilities are needed for this course:

- ■ Classroom
- ■ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

10- List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

- Assoc. Prof. LLiya LLive et al. "Energy efficiency and energy management Handbook" Programme energy efficiency and green economy , 2011
- B. Kumar, "Industrial Engineering & Management", Khana Pub., 2004
- Philips, F. "Cost analysis & Estimating for Engineering Management", Pearson Prentic, 2004

c- Recommended Books

1- David Sumanth, Productivity Engineering & Management.

11- Matrix of Course Objectives and Competencies

Course Objectives	Program LOs					
	LO1	LO2	LO3	LO4	LO5	LO6
1. Concepts and basics of industrial engineering and management.	√		√	√	√	√
2. Project cycle life, cost estimation, industrial organization.	√	√	√		√	√
3. Analysis of cost and value analysis, project management, system design and management.	√		√	√	√	

- Course Coordinator: Prof R K Ali **Signature:**

- Program Coordinator: Prof.Dr. Ahmed Reda Elshamy **Signature:**

University: **Benha University**
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: ESE591
Course Title: project 1
Semester/Year: Second/ 2020-2021
Specialization: Mechanical Engineering
Credit Hours: 3
Lecture: 3 **Tutorial:** 0 **Lab:**

2- Course Objectives

Provide the students with the concepts and application of different mechanical engineering deplane in mechanical power engineering and how to implement this knowledge in the best practice and applied mechanical power engineering problems.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

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.

Level (B) Sustainable Energy Competencies

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

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 energyLevel

(D) University of Edinburgh Competencies

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

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.

4- Course Contents

a) **Fundamental of sensors**
b) **Application of sensor**
c) **Data acquisition system**
d) **Advanced measurements**
e) **Applied or practical of engineering problems in one of the power engineering issues**
f) **Applied and introducing the problem**
g) **Problem identification or test rig building**
h) **Problem analysis**
i) **Problem solving**
j) **Problem design**
k) **Simulation model**
l) **Obtaining results**
m) **Checking the validity of results**

5- Teaching and Learning Methods

5.1 Practical training / laboratory
5.2 Case study
5.3 Class activity
5.4 Reports

7- Student Assessment

a- Student Assessment Methods

a.1 Oral exam to assess what the student understood and how he can explain what he/she understood.

a.2 Final exam to assess the final skills and knowledge student level in this project.

a.3 Reports to assess gained knowledge and practical experience.

b- Assessment Schedule

NO.	Assessment	Week
1	Oral exam	14
2	Final exam	15

c- Weighting of Assessments

Assessment	Weight (%)
Semester Work	20
Oral Examination	20
Final Term Examination	60
Total	**100**

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- ■ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes: Course notes prepared by instructor

Course Coordinator: Prof. Ahmed Reda El shami

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: ESE504
Course Title: Power Stations
Semester/Year: Second/ 2020-2021
Specialization: Mechanical Engineering
Credit Hours: 3
Lecture: 2 **Tutorial:** 2 **Lab:**

2- Course Objectives

For students undertaking this course, they will be able to:

2.1 Principles of design of power stations.

2.2 Different fluid power systems.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.1 Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science and mathematics.

A.3 Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, economic and environmental aspects as appropriate to the Power Stations and within the principles and contexts of sustainable design and development.

Level (B) Sustainable Energy Competencies

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

B.2 Plan, manage and carry out designs of mechanical systems using traditional means contemporary to the mechanical engineering field support to energy and sustainable energy.

Level (D) University of Edinburgh Competencies

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

D.1 Classification, construction design concepts, operation and characteristics pumps, turbines and compressors according to current developments and technologies.

D.4 Work in a variety of energy systems operations, maintenance and overhaul.

4- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1 **A1**	Identify the vocabulary associated with Power stations cycles
LO3 **B2**	Carry out a new design of power station to support to energy and sustainable energy .
LO4 **D1**	classify pumps, turbines and compressor.
Psychomotor Domain	
LO2 A3	Deign the essential components of the power station based on the principles of energy conservation and economic consideration .
LO5 **D4**	View and perform the thermal analysis of the power station with different enhancement methods
Affective Domain	

5- Mapping Learning Outcomes (LO's) with Competencies

LO's / NARS	A1	A3	B2	D1	D4
Cognitive Domain					
LO1	■				
LO3			■		
LO4				■	
Psychomotor Domain					
LO2		■			
LO5					■
Affective Domain					

6- Course Contents

a) **Course Description** (As indicated in program Bylaw)

Steam power plants (Analysis of steam cycles (Rankine cycle, End conditions, Reheat cycle, Regenerative cycle, Power plant development, and Cogeneration) – Plant components (Turbines – Steam generators – Ancillary Systems) – Thermal analysis and power plant performance – Plant Operation and Control. Gas turbine power plant (simple plant components – Thermal Analysis and performance of each component (Inetrcooling – Reheat – Regenerative – Water injection). Steam/Gas turbine power plant (Combined Cycle). Desalination Plants (Principles of Sea water desalination – Operational techniques of thermal desalination – Desalination process categories – Multi-Effect Distillation (MED) – Multi-Stage Flash Distillation (MSF) – Reverse Osmosis (RO) – Forward Reverse Osmosis (FRO) – Plant economy and selection).

b) Topics to be Covered weekly & Matrix of Competencies

Week	Topics	Course LOs

		LO1	LO2	LO3	LO4	LO5
1	Introduction to power station	√	√			
2	Classification of traditional power station	√	√			
3	Steam station cycles & components	√	√			
4	Gas power station cycles	√	√			
5	Combined power cycles	√	√	√		√
6	Combined power cycles(conti)	√	√	√		√
8	Steam generators		√	√		√
9	Heat recovery Steam generators		√	√		√
10	air preheater and superheaters	√		√		√
11	Condensers and feedwater heaters		√	√		√
13	Pumps compressors and turbines				√	
14	Cogeneration Desalination cycles		√			

6- a) Teaching and Learning Methods

Course LOs		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
Cognitive Domain	LO1	√		√	√					√	√
	LO2	√	√	√	√					√	√
	LO4	√	√	√	√					√	√
Psychomotor Domain	LO3	√	√	√	√					√	√
	LO5	√		√						√	√

6- b) Teaching and Learning Methods of Disables

None

7 Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester

8- Student Assessment

a- Student Assessment Methods

Course Competencies		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Quizzes	Lab Exam	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	√					√	√	√		
	LO2	√	√				√	√	√	√	
	LO4	√	√				√		√		√
Psychomotor Domain	LO3	√	√				√	√	√	√	
	LO5	√					√		√	√	

b- Assessment Schedule and Weight

Assessment	Week	Weight
1st Midterm Exam.	7	30 %
Home Exam(Minin project).	12	10%
Final Examination	15	40 %
Attendance		10 %
Home assignments, and Reports	2, 5, 9, 11, 13	10%
Oral exam	-	0 %
Total		**100** %

9- Facilities

The following facilities are needed for this course:

- ■ Classroom
- ■ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

10- List of References

a- Course Notes

1- Course notes prepared by instructor and power Point presentation.

b- Books

1- Wärtsilä Brochure, Power Plants Solutions, 2013

2- P. Konstantin, Power and Energy Systems - Engineering Economics, SpringerVieweg, 2018

3- R. K. Rajput, "Text Book of Power Plant Engineering", 3rd edition CRC Inc.,India, 2005

4- M. M. El- Wakil, "Power Plant Technology", Mc. Grawhill Inc., 1984.

c- Recommended Books

1- W. A. Vopat, and G.A. Skrotzki, "Power Station Engineering and Economy", Mc. Grawhill Inc., 1960.

11- Matrix of Course Objectives and Competencies

Course Objectives	Course Competencies				
	LO1	LO2	LO3	LO4	LO5
Principles of design of power stations.	√	√	√		
Different fluid power systems		√	√	√	√

- Course Coordinator: R. K Ali **Signature: R k ALI**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: ESE525 Computer Applications in Fluid Mechanics **Semester/Year:** Second / 2020-2021
Prerequisite Course(s): MPE305 Numerical Methods for Engineers & MPE302 Applied Fluid Mechanics **Core or Elective:** Core Course
Credit Hours: 2 **Weekly Contact Hours**: **Lecture:** 1 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

This course aims to provide an understanding of the theoretical background of CFD and an introduction to its practical application including a selection of appropriate models and numerical methods and assessment of the quality of the results. Moreover, it presents guidelines about how to generate a grid, how to specify boundary conditions, and how to determine if the computer output is meaningful.

3- Course Contents (As indicated in the program Bylaw)

The course deals with how to set up and solve thermal-fluid problems with the ANSYS/CFX computational fluid dynamics code. The course requires each student to build a computational model of a practical thermal-fluids problem using CFX. Students will learn how to use ANSYS/CFX modules by recreating and modifying tutorials taken from the User Manual.

4- Program Competencies Served by The Course (B2 and D2)

Level (A) Engineering Competencies

-

Level (B) Mechanical Engineering Competencies

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

Level (D) Energy and Sustainable Energy Engineering Competencies

D.2 Apply quantitative methods and computer software relevant to energy and sustainable energy engineering, in order to solve engineering problems.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Recognize the concepts of Computer Applications in Fluid Mechanics (CFD) and their application to basic engineering problems to determine whether the output is physically meaningful.
LO2	Demonstrate the ability to use modern CFD software tools to build flow geometries, generate an adequate mesh for an accurate solution, select appropriate solvers to obtain a flow solution, and visualize the resulting flow field.
LO3	Identify the importance of a high-quality, good resolution mesh for an accurate solution.
LO4	Transform a real fluid-flow system into a simplified model problem and select the proper

	governing equations for the physics involved in the system, to solve for the flow, to investigate the fluid-flow behavior, and to understand the results.
LO5	Apply appropriate boundary conditions to computational domains for meaningful solution.
Psychomotor Domain	
LO6	Conduct a case study using the commercial computational fluid dynamics code ANSYS-FLUENT to obtain CFD solutions for incompressible laminar and turbulent flows, flows with heat transfer, and flows with free surfaces.
Affective Domain	

6- Mapping Learning Outcomes (LO's) with Competencies

LO's / NARS	B2	D2
LO1	■	
LO2	■	
LO3	■	
LO4		■
LO5	■	
Psychomotor Domain		
LO6		■
Affective Domain		

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes					
			LO1 B2-1	LO2 B2-2	LO3 B2-3	LO4 D2-4	LO5 B2-5	LO6 D2-6
W1	What are Computational fluid dynamics? • Importance of CFD. • Applications of CFD.	**2**	■					
W2	The theoretical background to the equations governing fluid flow in an appropriate formulation for CFD analysis	**2**	■					
W3	Main steps of solving a CFD case using ANSYS fluent	**2**	■	■				
W4	Geometry creation (ANSYS Design Molder)	**2**		■				
W5	Grid Generation and Grid Independence	**2**			■			
W6	Boundary conditions	**2**				■		
W7	Solution algorithms	**2**		■	■			
W8	Laminar CFD calculations • Pipe Flow Entrance Region at Re = 500	**2**		■	■			■
W9	Post-processing of results and validation	**2**				■		
W10	• Flow around a Circular Cylinder at Re = 150	**2**		■	■			■
W11	Post-processing of results and validation	**2**				■		
W12	Turbulent CFD calculations Flow around a Circular Cylinder at Re = 10,000	**2**			■		■	■
W13	Post-processing of results and validation	**2**				■		
W14	CFD with heat transfer	**2**		■	■			■

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●									
	LO2	●				●					●
	LO3	●		●		●					●
	LO4	●	●	●		●					
	LO5		●								
Psycho motor Domain	LO6		●			●			●		

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the timetable declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cog	LO1	●			●						●

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
		Assessment Methods									
	LO2	●				●					●
	LO3		●		●	●					
	LO4		●		●	●				●	
	LO5										
Psychomotor Domain	LO6	●				●	●			●	

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Second Midterm Examination	12	20%
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	5 %
Home assignments	3, 5,10,11	5%
Total		**100 %**

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

Lectures Notes in PDF (please click here) https://fengbuedu-my.sharepoint.com/personal/mohamed_emam_feng_bu_edu_eg/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fmohamed%5Femam%5Ffeng%5Fbu%5Fedu%5Feg%2FDocuments%2FTeaching%20Courses%2FComputer%20applications%20in%20fluid%20mechanics%20%28CFD%29

b- Books[1] [2]

1. Computational Methods for Fluid Dynamics 4th ed. 2020 Edition by Joel H. Ferziger (Author), Milovan Perić (Author), Robert L. Street (Author).
2. Computational Fluid Mechanics and Heat Transfer (Computational and Physical Processes in Mechanics and Thermal Sciences) 4th Edition by Dale Anderson (Author), John C. Tannehill (Author), Richard H. Pletcher (Author), Ramakanth Munipalli (Author), Vijaya Shankar (Author), 2020

c- Recommended Books

Computational Methods for Fluid Dynamics 4th ed. 2020 Edition by Joel H. Ferziger (Author), Milovan Perić (Author), Robert L. Street (Author).

- Course Coordinator: Dr. Mohamed Elsayed Mohamed Emam **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

Competence-Based Learning Outcomes Course Specifications (2nd Semester 2020/2021)

University:	Benha University
Faculty:	Faculty of Engineering at Shoubra
Department offering the program:	Mechanical Engineering Department
Department offering the course:	Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: ESE506 (Energy storage & transmission) **Semester/Year:** Second / 2020-2021
Prerequisite Course(s): ESE403, ESE501 **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 2 **Laboratory:** 0

2- Course Aims

The aim of this course is to identify different types of transmission line and also measure the transmission efficiency and voltage regulation for each type of transmission line and ability to calculate voltage drop on cables.

3- Course Contents (As indicated in the program Bylaw)

Introduction to energy resources, conversion, transmission & distribution, consumption. Forms of energy: Units of energy and power and important physical constants, Conservation of energy, energy conversion techniques. Electricity generation, transmission and storage. Energy consumption; Domestic and Industrial. Case studies. Introduction to green energy policy and climate change mitigation. Renewable energy systems: Wind power, Hydropower, Solar, Biomass and Biofuel, Geothermal. Case studies of major installations. Economics and politics of renewable energy systems. The structure, design and efficiency of electrical transmission grids will be introduced. Power electronic devices and their use in energy storage and conversion will be presented. Emphasis will be on the development of an integrated approach for the storage and transmission of energy and cost versus efficiency trade-off analysis of such systems.

4- Program Competencies Served by The Course (A3, B3, D4)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A3. Define Principles of design including elements design, process and a system related to power system analysis

Level (B) Electrical Engineering Competencies

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

B3. Design and implement elements, modules, sub-systems, or systems in electrical engineering using technological and professional tools.

Level (D) University of Edinburgh Competencies

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

D.4 Work in a variety of energy systems operations and maintenance.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Apply the block-diagram algebra to obtain the system transfer function.
LO2	Construct signal flow graph to calculate system transfer function using Mason's formula
LO3	Create a model of physical system & its mechanical network to write its differential equations.
Psychomotor Domain	

LO4	Select the proper state variables to obtain the dynamic equation of LTI system and its state transition matrix and/or state transition equation.
LO5	Design the proper PID controller to meet specific time-domain specifications of LTI system

6- Mapping Learning Outcomes (LO's) with Competences

LO's / NARS	A3	B3	D4
Cognitive Domain			
LO1	■		
LO2	■		
LO3		■	
Psychomotor Domain			
LO4		■	
LO5			■

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes				
			LO1 A3-1	LO2 A3-2	LO3 B3-3	LO4 B3-4	LO5 D4-5
W1	Introduction to energy resources, conversion, transmission & distribution, consumption	**4**	■				
W2	Forms of energy: Units of energy and power and important physical constants.	**4**	■				
W3	Conservation of energy, energy conversion techniques. Electricity generation, transmission and storage. Energy consumption; Domestic and Industrial. Case studies	**4**		■		■	
W4	Introduction to green energy policy and climate change mitigation. Renewable energy systems: Wind power, Hydropower, Solar, Biomass and Biofuel, Geothermal. Case studies of major installations	**4**		■		■	
W5	Economics and politics of renewable energy systems. The structure, design and efficiency of electrical transmission grids.	**4**		■		■	
W6	Economics and politics of renewable energy systems. The structure, design and efficiency of electrical	**4**		■		■	

Week	Topics	Planned Hours	Learning Outcomes LO1 A3-1	LO2 A3-2	LO3 B3-3	LO4 B3-4	LO5 D4-5
	transmission grids.						
W7	Economics and politics of renewable energy systems. The structure, design and efficiency of electrical transmission grids.	4		■		■	
W8	Mid-term exam						
W9	The structure, design and efficiency of electrical transmission grids.	4	■				
W10	The structure, design and efficiency of electrical transmission grids.	4	■				■
W11	Power electronic devices and their use in energy storage and conversion.	4			■		
W12	Power electronic devices and their use in energy storage and conversion.	4					■
W13	Development of an integrated approach for the storage and transmission of energy and cost versus efficiency trade-off analysis of such systems.	4			■		■
W14	Development of an integrated approach for the storage and transmission of energy and cost versus efficiency trade-off analysis of such systems.	4			■		■

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●	●					●	●

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
	LO3	●	●	●							
Psychomotor Domain	LO4		●	●			●			●	
	LO5	●		●	●		●	●	●	●	

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.
- Social media communication such as WhatsApp groups, Microsoft teams chat, … etc

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●			●				●		●
	LO2	●				●			●		●
	LO3		●		●	●			●		
Ps yc ho	LO4		●					●			

Learning Outcomes	Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Question
LO5	●			●	●	●			●	

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Second Midterm Examination	12	20%
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	5 %
Home assignments	3, 5,10,11	5%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

Lectures Notes in PDF
Handed out to the students' part by part.

b- Books

1. V. Y. Ushakov "Electrical Power Engineering", 1st edition, Springer, Cham 2018.
2. L.L.Grigsby "Electrical Power Generation, Transmission and distribution", 3rd edition, 2012.
3. H. Sadaat. "Power System Analysis", 3rd edition, 2008
4. V.K. Mehta. "Principles of Power System", 5th edition, 2005.
5. D.P.Kothari. "Modern Power System Analysis", 3rd edition, 2003.

c- Recommended Books

1. V. Y. Ushakov “Electrical Power Engineering”, 1st edition, Springer, Cham 2018.

- Course Coordinator: Prof. Dr. Mohamed Ahmed Ebrahim **Signature:**

Dr. Hosam Abdel Razzak **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data (Basic Information)

Course Code & Title: EPM501 Power Electronics **Semester/Year:** Second / 2020-2021
Prerequisite Course(s): ELC301 Electronic Engineering **Core or Elective:** Core Course
Credit Hours: 3 **Weekly Contact Hours**: **Lecture:** 2 **Tutorial:** 0 **Laboratory:** 3

2- Course Aims

The aim of this course is to provide students with the various types and characteristics of power electronics switches. Moreover, employ the models of AC/DC converters (rectifiers), DC/AC converters (inverter), AC/AC regulators and DC/DC chopper circuits. and determine the performance of the converters with different types of loads. Finally, identify the methods of control of the different converters.

3- Course Contents (As indicated in the program Bylaw)

Power semiconductor devices: types, construction, characteristics, and rating values. Operation and performance analysis of single-phase and three-phase uncontrolled, controlled, and semi-controlled rectifier circuits with different loads. Effect of supply and load inductances on the performance of rectifier circuits. Operation and performance analysis of single-phase voltage-source inverter circuits. Electronic control circuits of alternating voltage: methods of control, operation, and performance analysis of single-phase and three-phase alternating voltage regulators. DC chopper circuits: operation, performance analysis of step-down and step-up chopper circuits. Performance analysis of direct voltage regulators.

4- Program Competencies Served by The Course (A.2, A.6 and B.3)

Level (A) Engineering Competencies

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.6 Plan, supervise and monitor implementation of engineering projects, taking into consideration other trades requirements.

Level (B) Mechanical Engineering Competencies

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.

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Recognize various types and the characteristics of power electronic switches
LO2	Analyze different types of power electronics converters
LO3	Formulate the models of rectifiers, inverters, DC chopper, and AC regulators
Psychomotor Domain	
LO4	Modify the performance of rectifier circuits and inverters

LO5	Observe the performance of AC and DC regulators
Affective Domain	
LO6	Develop some applications using different power electronics converters

6- Mapping Learning Outcomes (LO's) with Competencies

LO's \ NARS	A2	A6	B3
Cognitive Domain			
LO1	■		
LO2			■
LO3			■
Psychomotor Domain			
LO4		■	
LO5		■	
Affective Domain			
LO6	■		

7- Lecture Plan

a) Topics to be Covered weekly & Matrix of LO's

Week	Topics	Planned Hours	Learning Outcomes					
			LO1 A2-1	LO2 B3-2	LO3 B3-3	LO4 A6-4	LO5 A6-5	LO6 A2-6
W1	• Power semiconductor devices: types, construction, characteristics, and rating values. • **Lab: I-V ch/s of Diode, SCR, Mosfet**	**2** **3**	■					
W2	• Operation and performance analysis of single-phase uncontrolled rectifier circuits with different loads • **Lab: Output voltage and current waveforms of a single-phase uncontrolled rectifier circuit with R-load and RL-load**	**2** **3**		■		■		
W3	• Operation and performance analysis of three-phase uncontrolled rectifier circuits with different loads. • **Lab: Output voltage and current of a three-phase uncontrolled rectifier circuit with R-load and RL-load.**	**2** **3**		■		■		
W4	• Operation and performance analysis of single-phase controlled and semi controlled rectifier circuits with different loads. • **Lab: Output voltage and current waveforms of a single-phase controlled rectifier circuit with R-load and RL-load.**	**2** **3**		■		■		
W5	• Effect of supply and load inductances on the performance of rectifier circuits. • **Lab: Output voltage and current waveforms of a single-phase controlled rectifier circuit with R-load and RL-load.**	**2** **3**			■			

W6	• Operation and performance analysis of single-phase voltage-source inverter circuits. • **Lab: waveforms of square wave single-phase inverter with R-load and RL-load**	**2** **3**			■			
W7	• Electronic control circuits of alternating voltage: methods of control, operation, and performance analysis of single-phase using ON/OFF control. • **Lab: Analysis of AC/AC converter with R-load.**	**2** **3**					■	
W8	• Electronic control circuits of alternating voltage: methods of control, operation, and performance analysis of single-phase using phase-angle control. • **Lab: Light dimmer circuit**	**2** **3**					■	
W9	• Analysis of three-phase alternating voltage regulators. • **Lab: Simulation of a three-phase AC/AC voltage regulators using Matlab.**	**2** **3**					■	
W10	• DC chopper circuits: operation, performance analysis of step-down converter. • **Lab: Difference between linear regulator and Chopper circuit.**	**2** **3**					■	
W11	• Performance analysis of DC/DC step-up chopper circuits. • **Lab: Effect of changing duty cycle and load resistance on the output voltage af a step up converter.**	**2** **3**				■	■	
W12	• Performance analysis of direct voltage regulators (Buck and Boost converters). • **Lab: Design the parameters of a buck and boost converter.**	**2** **3**		■	■	■		
W13	• Performance analysis of direct voltage regulators (Buck/Boost converters). • **Lab: Setup a buck or boost converter (Prototype)**	**2** **3**		■	■	■		
W14	• Discussion of the mini-projects and applications • **Lab: Presentation and discussion of the prototype project**	**5**						■

b) Additional private study/learning hours expected for students per week is FOUR hours

8) Teaching and Learning Methods

Learning Outcomes	Teaching and Learning Methods

		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-Reading	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●						●	●
	LO2	●		●		●			●		●
	LO3	●	●	●							
Psychomotor Domain	LO4		●	●			●			●	●
	LO5		●	●			●	●		●	
Affective Domain	LO6				●	●				●	

Student Academic Counseling and Support

- Students are directed to contact teaching staff for academic support during specific office hours.
- Regarding this course, Instructor and TA will be available two hours a week as indicated on the timetable declared for students from the beginning of the semester.

9- Student Assessment

a) Student Assessment Methods

Learning Outcomes		**Assessment Methods**									
		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cogni tive Doma	LO1	●			●			●			●
	LO2	●		●		●			●		●

Learning Outcomes		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
	LO3	●		●	●						
Psychomotor Domain Affective	LO4	●					●				●
	LO5	●					●	●	●		●
Affective Domain	LO6			●	●				●	●	

b- Assessment Schedule and Weight

Assessment Tools	Week	Weight
First Midterm Examination	7	30 %
Final Examination	(As Scheduled)	40 %
Quizzes (3 times)	3, 5, 9	15 %
Home assignments	3, 5,10,11	15%
Total		**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- ■ Computer with software
- ■ MIS system
- ■ Internet Access

11- List of References

a- Course Notes

Lectures Notes in Microsoft team

b- Books

1. Miguel Castilla. "Control Circuits in Power Electronics", 1st edition, The Institution of Engineering and Technology, 2016.
2. Robert W. Erickson, "Fundamental of Power Electronics ",Springer, 3rd Edition, 2020.
3. P.S. Bimbhra: "Power Electronics", Khanna Publishers, India, 2007

c- Recommended Books

1. Daniel W. Hart: "Power Electronics", McGraw-Hill Companies, USA, 2011
2. M. H. Rashid: "Power Electronics, Circuits, Devices and Applications", Third Edition, Prentice Hall, 2003

- Course Coordinator: Dr. Khaled Hassanen **Signature:**

Dr. Islam Mohamed **Signature:**

- Program Coordinator: Prof. Dr. Ahmed Reda Elshamy **Signature:**

University: Benha University
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: ESE512 | **Course Title:** Geothermal Energy
Semester/Year: Second / 2020-2021 | **Specialization:** Energy Sustainable Engineering
Credit Hours: 3 | **Lecture:** 2 **Tutorial:2** **Lab:** -

2- Course Aims

The aim of this course to make student familiar with geothermal energy resources and their applications through the achievement of the following objectives.

1. Investigate the potential of geothermal energy resources.
2. Design direct use, power generation, and heat pump applications using geothermal energy.

3- Course Content

Overview of Geothermal Energy, Introduction (conduction, convection and radiation), Thermal Properties of Rock and Governing Equation, Heat Transfer in rock - Thermal Properties of Rock and Governing Equation, Fluid flow in rock (Fundamentals), Fluid Flow in Rock (Porous and Fractured Rock Systems), Reservoir Geomechanics (hydraulic stimulation & other issues), Direct Use of Geothermal Energy and Geothermal Heat Pump, Enhanced Geothermal System (EGS), Climate Change and Emerging Subsurface Engineering Applications (Geothermal, CO2 Geo sequestration, Underground Storage System), Natural Geothermal Resources , Engineered Geothermal Resources , Introduction and Operating Principle - Geothermal Resource Potentials - System Components - Basic Performance and Cost - Applications and Case Studies - Future Prospects, Constraints and Trends.

4- Program Competencies Served by The Course (A4, B1, D2 and D4)

Level (A) Engineering Competencies

On completing this course, students will be able to:

A.4 Utilize contemporary technologies, codes of practice and standards, quality guidelines, health and safety requirements, environmental issues, and risk management principles.

Level (B) Mechanical/ Electrical Power Engineering Competencies

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

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.

Level (D) Energy & Sustainable Energy Engineering Competencies

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

D.2 Apply quantitative methods and computer software relevant to energy and sustainable energy engineering, to solve engineering problems.

D.4 Work in a variety of energy systems operations, maintenance, and overhaul

5- Learning Outcomes (LO's)

At the end of the course, the student will be able to:

Cognitive Domain	
LO1	Illustrate the advantage and disadvantage of the geothermal energy and its applications.
LO2	Asses the geothermal resource potential for use.
LO3	Evaluate the thermal performance of geothermal energy systems.
Psychomotor Domain	
LO4	Use computer software to evaluate the thermal performance geothermal systems.
LO5	Design heat exchangers for geothermal applications.
Affective Domain	
LO6	Recognize the importance of geothermal energy use
LO7	Select the appropriate application for a geothermal source

6- Mapping Learning Outcomes (LO's) with Competencies

LO's / NARS	A4	B1		D2	D4
Cognitive Domain					
LO1				■	
LO2	■				
LO3	■				
Psychomotor Domain					
LO4				■	
LO5		■			
Affective Domain					
LO6					■
LO7					■

7- lecture Plan

a- Topics to be Covered weekly & Learning Outcomes

Week	Topics	Planned Hours	Learning Outcomes						
			LO1	LO2	LO3	LO4	LO5	LO6	LO7
1	Overview of Geothermal Energy	4	■					■	
2	Sources of Geothermal Heat	4		■					
3	Subsurface Fluid Flow	4							

4	Exploring Geothermal System	4		■					
5	Geothermal Resource Potentials	4		■					■
6	Direct Use of Geothermal Energy	4			■			■	
7	Heat Exchanger Systems	4				■	■		
8	Heat Engine Systems	4			■	■			
9	Heat Engine Systems	4			■				
10	Heat Engine Systems	4			■				
11	Heat Pump systems	4			■				
12	Heat Pump systems	4				■			
13	Enhanced Geothermal System (EGS)	4							■
14	Piping and Pumping Systems	4					■		

8- Teaching and Learning Methods

8-a Teaching and Learning Methods

Learning Outcomes		Teaching and Learning Methods									
		Face-to-face Lecture	Online Lectures	Tutorial / Exercise	Group Discussions	Laboratory	Self-learning	Presentation	Collaborate Learning (Team Project)	Research and Reporting	Brain Storming
Cognitive Domain	LO1	●		●							●
	LO2	●		●			●				●
	LO3	●		●							●
Psychomotor Domain	LO4	●		●		●					●
	LO5	●	●.	●		●					●
Aff ect iv	LO6	●		●							●

	LO7	●		●							●

Student Academic Counseling and Support

- in addition to the teaching and learning methods assigned throughout the course (section 5a), extra office hours will be provided to deal with the academic needs of students.

9- Assessment Methods

a) Student Assessment Methods

Learning Outcomes		Assessment Methods									
		Written Exams	Online Exams	Oral Exam	Pop Quizzes	In-class Problem Solving	Take-Home Exam	Research Assignments	Reporting Assignments	Project Assignments	In-class Questions
Cognitive Domain	LO1	●			●						
	LO2	●							●		
	LO3				●						
Psychomotor Domain	LO4									●	
	LO5	●			●					●	
Affective Domain	LO6	●									
	LO7	●									

b- Assessment Schedule and Weight

Assessment	Week	Weight
Assignments	3,5,11,13	5%
midterm Examination	8	30%
Quizzes	5,13	5%
Final exam	(As Scheduled)	40%
Oral exam/ Design Project	7, 14	20%
Total	15	**100** %

10- Facilities

The following facilities are needed for this course:

- ■ Classroom
- □ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

11- List of References

a- Course Notes

1- Course notes prepared by instructor.

b- Books

1- William E. Glassley, Geothermal Energy: Renewable Energy and the Environment, Second Edition, CRC Press, Taylor & Francis Group, 2015.

2- Andrew D. Chiasson, Geothermal Heat Pump and Heat Engine Systems: Theory And Practice, ASME Press and John Wiley & Sons, Ltd, 2016.

c- Recommended Books

3- Ronald DiPippo, Geothermal Power Plants: Principles, Applications, Case Studies and Environmental Impact, Elsevier, 2016.

4-

d- Web Sites

1-

- **Course Coordinator:** Prof. Dr. Ramadan Sakr **Signature:**

Prof. Dr. Nabeel Shafiek **Signature:**

- **Program Coordinator:** **Prof. Dr. Ahmed Reda Elshamy** **Signature:**

University: **Benha University**
Faculty: Faculty of Engineering at Shoubra
Department offering the program: Mechanical Engineering Department
Department offering the course: Energy and Sustainable Energy Engineering Program

1- Course Data

Course Code: ESE592
Course Title: project 2
Semester/Year: Second/ 2020-2021
Specialization: Mechanical Engineering
Credit Hours: 3
Lecture: 3 **Tutorial:** 0 **Lab:**

2- Course Objectives

Provide the students with the concepts and application of different mechanical engineering deplane in mechanical power engineering and how to implement this knowledge in the best practice and applied mechanical power engineering problems.

3- Course Competencies (NARS)

Level (A) Engineering Competencies

On completing this course, students will be able to:

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.

Level (B) Sustainable Energy Competencies

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

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 energyLevel

(D) University of Edinburgh Competencies

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

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.

4- Course Contents

a) Fundamental of sensors
b) Application of sensor
c) Data acquisition system
d) Advanced measurements
e) Applied or practical of engineering problems in one of the power engineering issues
f) Applied and introducing the problem
g) Problem identification or test rig building
h) Problem analysis
i) Problem solving
j) Problem design
k) Simulation model
l) Obtaining results
m) Checking the validity of results

5- Teaching and Learning Methods

5.1 Practical training / laboratory
5.2 Case study
5.3 Class activity
5.4 Reports

7- Student Assessment

a- Student Assessment Methods

a.1 Oral exam to assess what the student understood and how he can explain what he/she understood.
a.2 Final exam to assess the final skills and knowledge student level in this project.
a.3 Reports to assess gained knowledge and practical experience.

b- Assessment Schedule

NO.	Assessment	Week
1	Oral exam	14
2	Final exam	15

c- Weighting of Assessments

Assessment	Weight (%)
Semester Work	20
Oral Examination	20
Final Term Examination	60
Total	**100**

8- Facilities

The following facilities are needed for this course:

- ■ Classroom
- ■ Lecture Hall
- □ Sound and Microphone
- □ Other: …………………
- □ Smart Board
- ■ White Board
- ■ Data Show
- □ Computer with software
- □ MIS system
- □ Internet Access

9- List of References

a- Course Notes: Course notes prepared by instructor

Course Coordinator: Prof. Ahmed Reda El shami