Program Specification

For

Diploma Degree

in

Mechanical Power Engineering

Program Specification
For
Diploma Degree in
Mechanical Power Engineering

A- Basic Information

1- Program title: Diploma in Mechanical Power Engineering..

2- Program type: **Single** ✓ **Double** ☐ **Multiple** ☐

3- Department (s): Mechanical Power Engineering.
Coordinator: Dr. Yassen El-Sayed Yassen
Assistance Coordinator:
4- External evaluator(s): NA
5- Last date of program specifications approval: Bylaw 2000.

B- Professional Information

1- Program aims:

- Understanding the engineering basic sciences.
- Preparing students for a professional career with a broad knowledge of basic and practical mechanical engineering with high emphases on energy conversion and power generation.
- Developing heat engines and reversed heat engines.
- Developing methods for reducing the pollutant emissions from different systems.
- Develop the sense of praising fuel economy and environmental issues.
- Communicating effectively in written, verbal and graphical forms.
- Preparing students to communicate and work effectively in team and multi-disciplinary technical environments.

2- Graduate Attributes :

After completing the program the graduate would able to be:

A. Application of the acquired specialized knowledge in his/her professional practice.
B. Identifying professional problems and proposing solutions.
C. Mastering of professional skills and the use of appropriate technological means in his/her professional practice.
D. Communication and leadership of a team to work through systematic professional work.
E. Decision making in the light of available information.
F. Employment of available resources efficiently.
G. Awareness of his/her role in the development of society and the preservation of the environment.

H. Act reflects commitment to integrity and credibility of the profession.
I. Awareness of the need to develop him/her self and to engage in continuous learning.

3- Intended Learning Outcomes (ILOs) for the whole program

Mechanical Power Egineering Diploma Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

A. Knowledge and understanding			
NAQAAE Academic Reference Standards (ARS)	**ILOs**	**Graduate Attributes**	**Courses Covering such ILOs (by code)**
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-1 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Internal Combustion Engines**.	A, C	MEP526, MEP532, MEP564, MEP547, MEP584, Project(MEPP98)
	a1-2 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Air Conditioning and Ventialation**.		MEP526, MEP532, MEP564, MEP547, Project(MEPP98)
	a1-3 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Thermal Power Plants**.		MEP526, MEP532, MEP564, MEP572, MEP574, MEP576, MEP547, MEP573, MEP506, MEP575, MEP584, Project(MEPP98)
	a1-4 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Fluids Engineering and Pumping**.		MEP526, MEP532, MEP564, MEP508, MEP509, MEP510, MEP537, MEP513, MEP514, MEP512, MEP517, Project(MEPP98)
	a1-5 Exhibit ability to indetail, creatively, with a high level of clarity and authority, using scientific scrutiny and adequate tools identify, explain, and assess issues pertinent to a Diploma Project in the research field, within which the project is placed.	A, B, C, D, E, F	Project(MEPP98)
A2- Mutual relation between professional aspects of professional practice and its effects on the Environment.	a2-1 Discuss Social effects of mechanical power egineering technologies.	G	MEP526, MEP532, MEP564, Project(MEPP98)
	a2-2 Recognize the interaction between mechanical power technologies and surrounding environment		Project(MEPP98)

A3- Fundamentals of ethical & legal professional practice in the field of specialization.	a3-1 Recognize ethnical and professional responsibility issues arising in the practice of the engineering profession.	H	MEP547, MEP584, Project(MEPP98)
A4- Basics and principles of quality in professional practice in the field of specialization.	a4-1 Explain Quality Assurance concepts of different mechanical power components and systems development phases.	C, E, F	MEP547, Project(MEPP98)
B. Intellectual skills			
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	A	MEP526, MEP532, MEP564, MEP547, MEP572, MEP574, MEP576, MEP573, EP506, MEP575, MEP508, MEP509, MEP510, MEP537, MEP513, MEP514, MEP512, MEP517
	b1-2 Interpret, analyze, and evaluate a given system specification information and relate it to the design of the required system.		MEP572, MEP574, MEP576, MEP573, MEP506, MEP575, Project(MEPP98)
B2- Solve specialized problems in the field of practice.	b2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with incomplete data) related to mechanical power engineering.	A, B	MEP508, MEP509, MEP510, MEP537, MEP513, MEP514, MEP512, MEP517
B3- Analytical reading researches and subjects relevant to the field of specialization	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	A, B, E, F	MEP526, MEP532, MEP564, MEP547, MEP584
	b3-2 Perform applied research on industrial and societal concerns problems related to mechanical power engineering field (Project).		Project(MEPP98)
B4- Risk assessment in the professional practices.	b4-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.	G, H	MEP547, MEP572, MEP574, MEP576, MEP573, EP506, MEP575, Project(MEPP98)
B5- Take professional decisions in the light of available information.	b5-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design and development mechanical power engineering systems.	E	Project(MEPP98)
C. Professional and practical skills			
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and	A, B, C	MEP526, MEP532, MEP564, MEP547, MEP584MEP572, MEP574, MEP576, MEP573, MEP506, MEP575, MEP508, MEP509, MEP510, MEP537,

	tools.		MEP513, MEP514, MEP512, MEP517, Project(MEPP98)
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power egineering tchnical matters.	I	MEP526, MEP532, MEP564, MEP547, MEP584MEP572, MEP574, MEP576, MEP573, MEP506, MEP575, MEP508, MEP509, MEP510, MEP537, MEP513, MEP514, MEP512, MEP517, Project(MEPP98)
D. General and transferrable skills			
D1- Communicate effectively using all methods.	d1-1 Express professional and communication skills to innovate and to interact with the scientific community, research team and technocrats involved in multinational companies at global level in the related fields to mechanical power egineering.	D	Project(MEPP98)
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power egineering problems.	C, F, I	MEP526, MEP532, MEP564, MEP547, MEP584, MEP572, MEP574, MEP576, MEP573, MEP506, MEP575, MEP508, MEP509, MEP510, MEP537, MEP513, MEP514, MEP512, MEP517, Project(MEPP98)
	d2-2 Employ the information technology skills to serve his / her career development.		Project(MEPP98)
D3- Apply self evaluation and define personal educational needs.	d3-1 Apply self evaluation and specify his educational needs related to mechanical power egineering aspects.	I	Project(MEPP98)
D4- Use different resources to obtain knowledge and information.	d4-1 Use different resources of information like libraries, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	I	MEP526, MEP532, MEP564, MEP547, MEP584, MEP572, MEP574, MEP576, MEP573, MEP506, MEP575, MEP508, MEP509, MEP510, MEP537, MEP513, MEP514, MEP512, MEP517, Project(MEPP98)
D5- Work in a team and apply time management.	d5-1 Practicing team working, and lead teams in specified professional jobs.	D, F	Project(MEPP98)
	d5-2 Manage time perfectly.		Project(MEPP98)
D6- Lead teams in familiar professional context	d6-1 Lead a team work in specified familiar professional jobs.	D	Project(MEPP98)
D7- Learn independently and seek continuous learning.	d7-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	I	MEP508, MEP513, MEP514, MEP512, MEP517, Project(MEPP98)
	d7-2 Seek continuous learning		MEP509, MEP510, MEP526,

	through continuous education, organizing and participating in seminars, workshops, national and international conferences.		MEP532, MEP564

4- Program Academic Reference Standards (ARS)

The external references for standards considered in the development of this program were the Academic Reference Standards (ARS) for postgraduate programs prepared by the National Authority for Quality Assurance and Accreditation (NAQAAE) on 2009. These standards set out the attributes and academic characteristics that are expected to be achieved by the end of the program.

5- Program Structure and Contents:

5.1 Program Duration: Two academic years

5.2 Program Structure:

- Awarding a Diploma Degree in Mechanical Power Engineering Sciences required the study successfully courses amounting to 36 hours, distributed over two academic years according to the tables given in the study plan for each scientific department. These courses are chosen from among the 500 – level. Enrollment for Diploma Degree in Mechanical Power Engineering Sciences requires that the students should have been graduated in their B.Sc. Degree and in the same field of specialization from any Faculty of Engineering of an Egyptian University or equivalent.

- Grades for all postgraduate courses as well as the overall grade are evaluated as follows:

Distinction	90% or more
Very Good	80% - less than 90%
Good	70% - less than 80%
Pass	60% - less than 70%

- The student fails if he enters the exam and gets less than 60% of the total mark. In case the student fails in a certain course and repeats the exam, his grade in that succeeds should not be more than the higher limit for the Pass.

5.3 Program Contents (Courses) **:

- **Diploma : Thermal Power Plants**

Course Code	Course Title	Course Hrs/Week	Total Marks
First Year			
MEP526	Advanced Fluid Mechanics	3	100
MEP532	Heat And Mass Transfer	3	100
MEP564	Advances Thermodynamics	3	100
MEP572	Steam Power Plants	3	100
MEP574	Nuclear Power Plants	3	100
MEP576	Operation and Maintenance of Thermal Power Plants	3	100
Second Year			
MEP547	Energy Rationalization *	3	100

MEP573	Gas Turbine and Diesel Engine Power Plants	3	100
MEP506	Steam Equipment and Piping	3	100
MEP575	Control and Sefety Instruments in Power Plants	3	100
MEP584	Economics of Power Generation	3	100
MEPP98	project	3	100

* Elective Course

- **Diploma : Fluids Engineering and Pumping**

Course Code	Course Title	Course Hrs/Week	Total Marks
First Year			
MEP526	Advanced Fluid Mechanics	3	100
MEP532	Heat And Mass Transfer	3	100
MEP564	Advances Thermodynamics	3	100
MEP508	Pump Design (1)	3	100
MEP509	Pipe Networks and Reservoirs	3	100
MEP510	Operation and Maintenance of Pumps	3	100
Second Year			
MEP537	Energy and Environment *	3	100
MEP513	Pumping Stations	3	100
MEP514	Pump Design (2)	3	100
MEP512	Control of Pumps	3	100
MEP517	Computer Applications in Fluids Engineering and Pumping	3	100
MEPP98	project	3	100

* Elective Course

** The rest of the course were frozen diplomas non-disabled (nine diplomas) during the previous five years, according to council resolution department in 11/25/2012 and new date 30/4/2017.

6- Evaluation of program intended learning outcomes:

- Written examinations at the end of each academic year (after 30 weeks).

7- Program Matrix:

The following table explains the ILO's (of the current program) – Course (main ILOs) matrix.

Program Matrix: ILO's (of the current program) – Course (main ILOs) matrix.

Courses Codes	MEP																			Project
	526	**532**	**564**	**547**	**584**	**572**	**574**	**576**	**573**	**506**	**575**	**508**	**509**	**510**	**537**	**513**	**514**	**512**	**517**	**MEP P98**
ILOs																				
a1-1	x	x	x	x	x															x
a1-2	x	x	x	x																x
a1-3	x	x	x	x		x	x	x	x	x	x									x
a1-4	x	x	x									x	x	x	x	x	x	x	x	x
a1-5																				x
a2-1	x	x	x																	x
a2-2																				x
a3-1																				x
a4-1																				x
b1-1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
b1-2						x	x	x	x	x	x									x
b2-1												x	x	x	x	x	x	x	x	
b3-1	x	x	x	x	x															
b3-2																				x
b4-1																				x
b5-1																				x
c1-1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
c2-1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
d1-1																				x
d2-1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
d2-2																				x
d3-1																				x
d4-1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
d5-1																				x
d5-2																				x
d6-1																				x
d7-1												x				x	x	x	x	x
d7-2	x	x	x										x	x						

* Course Specification in progress (going on)

- ***Program Coordination Committee:***

Programme coordinator: **Dr. Yassen El-Sayed Yassen**

Head of the Department: **Prof. Dr. Kamal Ameen Murad**

Date: / /

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Engineering
Department offering the course	Mechanical Engineering
Academic year/Level	2nd year
Date of specification approval	*2020*

A- Basic Information

Title: Steam equipment and piping	Code Symbol: MEP 506	
Lecture	3 hours	
Tutorial	-	
Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims

The aims of this course are to provide the post graduate student, upon completing the course program, with the basic knowledge and skills of definitions, principles and applications of steam equipment and piping and the problems associated with it within the following topics such as:
Steam equipment for boilers, water and steam valves, steam strainers, steam traps, steam flow rates, types of steam pipes.
Solved examples enable the post graduate students to interpret the working of the steam equipment and piping and characteristic study of some individual components, along with energy analysis

2- Course Objectives

- Knowledge and practice the features of steam equipment and piping
- Knowledge and understanding the methodologies of solving engineering problems in fluid and thermal engineering applications
- Knowledge and understanding of the different types of steam equipment and piping.

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-3 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of Thermal Power Plants.	a-1-3-1 Define the concepts of physical meaning and phenomena used in steam equipment and piping.
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to steam equipment and piping based on the flow equations analysis.
	b1-2 Interpret, analyze, and evaluate a given system specification information and relate it to the design of the required system.	b1-2-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to steam equipment and piping
B4- Risk assessment in the professional practices.	b4-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.	b4-1-1 Evaluate pros and cons of given methodologies for steam equipment and piping development.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to steam equipment and piping

	solutions, using latest engineering techniques, skills, and tools.	engineering problems, using latest engineering techniques, skills, and tools.
C2- Write professional reports.	c2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on steam equipment and piping
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to steam equipment and piping
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about steam equipment and piping.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1,2	Steam equipment for boilers	6	6	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-3,4,5	water feeding tanks for industrial boilers, water pumps for boilers	9	9	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-6,7,8	water and steam valves, boiler blow down systems	9	9	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-9,10	steam strainers, steam traps	6	6	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-11,12	pressure inducing valves	6	6	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-13,14,15,16	air vents and vacuum breakers, equipment to control steam flow rates	12	12	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-17,18,19,20	methods of measure, steam	12	12	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1

	flow rates					
Week-21,22	design of steam pipes lines, thermal insulation of steam pipe lines	6	6	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-23,24,25,26	types of steam pipes, installation of steam pipe lines	12	12	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-27,28,29,30	expansion in steam pipe lines, methods of condensation recovery in steam pipe lines	12	12	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
	total	90	90			

5- Relationship between the Course and the Programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contributes in achieving.	A1 (a1-3),	B1 (b1-1), (b1-2) B4 (b4-1),	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D4 (d4-1)

6- Course Subject Area

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	---	---	---	100%

7- Course Topics

Topic No.	Topic	Weeks
1st	Steam equipment for boilers	1,2
2nd	water pumps for boilers	3-5
3rd	water and steam valves	6-8
4th	steam traps	9,10
5th	pressure inducing valves	11.12
6th	equipment to control steam flow rates	13-16
7th	methods of measure	17-20
8th	design of steam pipes lines	21,22
9th	types of steam pipes	23-26

10th	expansion in steam pipe lines	27-30

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics									
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Knowledge & Understanding	a-1-3-1 Define the concepts of physical meaning and phenomena used in Thermal Power Plants	x	x	x	x	x	x	x	x	x	x
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to thermal power plants based on the flow equations analysis.	x	x	x	x	x	x	x	x	x	x
	b1-2-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Thermal Power Plants	x	x	x	x	x	x	x	x	x	x
	b4-1-1 Evaluate pros and cons of given methodologies for Thermal Power Plants development.	x	x	x	x	x	x	x	x	x	x
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to thermal power plants problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x	x	x	x
	c2-1-1 Write and evaluate a professional report on thermal power plants.	x	x	x	x	x	x	x	x	x	x
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to thermal power plants	x	x	x	x	x	x	x	x	x	x

	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about thermal power plants.	x	x	x	x	x	x	x	x	x	x	x

9- Teaching and Learning Method

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modeling	Playing
Knowledge & understanding	a1-3-1	x		x		x								
Intellectual Skills	b1-1-1	x		x	x	x								
	b2-1-1													
	b4-1-1	x		x	x	x			x					
Professional Skills	c1-1-1			x	x	x	x		x	x	x			
	c2-1-1	x		x	x	x								
General Skills	d2-1-1	x		x	x	x			x	x	x			
	d4-1-1			x	x				x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.

	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exam	Monitoring
Knowledge & Understanding	a1-3-1	x											
Intellectual Skills	b1-1-1	x											
	b1-2-1	x											
	b4-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities Required for Teaching and Learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of References

[1] EL WAKIL, M.M.,: Powerplant Technology, McGraw-Hill, 1984.
[2] Weston, K.C.,: Energy Conversion, e-book, 2000.
[3] Gosami,D.Y., and F. Kreith: Energy Conversion, e-book, 2008.
[4] Ganapathy, V.,: Industrial Boilers Design, Applications, and Calculations, e-book, 2003.
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[6] Singer, J.G.,: Combustion Fossil Power, e-book, 1991.
[7] Thumann, A., and D. B. Mehta,: Handbook of Energy Engineering, e-book, 2000.
[8] Ganapathy, V.,: Industrial Boilers and Heat Recovery Steam Generators, e-book, 2003.
[9] Snthony, E.J.,: Fluidized Bed Combustion, e-book, 2004.
[10] Raja, A. K., et. al.,: Power Plant Engineering, e-book,2006.
[11] Petchers, N.,: Combined Heating Cooling and Power Handbook Technologies & Applications, e-book, 2003.

Course coordinator: Dr. Amany Saif

Prof. Dr. Kamal Ameen Morad
Head of Mechanical Power Engineering Department

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	1st year
Date of specification approval	***2020***

A- Basic Information

Title: **Advanced Fluid Mechanics**	**Code Symbol**: **MEP526**	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The major aim of this course is to understand the basic concepts of fluid dynamics, thermal fluid and get better understanding of different flow regimes. To help the post graduate students to add more information about laminar and turbulent flows, viscous and non-viscous fluids, Laminar and turbulent flows, Turbulence modeling, fluid measurements, and Multiple-pipe systems. Also, get more knowledge about the Total head losses in pipe systems and its engineering application. Analyze the fluid around immersed bodies. This course will also provide students with the ability to select and design of the experimental model by using dimensional analysis and similarity. Discuss the all phenomena associated with such type of flows and different parameters.

2- Course Objectives

1- Demonstration of the knowledge and understanding of the importance of study of advanced fluid mechanics
2- Definitions of the viscous flows, dimensional analysis and similarity, and fluid around immersed bodies as related to practical applications.
3- Reconcilability of the different equations for fluid flow with different applications.
4- Analysis of different fluid mechanics problems.

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-4 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Fluids Engineering and Pumping**.	a1-4-1 Understand basics of fluid mechanics and hydraulics
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to fluid mechanics and mechanical power engineering.
B3- Analytical reading researches and subjects relevant to the field of specialization**.**	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	b3-1-1 Select the suitable measuring scheme for boundary layer thickness based on analysis.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques,	c1-1-1 Apply the knowledge of mathematics and fluid mechanics to fluid flow in motion.

	skills, and tools.	
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on fluid mechanics problems.
D. General and transferable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to fluid mechanics.
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about advanced fluid mechanics.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1:4	**Kinematics of fluid motion**	**12**	**9**	**3**	-	a1-4
Week-5:8	**Flow of incompressible ideal fluids**	**12**	**9**	**3**	-	a1-4,b-1-1,b3-1
Week-9:12	**Flow of compressible ideal fluids**	**12**	**9**	**3**	-	a1-4, b1-1, c1-1
Week-13:16	**Impulse momentum principle**	**12**	**9**	**3**	-	a1-4, b1-1, c1-1
Week-17:19	**Similitude and dimensional analysis**	**9**	**6**	**3**		a1-4, b1-1, c1-1

Week20:22	**Fluid flow in pipes**	**9**	**6**	**3**	-	a1-4, b1-1, c2-1
Week23:25	**Fluid flow around immersed bodes**	**9**	**6**	**3**	-	a1-4, b3-1, c2-1
Week26:30	**Fluid measurements**	**9**	**6**	**3**	-	a1-4,b1-1, c2-1, d2-1
Total		**84**	**60**	**24**		

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	A1	B1 & B3	C1 & C2	D1 & D4

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	**30%**	**70%**	---	---	---	**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	**Kinematics of fluid motion**	**1-5**
2nd	**Flow of incompressible ideal fluids**	**6-13**
3rd	**Flow of compressible ideal fluids**	**16-21**
4th	**Similitude and dimensional analysis**	**22-24**
5th	**Fluid flow in pipes**	**25,26**
6th	**Fluid flow around immersed bodies**	**27,30**

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		**Course topics**					
		1st	**2nd**	**3rd**	**4th**	**5th**	**6th**
Knowledge & Understanding	**a1-4-1 Understand basics of fluid mechanics and hydraulics**	**x**	**x**	**x**	**x**	**x**	**x**
Intellectual Skills	**b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to fluid mechanics. and mechanical power engineering.**			**x**	**x**		

	b3-1-1 Select the suitable measuring scheme for boundary layer thickness based on analysis.			**x**	**x**		
Professional Skill	**c1-1-1 Apply the knowledge of mathematics and fluid mechanics to fluid flow in motion.**				**x**		**x**
	c2-1-1 Write and evaluate a professional report on fluid mechanics problems.					**x**	
General Skills	**d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to fluid mechanics.**		**x**	**x**			
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about advanced fluid mechanics.			**x**	**x**		**x**

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-4-1	x												
Intellectual Skills	b1-1-1	x				x								
	b3-1-1	x				x			x					
Professional Skills	c1-1-1	x				x	x		x	x	x	x		
	c2-1-1	x				x								
General Skills	d2-1-1		x	x		x			x	x	x			
	d4-1-1		x	x					x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.

	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-4-1	x											
Intellectual Skills	b1-1-1	x											
	b3-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

Essential Books (Text Books)

1- White, F. M. (2008), Fluid Mechanics, Sixth Edition, McGraw-Hill.
2- Irving H. Shames, "Mechanics of Fluids", 3rd ed. McGraw-Hill, INC. 1992.
3- Yunus A. Gengel and Robert H. Turner, "Fundamentals of Thermal – Fluid Sciences ", McGraw-Hill, INC. 2001.

Recommended Books

1- Potter, M.C., " Mechanics of Fluids ", 4th ed., Prentice-Hill, INC. 1997.
2- Stephen R. Turns, " Thermal – Fluid Sciences", Cambridge University Press, 2006.

Periodicals, Web sites, etc

- Journal of Fluid and Thermal Engineering.
- http://cms.nelc.edu.eg/course/view.php?id=114

Course Coordinator : Dr / Yassen El-Sayed Yassen
E-mail: y_yassen70@yahoo.com

Head of Department : Prof. Dr. Kamal Ameen Morad

Date :

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	first year
Date of specification approval	***2020***

A- Basic Information

Title: Heat and mass Transfer	**Code Symbol**: **MEP532**	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The first aim of this course is to develop, from the basic principles, the deferential equation of heat conduction, which governs the temperature distribution in a medium under steady state conditions. The solution to this equation provides knowledge of the temperature distribution, which may then be used with Fourier's law to determine the heat flux. Many heat transfer problems are time depends, such as, *unsteady* or *transient* problems typically arise when boundary conditions of a system are changed.

Under conditions for heat transfer within the solid is two or three dimensional, exact solutions to the heat equation may be used to compute the dependence of temperature on both location and time. Such solutions are considered for *finite solids* (plane walls, long cylinders and spheres). The transient heat conduction in one, two or periodic heat flow are examined analytically, numerically and graphically.

2- Course Objectives

On completion of this course, the student should have sufficient broad knowledge in mechanical engineering to:

1- Demonstrate knowledge of differential equation of heat conduction definitions and terminology.
2- Demonstrate knowledge of steady state heat conduction in two and three dimensions in analytical, numerical and graphical methods.
3 - Apply this knowledge on various engineering applications.
4- Use correlations to calculate the transient heat conduction in one and multi dimensions.
5- Determine the lumped capacity system analysis.

3-Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-1 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **heat and mass transfer**.	a1-1-1 Understand how the conduction differential equation can be used to obtain the temperatue distribution within different engine elements.
A2- Mutual relation between professional aspects of professional practice and its effects on the Environment.	a2-1 Discuss Social effects of mechanical power egineering technologies.	a2-1-1 Discuss and recognize the social effects of heat and mass transfer technology
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 select the suitable solution methods for heat and mas transfer problems based the heat conduction equation with the initial and boundary conditions.
B3- Analytical reading researches and subjects relevant to the field of specialization	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it heat and mass transfer problems.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques,	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating

	skills, and tools.	engineering solutions related to heat and mass transfer, using latest engineering techniques, skills, and tools.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power egineering technical matters.	c2-1-1 Write and evaluate a professional report on heat and mass transfer problems.
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power egineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to heat and mass transfer problems.
D4- Use different resources to obtain knowledge and information.	d4-1 Use different resources of information like libraries, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about heat and mass transfer.

4-Course Contents

Week No.	***Topic***	***Total Hours***	***Contact hrs***			***Course ILOs Covered (By No.)***
			Lec.	**Tut.**	**Lab.**	
Week-2 1	The differential equation of heat conduction	6	4	2	-	a1-1-1, a2-1-1
Week3-14	Steady state heat conduction in two and three dimensions analytical numerical and graphical methods.	36	24	12	-	a1-1, a2-1-1, b-1-1, b2-1, c1-1, c7-1
Week 15-16	Transient heat conduction in one and multi dimensions fluid :Analytical, Numerical Heisler chart and graphical methods.	6	4	2	-	a1-1-1, a2-1-1, b1-1-1, b3-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week 17-18	Transient heat conduction in one and multi dimensions fluid :Analytical, Numerical Heisler chart	6	4	2	-	A1-1-1, a2-1-1, b1-1-1, b3-1-1, c1-1-1, c2-1-1

	and graphical methods.					
Week 19-24	One , Two and periodic heat flow	15	9	6	-	a1-1-1, a2-1-1, b1-1-1, c1-1-1
Week25-30	The Lumped Capacitance Method	12	8	4	-	a1-1-1, a2-1-1, b1-1-1, b3-1-1, c1-1-1, c2-1-1 d2-1-1, d4-1-1

5- Relationship between the course and the programme

Field	Academic Reference Standard (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	**A1(a1-1)** and **A2(a2-1)**	**B1(b1-1)** and B3(**b3-1)**	**C1(c1-1)** and C2(**c2-1)**	**D2(d2-1)** and D4(**d4-1)**

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	30%		70%				100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	**Differential equation of heat conduction**	**2**
2nd	**Steady state heat conduction in two and three dimensions in analytical, numerical and graphical methods.**	**3-10**
3rd	**transient heat conduction in one and multi- dimensions analytical, numerical and graphical methods.**	**11-22**
4th	**The Lumped Capacitance Method**	**23-30**

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)	Course topics

		1st	2nd	3rd	4th
Knowledge & Understanding	**a1-1-1** Understand how the law of energy conservation with the differential equations can be used to obtain the heat equation under transient conditions.	x	x	x	x
	a2-1-1 Discuss and recognize the social effects of transient heat transfer technology.	x	x	x	x
Intellectual Skills	**b1-1-1** select the suitable solution methods for transient problems based the heat conduction equation with the initial and boundary conditions.	x	x	x	x
	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to transient heat transfer.	x	x	x	x
Professional Skill	**c1-1-1** Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to transient heat transfer, using latest engineering techniques, skills, and tools.	x	x	x	x
	c2-1-1 Write and evaluate a professional report on transient heat transfer problems.	x	x	x	x
General Skills	**d2-1-1** Use state-of-the-art computer aided design tools for solving professional problems related to Transient heat transfer problems.		x		x

	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about transient heat transfer.		**x**		**x**

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**8- Teaching and Learning Method:**												
		Lecture	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self learning**	**Cooperative**	**Discovering**	**Modelling**	**Playing**
Knowledge & understanding	a1-1-1	x				x								
	a2-1-1	x				x								
Intellectual Skills	b1-1-1	x				x								
	b3-1-1	x				x								
Professional Skills	c1-1-1	x				x							x	
	c2-1-1	x				x							x	
General Skills	d2-1-1		x							x	x			
	d4-1-1		x							x	x			

10- Assessment

10.1 Assessment Methods

Course Intended	**Assessment Methods**

Learning Outcome (ILOs)		Wirtten Exam	Oral Exam	Tutorial Assessment	Proiect Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-1-1	x											
	a2-1-1	x											
Intellectual Skills	b1-1-1	x											
	b3-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	**100**	**32th**
Final Oral Examination		
Mid term written Examination		
Tutorial discussion, presentation, and report assessment		
Total	**100%**	

11- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

12- List of references:

1- "Fundamentals of Heat and Mass Transfer" by Frank P. Incropera and David P. Dewitt, Seventh Edition, 2011

2- "Heat Transfer; A Practical Approach" by Yunus A. Cengel, Second edition, 2009.
3- Holman, J.P., " Heat Transfer"., McGraw-Hill Book Company, Inc. 1992.

Course Prof. Ibrahim Abdel-Rahman Ibrahim
Programme coordinator:
Head of the Department: Prof. Dr. Kamal Ameen Morad

Date: .

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	1st year
Date of specification approval	***2020***

A- Basic Information

Title: Energy Rationalization	**Code Symbol**: MEP547	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

Students has been revised to include the main concepts in Energy Rationalization and Schemes for processes improvements, and their influence on modern Improvements in power plants, as well as introducing recent advances in the understanding of fundamental Energy Rationalization.

With conceptual foundations established, subsequent chapters are used to develop useful effects in Energy Rationalization. The course deals with Different models for Improvements of electrical system. It also describes the behavior of Training for energy Rationalization and Cost of capital and minimum rate of return.

2- Course Objectives

1- the first objective is to cover cover the basic principles of convection heat transfer and to present a wealth of real-world engineering applications to give students a feel for engineering practice .

2- Is to develop an understanding of power plants, examine the differential equations that govern The Improvements of electrical system and thermal efficiency and determine important dimensionless parameters associated with energy Rationalization.

3- is to learn how to estimate the different parameters in order to perform analyses on thermal systems experiencing different types of plants.

4- Is to delineate pertinent trasport phenemena for any process or system involving power plant.

5- The student should be able to develop representative models for real processes and system and draw conclusions concerning process/system design or performance from the attendant analysis.

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-5 Understand the theories, basics and specialized knowledge in the field of **Turbo-Machinery and power plants**.	a-1-2-1 Define the concepts of physical meaning and phenomena are used in energy rationalization.
A2- Mutual relation between professional aspects of professional practice and its effects on the Environment.	a2-1 Discuss Social effects of mechanical power engineering technologies.	a2-2-1 Report and recognize the professional aspects of energy rationalization applications and their effects on the Environment.
A5- Basics and principles of quality in professional practice in the field of specialization.	a5-1 Explain Quality Assurance concepts of different mechanical power components and systems development phases.	a5-1-1 Explain Quality Assurance concepts of different mechanical power components and systems development phases.
B. Intellectual skills		
B1- Analyze and evaluate the information in the field of specialization, and relate it to solve problems.	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to water power engineering based on the flow equations analysis.

B3- Link and integrate diverse knowledge to solve professional problems.	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to energy rationalization.
B5- Assess risks in professional practice in the field of specialization.	b5-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.	b5-1-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.
C. Professional and practical skills		
C1- Master the basic as well as the latest professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to energy rationalization problems, using latest engineering techniques, skills, and tools.
C2- Write and evaluate technical and professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on energy rationalization.
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to energy rationalization.

D5- Use different sources to obtain knowledge and information.	d5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about energy rationalization.
D8- Learn independently and seek continuous learning.	d8-2 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.	d8-2-1 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1 and 3	Fundamental Concepts	9	6	3	–	a1-5-1, a2-1-1, a5-1-1, a5-1-1, b1-1-1, b3-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-4 and 6	Classification of Energy Rationalization opportunities	9	6	3	–	a1-5-1, a2-1-1, a5-1-1, a5-1-1, b1-1-1, b3-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-7 and 9	Schemes for processes improvements	9	6	3	–	a1-5-1, a2-1-1, a5-1-1, a5-1-1, b1-1-1, b3-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-10 and 12	Improvements in steam plant	9	6	3	–	a1-5-1, a5-1-1, a5-1-1, b1-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-13 and 15	Improvements in gas turbine plants	9	6	3	–	a1-5-1, a2-1-1, a5-1-1, a5-1-1, b1-1-1, b3-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1
Week-16 and 18	Improvements of electrical system	9	6	3	–	a1-5-1, a2-1-1, a5-1-1, a5-1-1, b1-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-19 and 21	Waste heat recovery	9	6	3	–	a1-5-1, a2-1-1, a5-1-1, a5-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-22 and 24	Co-generation plants	9	6	3	–	a1-5-1, a2-1-1, a5-1-1, b1-1-1, b3-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-25 and 27	Training for energy Rationalization	9	6	3	–	a1-5-1, a2-1-1, a5-1-1, a5-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1, d5-1-1
Week-28 and 30	Cost of capital and minimum rate of return	9	6	3	–	a1-5-1, a2-1-1, , a5-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1, d5-1-1,

						d8-2-1
Total		**90**	**60**	30	–	

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contributes in achieving.	A1 (a1-5), A2 (a2-1), A5 (a5-1)	B1 (b1-1), B3 (b3-1), B5 (b5-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D5 (d5-1), D8(d8-2)

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	**30%**	**70%**	---	---	---	**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Fundamental Concepts	1-6
2nd	Classification of Energy Rationalization opportunities	7-12
3rd	Improvements in steam plant	13-18
4th	Co-generation plants	19-24
5th	Training for energy Rationalization	25-30

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	5th
Knowledge & Understanding	a-1-2-1 Define the concepts of physical meaning and phenomena are used in energy rationalization.	x	x	x	x	x

	a2-2-1 Report and recognize the professional aspects of energy rationalization applications and their effects on the Environment.	x		x		
	a5-1-1 Explain Quality Assurance concepts of different mechanical power components and systems development phases.	x		x		x
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to water power engineering based on the flow equations analysis.	x	x	x	x	x
	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to energy rationalization.				x	x
	b5-1-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.			x	x	x
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to water power engineering problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x
	c2-1-1 Write and evaluate a professional report on water hammer.				x	
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to energy rationalization.	x	x	x	x	x

	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about energy rationalization.	x	x	x	x	x
	d8-2-1 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.	x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-5-1	x		x		x								
	a2-2-1	x		x		x								
	a5-1-1	x		x		x								
Intellectual Skills	b1-1-1	x		x	x	x								
	b3-1-1	x		x	x	x			x					
	b5-1-1	x		x	x	x			x	x				
Professional Skills	c1-1-1			x	x	x	x		x	x	x			
	c2-1-1	x		x	x	x								
General Skills	d2-1-1	x		x	x	x			x	x	x			
	d5-1-1			x	x				x	x	x			
	d8-1-1			x	x				x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Wirtten Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-5-1	x											
	a2-2-1	x											
	a5-1-1	x											
Intellectual Skills	b1-1-1	x											
	b3-1-1	x											
	b5-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d5-1-1	x											
	d8-1-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

Essential Books (Text Books)

1- Fundamentals of Energy rationalization (McGraw-Hill International Editions: Mechanical Engineering Series), Tata McGraw-Hill, 1985.

2- Fundamentals of Energy rationalization (Mcgraw Hill Series in Aeronautical and Aerospace Engineering), John Anderson, 2010.

Recommended Books

1- Fundamentals of Astrodynamics (Dover Books on Aeronautical Engineering) by Roger R. Bate, 1971.

2- Jet Engines: Fundamentals of Theory, Design and Operation, Klaus Hunecke, 1997.

Course coordinator: Prof. Dr. Mohamed Reda

Head of the Department: Prof. Dr. Kamal Ameen Morad

Date :

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	1st year
Date of specification approval	***2020***

A- Basic Information

Title: Advanced Thermodynamic	**Code Symbol**: MEP564	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The aims of this course are to provide the post graduate student, upon completing the course programme, with the basic knowledge and skills of definitions, principles and applications of advanced thermodynamic and the problems associated with it.

2- Course Objectives

On completion of this course, the post graduate student should have sufficient broad knowledge in mechanical engineering to:

1- The course aims at acquiring the student advanced thermodynamics.
2- Studying the basics of thermo-dynamic
3- Isentropic flow waves.
4- Adiabatic flow.
5- Applications of adiabatic flow.
6- Flow with friction.
7- Thermodynamics of turbo-machines

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-2 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Air Conditioning and Ventialation**. a1-3 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Thermal Power Plants**.	a1-2-1 Understand basics of thermodynamics. a1-3-1 Understand the isentropic and adiabatic flow to support more knowledge for combustion engines.
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to thermodynamics and mechanical power engineering.
B3- Analytical reading researches and subjects relevant to the field of specialization**.**	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	b3-1-1 Select the suitable solution methods (Analytical technique and modern computational) for predict adiabatic and isentropic flow.

C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1 Apply the knowledge of mathematics and thermodynamics to isentropic and adiabatic flow.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on thermodynamics problems.
D. General and transferable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to thermodynamics.
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about advanced thermodynamics.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1 and 2	Thermodynamics system, properties and processes.	6	6	-	-	a1-2, a1-3
Week-3 and 4	Ideal gases, property relationships, and equations of states.	6	6	-	-	a1-2, a1-3, b-1-1, b3-1
Week-5 and 6	Internal energy, enthalpy, process path, and steady state equation.	6	6	-	-	a1-2, a1-3, b1-1, c1-1
Week-7 and 8	First and second law of thermodynamics.	6	6	-	-	a1-2, a1-3, b1-1, c1-1
Week-9 and 11	Iso-entropic process .	6	6	-	-	a1-2, a1-3, b3-1, c2-1
Week-12 and 14	Thermo-chemical calculation..	6	6	-	-	a1-2, a1-3, b1-1, c2-1
Week-15 and 17	Adiabatic flame temperatures and enthalpy of combustion.	6	6	-	-	a1-2, a1-3, b3-1, c2-1
Week-18 and 19	Combustion efficiencies and air standard and actual engine cycles.	6	6	-	-	a1-2, a1-3, b1-1, c2-1, d2-1
Week-20 and 22	Reversible engine cycles.	9	9	-	-	a1-2, a1-3, b1-1, c2-1, d2-1
Week-23 and 24	Isentropic flow waves.	9	6	-	3	a1-2, a1-3, b1-1, c2-1, d4-1
Week-25 and 26	Thermodynamics of turbo-machines.	6	6	-	-	a1-2, a1-3, b1-1, c2-1, d2-1, d4-1
Week-27 and 28	Calculation for engine cycles.	9	6	-	3	a1-2, a1-3, b1-1, c2-1, d2-1, d4-1
Week-29 and 30	Applications..	9	6	-	3	a1-2, a1-3, b1-1, c2-1, d2-1, d4-1

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	A1 (a2-a3)	B1 & B3	C1 & C2	D1 & D4

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	**30%**	**70%**	---	---	---	**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Basic thermodynamics	1-6
2nd	Isentropic flow	7-12
3rd	Adiabatic flow	13-18
4th	Air standard and actual engine cycles	19-24
5th	Thermodynamics of turbo-machines	25-30

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	5th
Knowledge & Understanding	a1-2-1 Understand basics of thermodynamics.	x	x	x	x	x
	a1-3-1 Understand the isentropic and adiabatic flow to support more knowledge for combustion engines.	x	x	x	x	x
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to thermodynamics and mechanical power engineering.	x	x	x	x	x

	b3-1-1 Select the suitable solution methods (Analytical technique and modern computational) for predict adiabatic and isentropic flow.	x	x	x	x	x
Professional Skill	c1-1-1 Apply the knowledge of mathematics and thermodynamics to isentropic and adiabatic flow.	x	x	x	x	x
	c2-1-1 Write and evaluate a professional report on thermodynamics problems.	x	x	x	x	x
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to thermodynamics.				x	x
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about advanced thermodynamics.				x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-2-1	x												
	a1-3-1	x				x								
Intellectual Skills	b1-1-1	x				x								
	b3-1-1	x				x			x					
Professional Skills	c1-1-1	x				x	x		x	x	x	x		
	c2-1-1	x				x								
General Skills	d2-1-1		x	x		x			x	x	x			
	d4-1-1		x	x					x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-2-1	x											
	a1-3-1	x											
Intellectual Skills	b1-1-1	x											
	b3-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

"An Introduction to Combustion" By: Stephen Turns, 2nd Edition, 2000
Publisher: McGraw Hill Comp.
"Thermodynamics, An Engineering Approach", Yunus A. Gengel, and Michael A. Boles, McGraw Hill, ISBN: 0072884959 (2006).
"Fundamentals of Thermodynamics", John Wiley, 2003.

"Fundamentals and Technology of Combustion" By: El-Mahallawy and Habik, Elsevier 2002

Course coordinator: Prof. Saad Habik
Programme coordinator: Saad Habik
Head of the Department: Prof. Kamal Morad

Date:

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Engineering
Department offering the course	Mechanical Engineering
Academic year/Level	1st year
Date of specification approval	*2020*

A- Basic Information

Title: steam Power Plants	Code Symbol: MEP 572	
Lecture	3 hours	
Tutorial	-	
Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims

The aims of this course are to provide the post graduate student, upon completing the course program, with the basic knowledge and skills of definitions, principles and applications of thermal power plants and the problems associated with it within the following topics:
conventional working cycles, combined cycles, co-generation cycles, power plant setting, fuel and combustion, fuel burning equipment, draught systems, water treatment, and steam piping. Numerous examples based on modern power plants design are included so that students can grasp the methods and acquire an appreciation of different representative physical parameters.
Solved examples enable the post graduate students to interpret the working cycles configurations of the steam power plant and characteristic study of some individual components, along with exergy analysis

2- Course Objectives

1-Demonstration of the knowledge and understanding of exergy method of analysis, based on second law of thermodynamics, for steam power plants (steam turbine plants, combined cycle plants, and co-generation plants).

2- Power plant type, size, number of units, and site selection of the plants according to the load requirement.
3- Analysis, thermal design, and interpretation of the working cycles of the different types of thermal power plants along with control methods.
4- Combustion systems and burning equipment for coal, liquid, and gaseous fuels.
4- Water treatment methodologies, internal and external.
5- Steam piping layout, design, its attachments , and tracing .

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-3 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of Thermal Power Plants.	a-1-3-1 Define the concepts of physical meaning and phenomena used in Thermal Power Plants.
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to Thermal Power Plants based on the flow equations analysis.
	b1-2 Interpret, analyze, and evaluate a given system specification information and relate it to the design of the required system.	b1-2-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Thermal Power Plants

B4- Risk assessment in the professional practices.	b4-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.	b4-1-1 Evaluate pros and cons of given methodologies for Thermal Power Plants development.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Thermal Power Plants engineering problems, using latest engineering techniques, skills, and tools.
C2- Write professional reports.	c2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on Thermal Power Plants
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to Thermal Power Plants
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about Thermal Power Plants.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1,2	General review of	6	6	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1

	fundamentals					
Week-3,4,5	Conventional cycles	9	9	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-6,7,8	Combined cycles	9	9	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-9,10	Co-generation cycles	6	6	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-11,12	Power plant setting	6	6	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-13,14,15,16	Fuel and combustion	12	12	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-17,18,19,20	Fuel burning equipment	12	12	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-21,22	Draught systems	6	6	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-23,24,25,26	Water treatment	12	12	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-27,28,29,30	Steam piping	12	12	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
	total	90	90			

5- Relationship between the Course and the Programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contributes in achieving.	A1 (a1-3),	B1 (b1-1), (b1-2) B4 (b4-1),	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D4 (d4-1)

6- Course Subject Area

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	---	---	---	100%

7- Course Topics

Topic No.	Topic	Weeks
1st	General review of fundamentals	1,2
2nd	Conventional cycles	3-5

3rd	Combined Cycles	6-8
4th	Co-generation cycles	9,10
5th	Power plant setting	11.12
6th	Fuel and combustion	13-16
7th	Fuel burning equipment	17-20
8th	Draught systems	21,22
9th	Water treatment	23-26
10th	Steam piping	27-30

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics									
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Knowledge & Understanding	a-1-3-1 Define the concepts of physical meaning and phenomena used in Thermal Power Plants	x	x	x	x	x	x	x	x	x	x
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to thermal power plants based on the flow equations analysis.	x	x	x	x	x	x	x	x	x	x
	b1-2-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Thermal Power Plants	x	x	x	x	x	x	x	x	x	x
	b4-1-1 Evaluate pros and cons of given methodologies for Thermal Power Plants development.	x	x	x	x	x	x	x	x	x	x
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to thermal power plants problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x	x	x	x
	c2-1-1 Write and evaluate a professional report on thermal power	x	x	x	x	x	x	x	x	x	x

	plants.										
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to thermal power plants	x	x	x	x	x	x	x	x	x	x
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about thermal power plants.	x	x	x	x	x	x	x	x	x	x

9- Teaching and Learning Method

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modeling	Playing
Knowledge & understanding	a1-3-1	x		x		x								
Intellectual Skills	b1-1-1	x		x	x	x								
	b2-1-1													
	b4-1-1	x		x	x	x			x					
Professional Skills	c1-1-1			x	x	x	x		x	x	x			
	c2-1-1	x		x	x	x								
General Skills	d2-1-1	x		x	x	x			x	x	x			
	d4-1-1			x	x				x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and

	tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exam	Monitoring
Knowledge & Understanding	a1-3-1	x											
Intellectual Skills	b1-1-1	x											
	b1-2-1	x											
	b4-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	

laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities Required for Teaching and Learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of References

[1] EL WAKIL, M.M.,: Powerplant Technology, McGraw-Hill, 1984.
[2] Weston, K.C.,: Energy Conversion, e-book, 2000.
[3] Gosami,D.Y., and F. Kreith: Energy Conversion, e-book, 2008.
[4] Ganapathy, V.,: Industrial Boilers Design, Applications, and Calculations, e-book, 2003.
[5] Kehlhofer, R.,: Combined-Cycle Gas Steam Turbine Power Plants, e-book, 1997.
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[7] Thumann, A., and D. B. Mehta,: Handbook of Energy Engineering, e-book, 2000.
[8] Ganapathy, V.,: Industrial Boilers and Heat Recovery Steam Generators, e-book, 2003.
[9] Snthony, E.J.,: Fluidized Bed Combustion, e-book, 2004.
[10] Raja, A. K., et. al.,: Power Plant Engineering, e-book,2006.
[11] Petchers, N.,: Combined Heating Cooling and Power Handbook Technologies & Applications, e-book, 2003.

Programme coordinator:

Prof. Dr. Nady Naguib Mikhael
Professor of Thermal Power and Heat Engines
Mechanical Power Engineering Department

Date:

Prof. Dr. Kamal Ameen Morad
Head of Mechanical Power Engineering Department

Course Specification

Program on which the course is given	Diploma in Thermal Power Stations
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	Second year
Date of specification approval	2020

A- Basic Information

Title: Gas Turbine and Diesel Engine Power Plants	**Code Symbol**: **MEP573**	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

In our treatment of this course, we have two major objectives; in addition to obtaining an understanding of the operation and classification of the gas turbine power plants, we wish to understand the performance of the diesel power plants. This course is devoted primarily to help the post graduate students to add more information about the gas turbine power plants operation and classification, thermal efficiency improvement, combustion chambers, performance of the diesel engine power plants, engine supercharging, dual fuel engine and fuel injection system.

2- Course Objectives:

On completion of this course, the student should have sufficient broad knowledge in mechanical engineering to:
1- Demonstrate knowledge of the gas turbine performance;
2- Classify and describe the gas turbine power plants;
3- Demonstrate knowledge of the diesel engine power plants;
4- Classify and describe the combustion chambers;
5- Expalin the performance of the diesel engine;
6- Classify the fuel injection systems of the diesel engine;
7- Expalin the performance of dual fuel plants.

3- Intended Learning Outcomes (ILOs):

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-3 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledgein the field ofgas turbine and diesel power plants.	a1-3-1 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledgein gas turbine and diesel power plants operation.
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems in gas turbine and diesel engine power plants.
	b1-2 Interpret, analyze, and evaluate a given system specification information and relate it to the design of the required system.	b1-2-1 How to analyze the characteristics and performance of different components of gas turbine and diesel engine power plants.
B4- Risk assessment in the professional practices.	b4-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.	b4-1-1 How to develop the operation of the gas turbine and diesel engine power plants and increase its efficiencies.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1 How to solve the operating problems in gas turbine and diesel engine power plants.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 How to write a technical reports about the operation and performance of gas turbine and diesel engine power plants.
D. General and transferrable skills		
D2- Use information technology to improve his/her professional	d2-1 Use state-of-the-art computer aided design tools for solving	d2-1-1 How to use the advanced computer programs to solve the

practice.	mechanical power engineering problems.	problems and design of the different components of gas turbine power plant.
D4- Use different resources to obtain knowledge and information.	d4-1 Use different resources of information like libraries, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 How to upgrade the information about the gas turbine and diesel engine power plants.

4- Course Contents:

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	**Tut.**	**Lab.**	
Week-1	**Gas turbine power plants classifications**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1**
Week-2	**Gas turbine power plants classifications (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1**
Week-3	**Gas turbine power plants classifications (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1**
Week-4	**Thermal efficiency improvement**	**3**	**2**	**1**	**-**	**b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1**
Week-5	**Thermal efficiency improvement (Cont.)**	**3**	**2**	**1**	**-**	**b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1**
Week-6	**Thermal efficiency improvement (Cont.)**	**3**	**2**	**1**	**-**	**b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1**
Week-7	**Combustion chambers performance**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1, d4-1-1**
Week-8	**Combustion chambers performance (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1, d4-1-1**
Week-9	**Combustion chambers performance (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1, d4-1-1**
Week-10	**The main systems of the diesel engine power plants**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1**
Week-11	**The main systems of the diesel engine power plants (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1**
Week-12	**The main systems of the diesel engine power plants (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1**
Week-13	**Combustion chambers performance of the diesel engine power plants**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1, d4-1-1**
Week-14	**Combustion chambers performance of the diesel engine power plants (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1, d4-1-1**
Week-15	**Combustion chambers performance of the diesel engine power plants (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, c2-1-1, d4-1-1**
Week-16	**Engine supercharging**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1**
Week-17	**Engine supercharging (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1**
Week-18	**Engine supercharging (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1**
Week-19	**Dual fuel engines**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1**

Week-20	**Dual fuel engines (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1**
Week-21	**Dual fuel engines (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1**
Week-22-24	**Fuel injection systems**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1**
Week-25-27	**Fuel injection systems (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1**
Week-28-30	**Fuel injection systems (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1**

5- Relationship between the course and the programme:

Field	Academic Reference Standard			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1(a1-3)	B1(b1-1, b1-2), B4(b4-1)	C1(c1-1), C2(c2-1)	D2(d2-1), D4(d4-1)

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering and Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**---**	**---**	**---**	**100%**

7- Course Topics:

Topic No.	Topic	Weeks
1st	**Gas turbine power plants classifications**	1, 2 and 3
2nd	**Thermal efficiency improvement**	4, 5 and 6
3rd	**Combustion chambers performance**	7, 8 and 9
4th	**The main systems of the diesel engine power plants**	10, 11 and 12
5th	**Combustion chambers performance of the diesel engine power plants**	13, 14 and 15
6th	**Engine supercharging**	16, 17 and 18
7th	**Dual fuel engines**	19, 20 and 21
8th	**Fuel injection systems**	22, to 30

8- ILOs Matrix Topics:

Course Intended Learning Outcomes (ILOs)		Course topics							
		1st	2nd	3rd	4th	5th	6th	7th	8th
Knowledge & Understanding	a1-3-1 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledgein gas turbine and diesel power plants operation.	X		X	X	X	X	X	X
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems in gas turbine and diesel engine power plants.		X				X	X	X
	b1-2-1 How to analyze the characteristics and performance of different components of gas turbine and diesel engine power plants.		X				X	X	X
	b4-1-1 How to develop the operation of the gas turbine and diesel engine power plants and increase its efficiencies.		X				X	X	X
Professional Skill	c1-1-1 How to solve the operating problems in gas turbine and diesel engine power plants.		X				X	X	X
	c2-1-1 How to write a technical reports about the operation and performance of gas turbine and diesel engine power plants.	X		X	X	X	X	X	X
General Skills	d2-1-1 How to use the advanced computer programs to solve the problems and design of the different components of gas turbine power plant.		X				X	X	X
	d4-1-1 How to upgrade the information about the gas turbine and diesel engine power plants.		X	X		X	X	X	X

9- Teaching and Learning Method:

Course Intended learning outcomes(ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problemsolving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-3-1	x	x	x			x		x	x	x			
Intellectual Skills	b1-1-1	x	x	x		x	x			x	x			
	b1-2-1	x	x	x		x	x			x	x			
	b4-1-1	x	x			x				x	x	x		
Professional Skills	c1-1-1	x	x			x				x	x	x		
	c2-1-1	x	x			x	x			x	x	x		
General Skills	d2-1-1	x	x			x	x			x	x	x		
	d4-1-1	x	x			x				x	x	x		

10- Assessment

10.1 Assessment Methods:

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Written Exam	Oral Exam	Tutorial	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation	Discussion	Laboratory Test	Home Exam	Monitoring
Knowledge& Understanding	a1-3-1	x											
IntellectualSkills	b1-1-1	x											
	b1-2-1	x											
	b4-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

10.2 Assessment Schedule and GradesDistribution:

Assessment Method	Percentage	week
Final Examination	**100**	**32th**
Mid term written Examination1	**-**	**-**
Mid term written Examination 2	**-**	**-**
Mid term laboratory assessment	**-**	**-**
End of term laboratory examination	**-**	**-**
Tutorial and report assessment	**-**	**-**
Total	**100%**	

11- Facilities required for teaching and learning:

Teaching aids like, lecture room with audio-visual facilities, white board.

12- List of references:

1- "Industrial and ProcessFurnacesPrinciples, Design and Operation", by Peter Mullinger and Barrie Jenkins, 2008.
2- "Industrial Furnaces" by W.Trinks, M.H.Mawhinney, R.A.Shannon, R.J.Reed, Sixth edition, 2004.
3- "Power Plant Engineering" by A. K. Raja, Amit Prakash Srivastava and Manish Dwivedi, 2006.
4- "Fundamentals of Internal Combustion Engines" by H. N. Gupta, 2006
5- "Internal Combustion Engines" by Shyam K. Agrawal, 2008.
6- "Internal Combustion Engine Theory and Practice" by S. P. Sen, 1977.

Course coordinator: Dr. Hamada Mohamed Gad

Programme coordinator:

Head of the Department: Prof. Dr. Kamal Morad

Date:

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Engineering
Department offering the course	Mechanical Engineering
Academic year/Level	1st year
Date of specification approval	*2020*

A- Basic Information

Title: Nuclear Power Plants	Code Symbol: MEP 574	
Lecture	3 hours	
Tutorial	-	
Laboratory	-	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims

The aims of this course are to provide the post graduate student, upon completing the course program, with the basic knowledge and skills of definitions, principles and applications of nuclear power plants and the problems associated with it within the following topics:
Principles of nuclear energy, nuclear fusion and fission, pressurized water reactor power plants, boiling water reactor power plants, gas cooled reactor power plants, fast breeding reactors, cladding, structural, and shielding materials, and disposal of nuclear waste.

2- Course Objectives

1-Demonstration of the knowledge and understanding of nuclear engineering and its terminology such as radioactivity, decay rate and half-life, neutron flux and reaction rate, and nuclear fusion and fission.
2- Nuclear reactors types, construction, components.
3- Nuclear power plant types, its working cycles, and components, and disposal of nuclear waste.

4- Analysis, thermal design, and interpretation of the working cycles of the different types of nuclear power plants along with its problems and control methods.

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-3 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of Thermal Power Plants.	a-1-3-1 Define the concepts of physical meaning and phenomena used in nuclear power plants.
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to nuclear Power Plants based on the flow equations analysis.
	b1-2 Interpret, analyze, and evaluate a given system specification information and relate it to the design of the required system.	b1-2-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to nuclear Power Plants
B4- Risk assessment in the professional practices.	b4-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.	b4-1-1 Evaluate pros and cons of given methodologies for Thermal Power nuclear development.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions

	creating engineering solutions, using latest engineering techniques, skills, and tools.	related to nuclear Power Plants engineering problems, using latest engineering techniques, skills, and tools.
C2- Write professional reports.	c2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on nuclear Power Plants
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to nuclear Power Plants
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about nuclear Power Plants.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1-7	Principles of nuclear engineering	12	3	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-8-12	Nuclear reactors types, construction, components	6	6	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-13-19	Nuclear power plant types and its components	9	6	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-20-25	Analysis, thermal design, interpretation of the working cycles of the different types of nuclear power plants along with control methods	12	3	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1
Week-26-30	Nuclear reactors problems and disposal of nuclear waste.	3	3	–	–	a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1, d2-1-1, d4-1-1

5- Relationship between the Course and the Programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contributes in achieving.	A1 (a1-3),	B1 (b1-1), (b1-2) B4 (b4-1),	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D4 (d4-1)

6- Course Subject Area

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	---	---	---	100%

7- Course Topics

Topic No.	Topic	Weeks
1st	Principles of nuclear engineering	1-7
2nd	Nuclear reactors types, construction, components	7-10
3rd	Nuclear power plant types and its components	11-15
4th	Analysis, thermal design, interpretation of the working cycles of the different types of nuclear power plants and control methods	16-23
5th	Nuclear reactors problems and disposal of nuclear waste.	24-30

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		1st	2nd	3rd	4th	5th
Knowledge & Understanding	a-1-3-1 Define the concepts of physical meaning and phenomena used in Thermal Power Plants	x	x	x	x	x

Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to thermal power plants based on the flow equations analysis.	x	x	x	x	x
	b1-2-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Thermal Power Plants	x	x	x	x	x
	b4-1-1 Evaluate pros and cons of given methodologies for Thermal Power Plants development.	x	x	x	x	x
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to thermal power plants problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x
	c2-1-1 Write and evaluate a professional report on thermal power plants.	x	x	x	x	x
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to thermal power plants	x	x	x	x	x
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about thermal power plants.	x	x	x	x	x

9- Teaching and Learning Method

Course Intended learning	Teaching and Learning Method

outcomes (ILOs)		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modeling	Playing
Knowledge & understanding	a1-3-1	x		x		x								
Intellectual Skills	b1-1-1	x		x	x	x								
	b2-1-1													
	b4-1-1	x		x	x	x			x					
Professional Skills	c1-1-1			x	x	x	x		x	x	x			
	c2-1-1	x		x	x	x								
General Skills	d2-1-1	x		x	x	x			x	x	x			
	d4-1-1			x	x				x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning	Assessment Methods

Outcome (ILOs)		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exam	Monitoring
Knowledge & Understanding	a1-3-1	x											
Intellectual Skills	b1-1-1	x											
	b1-2-1	x											
	b4-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities Required for Teaching and Learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of References

[1] El Wakil, M.M.,: Powerplant Technology, McGraw-Hill, 1984.
[2] Weston, K.C.,: Energy Conversion, e-book, 2000.

[3] Gosami,D.Y., and F. Kreith: Energy Conversion, e-book, 2008.
[4] DOE-HDBK-10191-93 - Atomic and Nuclear Physics handbook. e-book, 1993.
[5] Shultis, J and R.E. Faw: Fundamentals of Nuclear Science and Engineering, e-book, 2002.

Program coordinator:

Prof. Dr. Nady Naguib Mikhael
Professor of Thermal Power and Heat Engines
Mechanical Power Engineering Department

Date:

Prof. Dr. Kamal Ameen Morad

Head of Mechanical Power Engineering Department

Course Specification

Program on which the course is given	Diploma in Thermal Power Stations
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	Second year
Date of specification approval	2020

A- Basic Information

Title: Control and Safety Instruments in Power Plants	**Code Symbol**: **MEP575**	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

In our treatment of this course, we have two major objectives; in addition to obtaining an understanding of the different measuring instruments and its classifications, we wish to understand the operating parameters control in the power plant. This course is devoted primarily to help the post graduate students to add more information about the measurement of temperature, pressure, flow, gas concentration, water purity, and dust concentration in power plant, control of pressure, temperature and load in power plants, control of thermal and gas pollution from power plant.

2- Course Objectives:

On completion of this course, the student should have sufficient broad knowledge in mechanical engineering to:
1- Demonstrate knowledge of the measuring instruments;
2- Classify and describe measuring of temperature, pressure, flow and gas concentration in power plants;
3- Demonstrate knowledge of the control of temperature, pressure and load in power plants;
4- Expalin and control the pollution from power plants;

3- Intended Learning Outcomes (ILOs):

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-3 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledgein the field ofgas turbine and diesel power plants.	a1-3-1 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledgein control and safety instruments in power plants.
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems incontrol and safety instruments in power plants.
	b1-2 Interpret, analyze, and evaluate a given system specification information and relate it to the design of the required system.	b1-2-1 How to analyze the characteristics and performance of different components of control and safety instruments in power plants.
B4- Risk assessment in the professional practices.	b4-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.	b4-1-1 How to control the temperature, pressure and load in power plants.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1 How to solve the operating problems in control and safety instruments in power plants.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 How to write a technical reports about the operation and overshooting of power plants.
D. General and transferrable skills		
D2- Use information technology to improve his/her professional	d2-1 Use state-of-the-art computer aided design tools for solving	d2-1-1 How to use the advanced computer programs to solve the

practice.	mechanical power engineering problems.	problems and design of the different components of gas control system in the power plants.
D4- Use different resources to obtain knowledge and information.	d4-1 Use different resources of information like libraries, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 How to upgrade the information about the control and pollution of the power plants.

4- Course Contents:

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1	**Instruments for measuring the temperature**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1**
Week-2	**Instruments for measuring the temperature (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1**
Week-3	**Instruments for measuring the pressure**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1**
Week-4	**Instruments for measuring the pressure (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1**
Week-5	**Instruments for measuring the fluid flow**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1**
Week-6	**Instruments for measuring the fluid flow (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1**
Week-7	**Instruments for measuring the gas concentration**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1, d2-1-1, d4-1-1**
Week-8	**Instruments for measuring the gas concentration (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1, d2-1-1, d4-1-1**
Week-9	**Instruments for measuring the water purity and dust concentration**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1**
Week-10	**Control of steam temperature**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1**
Week-11	**Control of steam temperature (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1**
Week-12	**Control of steam pressure**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1**
Week-13	**Control of steam pressure (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1**
Week-14	**Control of station load**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1**
Week-15	**Control of station load (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, b4-1-1, c1-1-1**
Week-16	**Control of electric frequency of the alternator**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1**
Week-17	**Control of electric frequency of the alternator (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1**
Week-18	**Control of thermal, gas and noise pollution from power station**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1, d2-1-1, d4-1-1**
Week-19	**Control of thermal, gas and noise pollution from power station (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1, d2-1-1, d4-1-1**

Week-20	**Control of thermal, gas and noise pollution from power station (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1, d2-1-1, d4-1-1**
Week-21	**Control of thermal, gas and noise pollution from power station (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1, d2-1-1, d4-1-1**
Week-22-24	**Protection measures against of overshooting of power station performance**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1, c2-1-1**
Week-25-27	**Protection measures against of overshooting of power station performance (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1, c2-1-1**
Week-28-30	**Protection measures against of overshooting of power station performance (Cont.)**	**3**	**2**	**1**	**-**	**a1-3-1, b1-1-1, b1-2-1, c1-1-1, c2-1-1**

5- Relationship between the course and the programme:

Field	Academic Reference Standard			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1(a1-3)	B1(b1-1, b1-2), B4(b4-1)	C1(c1-1), C2(c2-1)	D2(d2-1), D4(d4-1)

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering and Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	**30%**	**70%**	---	---	---	**100%**

7- Course Topics:

Topic No.	Topic	Weeks
1st	**Instruments for measuring the temperature**	1 and 2
2nd	**Instruments for measuring the pressure**	3 and 4
3rd	**Instruments for measuring the fluid flow**	5 and 6
4th	**Instruments for measuring the gas concentration**	7 and 8
5th	**Instruments for measuring the water purity and dust concentration**	9
6th	**Control of steam temperature**	10 and 11
7th	**Control of steam pressure**	12 and 13
8th	**Control of station load**	14 and 15
9th	**Control of electric frequency of the alternator**	16 and 17
10th	**Control of thermal, gas and noise pollution from power station**	18, 19, 20 and 21
11th	**Protection measures against of overshooting of power station performance**	22, 23 to 30

8- ILOs Matrix Topics:

Course Intended Learning Outcomes (ILOs)		Course topics										
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th
Knowledge & Understanding	a1-3-1 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledgein control and safety instruments in power plants.	X	X	X	X	X	X	X	X	X	X	X
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems in control and safety instruments in power plants.	X	X	X	X	X	X	X	X	X	X	X
	b1-2-1 How to analyze the characteristics and performance of different components of control and safety instruments in power plants.	X	X	X	X	X	X	X	X	X	X	X
	b4-1-1 How to control the temperature, pressure and load in power plants.						X	X	X			
Professional Skill	c1-1-1 How to solve the operating problems in control and safety instruments in power plants.	X	X	X	X	X	X	X	X	X	X	X
	c2-1-1 How to write a technical reports about the operation and overshooting of power plants.											X
General Skills	d2-1-1 How to use the advanced computer programs to solve the problems and design of the different components of gas control system in the power plants.				X						X	
	d4-1-1 How to upgrade the information about the control and pollution of the power plants.				X						X	

9- Teaching and Learning Method:

Course Intended learning outcomes(ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problemsolving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-3-1	x	x	x			x		x	x	x			
Intellectual Skills	b1-1-1	x	x	x		x	x			x	x			
	b1-2-1	x	x	x		x	x			x	x			
	b4-1-1	x	x			x				x	x	x		
Professional Skills	c1-1-1	x	x			x				x	x	x		
	c2-1-1	x	x			x	x			x	x	x		
General Skills	d2-1-1	x	x			x	x			x	x	x		
	d4-1-1	x	x			x				x	x	x		

10- Assessment

10.1 Assessment Methods:

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Written Exam	Oral Exam	Tutorial	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation	Discussion	Laboratory Test	Home Exam	Monitoring
Knowledge& Understanding	a1-3-1	x											
IntellectualSkills	b1-1-1	x											
	b1-2-1	x											
	b4-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

10.2 Assessment Schedule and GradesDistribution:

Assessment Method	Percentage	week
Final Examination	**100**	**32th**
Mid term written Examination1	**-**	**-**
Mid term written Examination 2	**-**	**-**
Mid term laboratory assessment	**-**	**-**
End of term laboratory examination	**-**	**-**
Tutorial and report assessment	**-**	**-**
Total	**100%**	

11- Facilities required for teaching and learning:

Teaching aids like, lecture room with audio-visual facilities, white board.

12- List of references:

1- "Industrial and ProcessFurnacesPrinciples, Design and Operation", by Peter Mullinger and Barrie Jenkins, 2008.
2- "Industrial Furnaces" by W.Trinks, M.H.Mawhinney, R.A.Shannon, R.J.Reed, Sixth edition, 2004.
3- "Power Plant Engineering" by A. K. Raja, Amit Prakash Srivastava and Manish Dwivedi, 2006.
4- "Theory and Design for Mechanical Measurements" by Richard S. Figliola and Donald E. Beasley, 2011.
5- "Principles of Measurement Systems" by John P. Bentley, 2005.

Course coordinator: Dr. Hamada Mohamed Gad

Programme coordinator:

Head of the Department: Prof. Dr. Kamal Morad

Date:

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	***2nd***
Date of specification approval	***2020***

A- Basic Information

Title: Economics of Power Generation	**Code Symbol**: **MEP584**	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The aims of this course are to develop and discuss the general aspects of Economics of Power Generation. Discuss the first and second law of thermal system, energy analysis of power cycles. Discuss the cost of electrical power generation, selection of type of generation, performance and operating characteristics of power plants. Discuss the load division among generators, interest and depreciation, annual fuel cost and economic evaluation methods.

The cost of a power plant depends upon, when a new power plant is to set up or an existing plant is to be replaced or plant to be extended. The cost analysis includes: Fixed Cost which includes Initial cost of the plant, Rate of interest, Depreciation cost, Taxes, and Insurance and Operational Cost which includes Fuel cost, Operating labour cost, Maintenance cost, Supplies, Supervision, Operating taxes. Power station design requires wide experience.

2- Course Objectives

On completion of this course, the student should have sufficient broad knowledge in mechanical engineering to:

1- Demonstrate knowledge of the general aspects of the first and second law of thermal system.
2- Estimation of the cost of a power plant
3 - Apply this knowledge on various engineering applications.
4- Use curves and charts to calculate the load distribution.
5- Determine the Fixed Cost and Operational Cost.

3-Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-1 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **cooling load.**	a1-1-1 Understand how to calculate the efficiency of power cycle.
A3- Fundamentals of ethical & legal professional practice in the field of specialization.	a3-1 Recognize ethnical and professional responsibility issues arising in the practice of the engineering profession.	a3-1-1 Discuss and recognize the social effects of Economics of Power Generation technology.
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities.	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 select the suitable design for Power plants.
B3- Analytical reading researches and subjects relevant to the field of specialization	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	b3-1-1Analyze, interpret and manipulate data from a variety of sources and relate to Economics of Power Generation problems.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Economics of Power Generation, using latest engineering techniques, skills, and tools.

D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power egineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to load distribution and power generation.

4-Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1-2	First and second law analysis of thermal system and energy analysis of power cycles.	6	4	2	-	a1-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1
Week3-4	First and second law analysis of thermal system and energy analysis of power cycles.	6	4	2	-	a1-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1
Week 5-6	First and second law analysis of thermal system and energy analysis of power cycles.	6	4	2	-	a1-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1
Week 7-8	The cost of electrical power generation and selection of type of generation.	6	4	2	-	a1-1-1, a3-1-1, b1-1-1, c1-1-1, d2-1-1
Week 9-10	The cost of electrical power generation and selection of type of generation.	6	4	2	-	a1-1-1, a3-1-1, b1-1-1, c1-1-1, d2-1-1
Week 11-12	The cost of electrical power generation and selection of type of generation.	6	4	2	-	a1-1-1, a3-1-1, b1-1-1, c1-1-1, d2-1-1
Week 15-16	Performance and operating characteristics of power plants and load division among generators.	6	4	2	-	a1-1-1, a3-1-1, b3-1-1, c1-1-1, d2-1-1
Week 17-18	Performance and operating characteristics of power plants and load division among generators.	6	4	2	-	a1-1-1,a3-1-1, b3-1-1, c1-1-1, d2-1-1
Week 19-20	Annual fuel cost and economic evaluation methods	6	4	2	-	a1-1-1, a3-1-1, b3-1-1, d2-1-1
Week 21-22	Annual fuel cost and economic evaluation methods	6	4	2	-	a1-1-1, a3-1-1, b3-1-1, c1-1-1, d1-1-1
Week 23-24	Construction cost, operation and maintenance costs	6	4	2	-	a1-1-1,a3-1-1, b1-1-1, c1-1-1, d2-1-1
Week25-30	Load distributions	12	9	3	-	a1-1-1,a3-1-1, b1-1-1, c1-1-1, d2-1-1

5- Relationship between the course and the programme

Field	Academic Reference Standard (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	**A1(a1-1)** and **A3(a3-1)**	**B1(b1-1)** and B3(**b3-1)**	**C1(c1-1)**	**D2(d2-1)**

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	30%		70%				100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	**First and second law analysis of thermal system and energy analysis of power cycles.**	**1-6**
2nd	**The cost of electrical power generation and selection of type of generation.**	**7-12**
3rd	**Performance and operating characteristics of power plants and load division among generators.**	**15-18**
4th	**Annual fuel cost and economic evaluation methods. Construction cost, operation and maintenance costs and Load distributions .**	**19-22**
5th	**Construction cost, operation and maintenance costs and load distributions**	**23-30**

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)	Course topics

		1st	2nd	3rd	4th
Knowledge & Understanding	a1-1-1 Understand how to calculate the efficiency of power cycle.	x	x	x	x
	a3-1-1 Discuss and recognize the social effects of Economics of Power Generation technology.		x	x	x
Intellectual Skills	b1-1-1 select the suitable design for Power plants.	x	x		x
	b3-1-1Analyze, interpret and manipulate data from a variety of sources and relate to Economics of Power Generation problems.	x		x	x
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Economics of Power Generation, using latest engineering techniques, skills, and tools.	x	x	x	x
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to Air Conditioning Cooling load problems.	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)	8- Teaching and Learning Method:

		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-1-1	x				x								
	a3-1-1	x				x								
Intellectual Skills	b1-1-1	x				x								
	b3-1-1	x				x								
Professional Skills	c1-1-1	x				x							x	
General Skills	d2-1-1	x		x	x	x								

10- Assessment

10.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods												
		Wirtten Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring	
Knowledge & Understanding	a1-1-1	x												
	a3-1-1	x												
Intellectual Skills	b1-1-1	x												
	b3-1-1	x												
Professional Skills	c1-1-1	x												
General Skills	d2-1-1	x												

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	**100**	**32th**
Final Oral Examination		
Mid term written Examination		
Tutorial discussion, presentation, and report assessment		
Total	**100%**	

11- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

12- List of references:

1- Lecture notes and handouts compiled by course coordinator and made available to students during course devilery.

2- Essential Books (Text Books)

3- Desmond E. Winterbone," Advanced Thermodynamics for Engineers" Butterworth-Heinemarm. 1997.

4- Kalyan Annamalai & Ishwar K. Puri," Advanced Thermodynamics Engineering" by CRC Press LLC, 2002

5- A.K. Raja, P. S. Amit and D. Manish, "Power Plant Engineering" New Age International (P) Ltd., Publishers, 2006

Course Prof. Ibrahim Abdel-Rahman Ibtahim
Programme coordinator:
Head of the Department: Prof. Dr. Kamal Ameen Morad

Date:

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	***2nd***
Date of specification approval	***2020***

A- Basic Information

Title: Economics of Power Generation	**Code Symbol**: **MEP584**	
Lecture	3hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The aims of this course are to develop and discuss the general aspects of Economics of Power Generation. Discuss the first and second law of thermal system, energy analysis of power cycles. Discuss the cost of electrical power generation, selection of type of generation, performance and operating characteristics of power plants. Discuss the load division among generators, interest and depreciation, annual fuel cost and economic evaluation methods.

The cost of a power plant depends upon, when a new power plant is to set up or an existing plant is to be replaced or plant to be extended. The cost analysis includes: Fixed Cost which includes Initial cost of the plant, Rate of interest, Depreciation cost, Taxes, and Insurance and Operational Cost which includes Fuel cost, Operating labour cost, Maintenance cost, Supplies, Supervision, Operating taxes. Power station design requires wide experience.

2- Course Objectives

On completion of this course, the student should have sufficient broad knowledge in mechanical engineering to:

1- Demonstrate knowledge of the general aspects of the first and second law of thermal system.
2- Estimation of the cost of a power plant
3 - Apply this knowledge on various engineering applications.
4- Use curves and charts to calculate the load distribution.
5- Determine the Fixed Cost and Operational Cost.

3-Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-1 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **cooling load.**	a1-1-1 Understand how to calculate the efficiency of power cycle.
A3- Fundamentals of ethical & legal professional practice in the field of specialization.	a3-1 Recognize ethnical and professional responsibility issues arising in the practice of the engineering profession.	a3-1-1 Discuss and recognize the social effects of Economics of Power Generation technology.
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities.	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 select the suitable design for Power plants.
B3- Analytical reading researches and subjects relevant to the field of specialization	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	b3-1-1Analyze, interpret and manipulate data from a variety of sources and relate to Economics of Power Generation problems.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Economics of Power Generation, using latest engineering techniques, skills, and tools.

D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power egineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to load distribution and power generation.

4-Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1-2	First and second law analysis of thermal system and energy analysis of power cycles.	6	4	2	-	a1-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1
Week3-4	First and second law analysis of thermal system and energy analysis of power cycles.	6	4	2	-	a1-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1
Week 5-6	First and second law analysis of thermal system and energy analysis of power cycles.	6	4	2	-	a1-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1
Week 7-8	The cost of electrical power generation and selection of type of generation.	6	4	2	-	a1-1-1, a3-1-1, b1-1-1, c1-1-1, d2-1-1
Week 9-10	The cost of electrical power generation and selection of type of generation.	6	4	2	-	a1-1-1, a3-1-1, b1-1-1, c1-1-1, d2-1-1
Week 11-12	The cost of electrical power generation and selection of type of generation.	6	4	2	-	a1-1-1, a3-1-1, b1-1-1, c1-1-1, d2-1-1
Week 15-16	Performance and operating characteristics of power plants and load division among generators.	6	4	2	-	a1-1-1, a3-1-1, b3-1-1, c1-1-1, d2-1-1
Week 17-18	Performance and operating characteristics of power plants and load division among generators.	6	4	2	-	a1-1-1,a3-1-1, b3-1-1, c1-1-1, d2-1-1
Week 19-20	Annual fuel cost and economic evaluation methods	6	4	2	-	a1-1-1, a3-1-1, b3-1-1, d2-1-1
Week 21-22	Annual fuel cost and economic evaluation methods	6	4	2	-	a1-1-1, a3-1-1, b3-1-1, c1-1-1, d1-1-1
Week 23-24	Construction cost, operation and maintenance costs	6	4	2	-	a1-1-1,a3-1-1, b1-1-1, c1-1-1, d2-1-1
Week25-30	Load distributions	12	9	3	-	a1-1-1,a3-1-1, b1-1-1, c1-1-1, d2-1-1

5- Relationship between the course and the programme

Field	Academic Reference Standard (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	**A1(a1-1)** and **A3(a3-1)**	**B1(b1-1)** and B3(**b3-1)**	**C1(c1-1)**	**D2(d2-1)**

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	30%		70%				100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	**First and second law analysis of thermal system and energy analysis of power cycles.**	**1-6**
2nd	**The cost of electrical power generation and selection of type of generation.**	**7-12**
3rd	**Performance and operating characteristics of power plants and load division among generators.**	**15-18**
4th	**Annual fuel cost and economic evaluation methods. Construction cost, operation and maintenance costs and Load distributions .**	**19-22**
5th	**Construction cost, operation and maintenance costs and load distributions**	**23-30**

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)	**Course topics**			
	1st	**2nd**	**3rd**	**4th**

Knowledge & Understanding	a1-1-1 Understand how to calculate the efficiency of power cycle.	**x**	**x**	**x**	**x**
	a3-1-1 Discuss and recognize the social effects of Economics of Power Generation technology.		**x**	**x**	**x**
Intellectual Skills	b1-1-1 select the suitable design for Power plants.	**x**	**x**		**x**
	b3-1-1Analyze, interpret and manipulate data from a variety of sources and relate to Economics of Power Generation problems.	**x**		**x**	**x**
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Economics of Power Generation, using latest engineering techniques, skills, and tools.	**x**	**x**	**x**	**x**
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to Air Conditioning Cooling load problems.	**x**	**x**	**x**	**x**

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)	**8- Teaching and Learning Method:**												
	Lecture	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self learning**	**Cooperative**	**Discovering**	**Modelling**	**Playing**

Knowledge & understanding	a1-1-1	x				x								
	a3-1-1	x				x								
Intellectual Skills	b1-1-1	x				x								
	b3-1-1	x				x								
Professional Skills	c1-1-1	x				x							x	
General Skills	d2-1-1	x		x	x	x								

10- Assessment

10.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Wirtten Exam	Oral Exam	Tutorial Assessment	Proiect Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-1-1	x											
	a3-1-1	x											
Intellectual Skills	b1-1-1	x											
	b3-1-1	x											
Professional Skills	c1-1-1	x											
General Skills	d2-1-1	x											

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	**100**	**32th**
Final Oral Examination		
Mid term written Examination		
Tutorial discussion, presentation, and report assessment		
Total	**100%**	

11- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

12- List of references:

1- Lecture notes and handouts compiled by course coordinator and made available to students during course devilery.

2- Essential Books (Text Books)

3- Desmond E. Winterbone," Advanced Thermodynamics for Engineers" Butterworth-Heinemarm. 1997.

4- Kalyan Annamalai & Ishwar K. Puri," Advanced Thermodynamics Engineering" by CRC Press LLC, 2002

5- A.K. Raja, P. S. Amit and D. Manish, "Power Plant Engineering" New Age International (P) Ltd., Publishers, 2006

Course Prof. Ibrahim Abdel-Rahman Ibtahim
Programme coordinator:
Head of the Department: Prof. Dr. Kamal Ameen Morad

Date:

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	1st year
Date of specification approval	***2020***

A- Basic Information

Title: Pump Design (1)	**Code Symbol**: **MEP 508**	
Lecture	3 hours	
Tutorial & Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The aims of this course are to provide the student, upon completing the Mechanical Power Engineering Program, with the basic knowledge and skills of pump design, and classifications of different pump types. Design of centrifugal pump includes shaft, impeller, and casing. Moreover, the course covers topics such as: Pumps classification, theory, design, selection, and performance.

2- Course Objectives

1- **Demonstration of the knowledge and understanding of the importance of pump design.**
2- **Recognizability of diferent types of pumps.**
3- **Evaluation of the performance of diffrent pumps.**
4- **Analysis of different pumps problems and suggesing solution forsuch problems.**

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-4 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Fluids Engineering and Pumping**.	a-1-4-1 Define the concepts of physical meaning and phenomena are used in pump design. a1-4-2 Classify the types of pumps.
B. Intellectual skills		
B1- Analyze and evaluate the information in the field of specialization, and relate it to solve problems.	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to pump design based on the flow equations analysis and size.
B2- Solve specialized problems in the field of practice.	b2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with incomplete data) related to mechanical power engineering.	b2-1-1 Select the suitable solution methods (Analytical technique and modern computational) for design of pump problems based on the dimension analysis.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to pump design problems,

	solutions, using latest engineering techniques, skills, and tools.	using latest engineering techniques, skills, and tools.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on Pump Construction and Instrumentation (shaft, impeller, and vanes).
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to pump design.
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about pump design.
D7- Learn independently and seek continuous learning.	d7-2 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.	d7-2-1 Exhibit the ability to learn more about pump design.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1 : 4	Revision of classification and performance of different pump types	12	12	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-5 : 8	Design of centrifugal pumps	12	12	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-9 : 12	Design of pump shaft and impeller dimensions	12	12	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1, d7-2-1
Week-13 : 16	Design of impeller vanes	12	12	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, d2-1-1, d4-1-1
Week-17 : 24	Diffuser design	12	12	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, d2-1-1, d4-1-1
Week-25 :30	Design of pump casing	12	12	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1, d7-2-1
Total		**72**	**72**	–	–	

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	A1 (a1-4)	B1 (b1-1), B2 (b2-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D4 (d4-1), D7 (d7-2)

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**50%**		**20%**		**100 %**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Revision of classification and performance of different pump types	**1-4**
2nd	Design of centrifugal pumps	**5-8**
3rd	Design of pump shaft and impeller dimensions	**9-12**
4th	Design of impeller vanes, Diffuser design	**13-24**
5th	Design of pump casing	**24-30**

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	5th
Knowledge & Understanding	a-1-4-1 Define the concepts of physical meaning and phenomena are used in pump design.	x	x	x	x	x
	a1-4-2 Classify the types of pumps.	x	x	x		
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to pump design based on the flow equations analysis and size.	x	x	x	x	x
	b2-1-1 Select the suitable solution methods (Analytical technique and modern computational) for design of pump problems based on the dimension analysis.			x	x	
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to pump design problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x
	c2-1-1 Write and evaluate a professional report on Pump Construction and Instrumentation (shaft, impeller, and vanes).	x	x			x

General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to pump design.	x	x	x	x	x
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about pump design.	x	x	x	x	x
	d7-2-1 Exhibit the ability to learn more about pump design.			x	x	

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-4-1	x		x										
	a1-4-2	x		x		x								
Intellectual Skills	b1-1-1	x		x	x	x								
	b2-1-1	x		x	x	x			x					
Professional Skills	c1-1-1			x	x	x	x		x	x	x			
	c2-1-1	x		x	x	x								
General Skills	d2-1-1	x		x	x	x			x	x	x			
	d4-1-1			x	x				x	x	x			
	d7-2-1			x	x				x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and

	tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Wirtten Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-4-1	x											
	a1-4-2	x											
Intellectual Skills	b1-1-1	x											
	b2-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											
	d7-2-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	

Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

13.1- Course Notes & Presentations

13.2- Essential Books (Text Books)

1- A., Esposito, "Fluid Power with Applications", 7th ed., Pearson Education, 2009.

2- R. S., Khurmi, "A Textbook of Hydraulics, Fluid mechanics and Hydraulic Machines", S. Chand & Company LTD., 2003.

3- I. J., Karassik, J. P., Messina, P., Cooper, and C. C., Heald," Pump Handbook", 3rd ed., MacGraw-Hill, 2001.

Course coordinator. Prof. / Abdoelhady Elabady

Head of the Department: Prof. Kamal Ameen Murad

Date:

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	1st year
Date of specification approval	***2020***

A- Basic Information

Title: Pipe Networks and Reservoirs	**Code Symbol**: MEP509	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The major aim of this course is to understand the basic concepts of pipe networks and reservoirs, with the basic knowledge and skills of the concepts and principles of fluid mechanics and types of flows. To help the post graduate students to add more information about Pipelines Construction and Instrumentation, Flows in Piping Systems, Multiple Pipelines Systems, Pipeline networks, and Pipelines Economics. Also, get more knowledge about the Total head losses in pipe systems and its engineering application. Analysis of pipe networks with different fluid flows. This course will also provide students with the ability to select and design of the series, parallel, and branch piping by using different methods. Discuss the all phenomena associated with such type of flows and different parameters.

2- Course Objectives

1- Demonstration of the knowledge and understanding of the importance of study of pipe networks and reservoirs
2- Definitions of the Pressure Regulators and Relief Valves, Hydraulic Pressure Gradient and Operating Costs as related to practical applications.
3- Reconcilability of the different equations for fluid flow with different applications.
4- Analysis of different pipe networks problems.

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-4 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Fluids Engineering and Pumping**.	a-1-4-1 Define the concepts of physical meaning and phenomena are used in pipe networks and reservoirs. a1-4-2 Classify the types of fluid flows in the pipe system according to their water and natural gas.
B. Intellectual skills		
B1- Analyze and evaluate the information in the field of specialization, and relate it to solve problems.	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to pipe networks and reservoirs based on the flow equations analysis.
B2- Solve specialized problems in the field of practice.	b2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with incomplete data) related to mechanical power engineering.	b2-1-1 Select the suitable solution methods (Analytical technique and modern computational) for design of pipe networks problems based on the flow equations analysis.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to pipe networks and

	solutions, using latest engineering techniques, skills, and tools.	reservoirs problems, using latest engineering techniques, skills, and tools.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on Pipelines Construction and Instrumentation (Metallic and Nonmetallic Pipes, Pipe Fittings and Valves, Pipe Designation, Protection of Pipelines, and Flowmeters).
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to pipe networks and reservoirs.
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about pipe networks and reservoirs.
D7- Learn independently and seek continuous learning.	d7-2 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.	d7-2-1 Exhibit the ability to learn more about pipe networks and reservoirs.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1 and 2	Symbols for pipelines and fittings	6	6	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-3 and 4	Incompressible flow in pressure conduits	6	6	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-5 and 6	Pipeline system analysis and design	6	6	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-7 and 8	Pipe fittings	6	6	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, d2-1-1, d4-1-1
Week-9 and 10	Pipe industry and technology	6	6	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, d2-1-1, d4-1-1
Week-11 and 12	An introduction to solids in piping	6	6	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, d2-1-1, d4-1-1
Week-13 and 14	Pipeline insulation	6	6	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1, d7-2-1
Week-15 and 16	Laying and protection	6	6	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, d2-1-1, d4-1-1
Week-17 and 19	Economics of pipelines and costing	9	9	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, d2-1-1, d4-1-1
Week-20 and 21	Water hammer in pipelines	6	6	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1, d7-2-1
Week-22 and 23	Methods of water hammer protection	6	6	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1, d7-2-1
Week-24 and 26	Computer programming aids	9	9	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1, d7-2-1
Week-27 and 28	Measurements and telemetry	6	6	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-29 and 30	Standard specifications	6	6	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Total		**90**	**90**	–	–	

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	A1 (a1-4)	B1 (b1-1), B2 (b2-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D4 (d4-1), D7 (d7-2)

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	**30%**	**70%**	---	---	---	**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Pipelines Construction and Instrumentation	1-6
2nd	Flows in Piping Systems	7-12
3rd	Multiple Pipelines Systems	13-18
4th	Design of Pipeline networks	19-24
5th	Pipelines Economics	25-30

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	5th
Knowledge & Understanding	a1-4-1 Define the concepts of physical meaning and phenomena are used in pipe networks and reservoirs.	x	x	x	x	x
	a1-4-2 Classify the types of fluid flows in the pipe system according to their water and natural gas.	x	x	x		
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to pipe networks and reservoirs based on the flow equations analysis.	x	x	x	x	x
	b2-1-1 Select the suitable solution methods (Analytical technique and modern computational) for design of pipe networks problems based on the flow equations analysis.			x	x	
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to pipe networks and reservoirs problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x

	c2-1-1 Write and evaluate a professional report on Pipelines Construction and Instrumentation (Metallic and Nonmetallic Pipes, Pipe Fittings and Valves, Pipe Designation, Protection of Pipelines, and Flowmeters).	x	x			x
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to pipe networks and reservoirs.	x	x	x	x	x
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about pipe networks and reservoirs.	x	x	x	x	x
	d7-2-1 Exhibit the ability to learn more about pipe networks and reservoirs.			x	x	

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-4-1	x		x										
	a1-4-2	x		x		x								
Intellectual Skills	b1-1-1	x		x	x	x								
	b2-1-1	x		x	x	x			x					
Professional Skills	c1-1-1			x	x	x	x		x	x	x			
	c2-1-1	x		x	x	x								
General Skills	d2-1-1	x		x	x	x			x	x	x			
	d4-1-1			x	x				x	x	x			
	d7-2-1			x	x				x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Wirtten Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-4-1	x											
	a1-4-2	x											
Intellectual Skills	b1-1-1	x											
	b2-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											
	d7-2-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

Essential Books (Text Books)

1- E. Shashi Menon, "Gas Pipeline Hydraulics", Taylor and Francis Group, LLC, 2005.
2- Henry Liu, “Pipeline Engineering”, CRC Press LLC, 2003.

Recommended Books

1- M. Mohitpour, and A. Mnrray, "Pipeline Design and Construction", NOVA Gas International Ltd., 1998.
2- Merle C. Potter, and David C. Wiggert, "Mechanics of Fluids", Prentice-Hall Inc. 1997.

Periodicals, Web sites, etc

- Journal of Gas Pipeline.
- http://cms.nelc.edu.eg/course/view.php?id=114

Course Coordinator : Dr / Yassen El-Sayed Yassen
E-mail: y_yassen70@yahoo.com

Head of Department : Prof. Dr. Kamal Ameen Morad

Date :

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	first year
Date of specification approval	***2020***

A- Basic Information

Title: Operation and Maintenance of Pumps	**Code Symbol**: **MEP510**	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The major aim of this course is to understand the basic concepts of operation and maintenance of pumps, with the basic knowledge and skills of the concepts and principles of fluid dynamics and hydraulics. To help the post graduate students to add more information about pumps classification and range of applications, pumps sealing and the mechanical seals with the theory of operation, pump types, types of impeller rotors, pump materials used for the construction of different pump components with standard specifications, and pump data sheets. Also, get more knowledge about the pump testing, operation, accessories, and maintenance of pumps and its engineering application. Analysis pumps maintenance and testing with range of applications. Discuss the all phenomena associated with such type of pump drawings and evaluation at bids and different parameters.

2- Course Objectives

1- Demonstration of the knowledge and understanding of the importance of study of operation and maintenance of pumps.
2- Definitions of the pump troubles and ways of maintenance and repair as related to practical applications.
3- Reconcilability of the different maintenance of pumps with different applications.
4- Analysis of different pump testing problems.

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-4 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Fluids Engineering and Pumping**.	a-1-4-1 Define the concepts of physical meaning and phenomena are used in operation and maintenance of pumps.
B. Intellectual skills		
B1- Analyze and evaluate the information in the field of specialization, and relate it to solve problems.	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to operation and maintenance of pumps based on the flow equations analysis.
B2- Solve specialized problems in the field of practice.	b2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with incomplete data) related to mechanical power engineering.	b2-1-1 Select the suitable solution methods (Analytical technique and modern computational) for design of pump data sheets problems based on the flow equations analysis.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to operation and maintenance

	solutions, using latest engineering techniques, skills, and tools.	of pumps problems, using latest engineering techniques, skills, and tools.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on pumps sealing, materials, and accessories.
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to operation and maintenance of pumps.
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about operation and maintenance of pumps.
D7- Learn independently and seek continuous learning.	d7-2 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.	d7-2-1 Exhibit the ability to learn more about operation and maintenance of pumps.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1 and 2	Pumps Classification and Range of Applications	6	6	–	–	a1-4-1, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1

Week-3 and 4	Pumps Sealing and the Mechanical seals with the theory of Operation	6	6	–	–	a1-4-1, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-5 and 6	Pump Types	6	6	–	–	a1-4-1, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-7 and 8	Types of Impeller Rotors	6	6	–	–	a1-4-1, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-9 and 10	Pump Materials used for the Construction of different Pump components with standard specifications	6	6	–	–	a1-4-1, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-11 and 12	Starting and Stopping Procedures for Pumps with low specific speeds	6	6	–	–	a1-4-1, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-13 and 14	Daily, semi annual and annual inspection and maintenance of different Types of Pumps	6	6	–	–	a1-4-1, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-15 and 16	Pump Troubles and ways of maintenance and Repair	6	6	–	–	a1-4-1, b1-1-1, c1-1-1, d2-1-1, d4-1-1, d7-2-1
Week-17 and 19	Pump Testing	9	9	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, d2-1-1, d4-1-1, d7-2-1
Week-20 and 21	Tabling of Results and Improving the Performance	6	6	–	–	a1-4-1, b1-1-1, c1-1-1, d2-1-1, d4-1-1, d7-2-1
Week-22 and 23	Accessories	6	6	–	–	a1-4-1, b1-1-1, c1-1-1, d2-1-1, d4-1-1, d7-2-1
Week-24 and 26	Maintenance	9	9	–	–	a1-4-1, b1-1-1, c1-1-1, d2-1-1, d4-1-1, d7-2-1
Week-27 and 28	Pump Data Sheets	6	6	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, d2-1-1, d4-1-1
Week-29 and 30	Pump Drawings and Evaluation at Bids	6	6	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, d2-1-1, d4-1-1
Total		**90**	**90**	–	–	

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	A1 (a1-4)	B1 (b1-1), B2 (b2-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D4 (d4-1), D7 (d7-2)

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	**30%**	**70%**	---	---	---	**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Pumps Classification	1-6
2nd	Pump Types	7-12
3rd	Pump Testing	13-18
4th	Operation and Maintenance of Pumps	19-24
5th	Pump Data Sheets	25-30

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	5th
Knowledge & Understanding	a1-4-1 Define the concepts of physical meaning and phenomena are used in operation and maintenance of pumps.	x	x	x	x	x
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to operation and maintenance of pumps based on the flow equations analysis.	x	x	x	x	x
	b2-1-1 Select the suitable solution methods (Analytical technique and modern computational) for design of pump data sheets problems based on the flow equations analysis.					x

Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to operation and maintenance of pumps problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x
	c2-1-1 Write and evaluate a professional report on pumps sealing, materials, and accessories.	x	x	x		
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to operation and maintenance of pumps.	x	x	x	x	x
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about operation and maintenance of pumps.	x	x	x	x	x
	d7-2-1 Exhibit the ability to learn more about operation and maintenance of pumps.				x	

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)	Teaching and Learning Method												
	Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing

Knowledge & understanding	a1-4-1	x		x										
Intellectual Skills	b1-1-1	x		x	x	x								
	b2-1-1	x		x	x	x			x					
Professional Skills	c1-1-1			x	x	x	x		x	x	x			
	c2-1-1	x		x	x	x								
General Skills	d2-1-1	x		x	x	x			x	x	x			
	d4-1-1			x	x				x	x	x			
	d7-2-1			x	x				x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Wirtten Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-4-1	x											
Intellectual Skills	b1-1-1	x											
	b2-1-1	x											
Professional Skills	c1-1-1	x											

	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											
	d7-2-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

Essential Books (Text Books)

1- Peter K. Bridn, "Hydraulic Fluids", John Wiley & Sons, Inc. New York, 1996.
2- Larry W. Mays, “Hydraulic Design Handbook”, McGraw-Hill, 2004.

Recommended Books

1- Peter Chapple, "Principles of Hydraulic System Design", Coxmoor Publishing Company, 2003.

Course Coordinator : Prof. Dr. Fawzy Mohamed El-Otla

Head of Department : Prof. Dr. Kamal Ameen Morad

Date :

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	first year
Date of specification approval	***2020***

A- Basic Information

Title: Controls of Pumps	**Code Symbol**: **MEP 512**	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Programme Aims:

In our treatment of control of pumps, we have two major objectives. In addition to obtaining an understanding of the control system types that underline the control of pumps, we wish to show the means of how to do calculations to describe it. This course is devoted primarily to achieving the former objective. Physical origin discussed, and relevant dimensionless parameters viewed and discussed too.

With conceptual foundations, established, subsequent chapters used to develop useful tools for controls of pumps, control system types, system essentials, sensing and measuring elements. The course present methods for constant speed control, valves and valves elements, operation and valve types, control valves and the components. In addition, the course describes methods for determining flow characteristics through valves, pressure recovery and cavitation, activators and control systems, multi orifice and types.

2- Graduate Attributes:

1- the first objective is to cover the basic principles of controls of pumps and to present a wealth of real-world engineering applications to give students a feel for engineering practice .
2- Is to develop an understanding of controls of pumps phenemena, examine the control system types that govern the sensing and measuring elements, constant speed control. Valves and valves elements, operation and valves types, control valves and the components that are applicable to flow of different fluids and determine important parameters associated with these types.

3- Is to learn how to estimate flow characteristics through valves in order to perform analyses on practical systems experiencing different types of flow under different practical conditions.
4- Is to use requisite practical inputs for computing pressure recovery and cavitations.
5- Is to delineate pertinent activators and control systems, multi orifice and types for any process or system involving different types of flow.
6- The student should be able to develop representative models for real processes and system and draw from the conclusions diagrams and figures concerning process system according to their design or performance from the attendant analysis.

3- Intended Learning Outcomes (ILOs) for the whole program:

NAQAAE Academic Reference Standards (ARS)	Programme ILOs that the course contribute in achieving	Course ILOs
A. Knowledge & Understanding		
A1 [Theories, basics and specialized knowledge in the field of the controls of pumps as well as the subjects that affect his/her professional practice] & A3 [Main scientific advances in the field of the controls of pumps]	**a1-1** The basic theories and principles of some other engineering and mechanical engineering disciplines providing support to mechanical power disciplines. **a3-1** Characteristics and properties of materials relevant to practical engineering applications of pumps.	**a1-1-1** Understand the relation of hydraulic machines science related to the controls of pumps. **a3-1-1** Understand the dependance of the fluids properties on the natural of the flow parameters inside pumps.
B. Intellectual skills		
B1 [Analyze and evaluate the information in the field of the controls of pumps] & B5 [Assess risks in the professional practice in the field of the controls	**b1-1** Solve engineering problems and design energy systems, components and elements in a creative and innovative attitude related to pumps control.	**b1-1-1** select the suitable solution methods for pumps control problems based on the governing momentum, energy, and mass equations together with the boundary conditions.

of pumps]	**b5-1** apply the appropriate tools from mathematics, science, technology, and the know-how gained from the professional experience to analyze mechanical engineering design problems to meet certain needs.	**b5-1-1** show how, with the aid of a computer, numerically (finite-difference) methods may be used to accurately predict performance of pumps control within the medium.
C. Professional skills		
C1 [Master the basic as well as the latest skills in the field of the controls of pumps] & C2 [Write and evaluate technical and professional reports]	**c1-1** Use a wide range of analytical and technical tools, techniques and equipment including pertinent software. **c2-1** Write and apply numerical modeling methods and/or appropriate computational techniques to engineering problems related to pumps.	**c1-1-1** Apply the knowledge of mathematics (differential equations) and fluid mechanics to derive the differential equation models that describe the flow for different materials inside pumps. **c2-1-1** apply the numerical methods and/or appropriate software package pertaining to pumps control problems.
D. General skills		
D5 [Use different sources to obtain knowledge and information] & D8 [Learn independently and seek continuous learning]	**d5-1** Work effectively in a team and in multi-disciplinary technical and non-technical environments. **d8-2** Share ideas and communicate effectively in written, oral and graphical forms.	**d5-1-1** Work in a team through the preparation of pumps control reports which are required from the students. **d8-2-1** Share ideas and communicate effectively in written, oral and graphical forms.

5- Program Structure and Contents:

5.1 Program Duration: a minimum of 2 years & a maximum of 5 years (including one year of preparatory courses).

5.2 Program Structure:

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	**Tut.**	**Lab.**	
Week-1	Introduction to pumps control flow.	3	3	-	-	a1-1-1, a3-1-1, d5-1-1, d8-2-1
Week-2	Fundamentals of control system types.	3	3	-	-	a1-1-1, b1-1-1, b5-1-1, c1-1-1, c2-1-1
Week-3	Fundamentals of system essentials, and measuring elements.	3	3	-	-	a1-1-1, a3-1-1, b1-1-1, c1-1-1
Week-4	Basics of control speed control.	3	3	-	-	a1-1-1, a3-1-1, b1-1-1, c1-1-1
Week-5	Basics of valves and valves types, control valves and components.	3	3	-	-	d5-1-1, d8-2-1
Week-6	Basics of flow characteristics through valves.	3	3	-	-	a1-1-1, a3-1-1, b1-1-1, b5-1-1, c1-1-1
Week-7	Description of pressure recovery.	3	3	-	-	d5-1-1, d8-2-1
Week-8	Two phase flow regimes (gas-liquid).	3	3	-	-	a1-1-1, a3-1-1, b1-1-1, b5-1-1, c1-1-1, c2-1-1
Week-9	Two phase flow regimes (gas-solid).	3	3	-	-	a1-1-1, a3-1-1, b1-1-1, c1-1-1
Week-10	Two phase flow regimes (liquid-solid).	3	3	-	2	a1-1-1, a3-1-1, b1-1-1, c1-1-1
Week-11-14	Description of cavitation.	3	3	-	-	a3-1-1, b1-1-1, c1-1-1, d5-1-1, d8-2-1
Week-15-18	Activators and control systems.	3	3	-	2	a1-1-1, b1-1-1, c1-1-1, c2-1-1, d5-1-1
Week-19-25	Multi orifice and types of pumps control.	3	3	-	2	a1-1-1, a3-1-1, b1-1-1, b5-1-1, c1-1-1 d5-1-1, d8-2-1
Week-26-30	Conclusions obtained from the course.	3	3	-	2	a1-1-1, a3-1-1, b1-1-1, c1-1-1, c2-1-1, d5-1-1

6- Relationship between the course and the programme

Field	Academic Reference Standard (NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	**A1(a1-1)** and **A3 (a3-1)**	**B1 (b1-1)** and **B5 (b5-1)**	**C1 (c1-1)** and **C2 (c2-1)**	**D5 (d5-1)** and **D8 (d8-1)**

7- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	30%		70%				100%

8- Course Topics.

Topic No.	Topic	Weeks
1st	Control and introduction, control system types	1-5
2nd	System essentials, sensing and measuring elements, constant speed control, valves and valves elements, operation and valves types	6-10
3rd	Control valves and components, flow characteristics through valves	11-20
4th	Pressure recovery and cavitations, activators and control systems, multi orifice and types	21-30

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)	**Course topics**

		1st	2nd	3rd	4th
Knowledge & Understanding	**a1-1-1** Understand the relation of hydraulic machines science related to the controls of pumps.	**X**	**X**	**X**	**X**
	a3-1-1 Understand the dependance of the fluids properties on the natural of the flow parameters inside pumps.	**X**	**X**	**X**	**X**
Intellectual Skills	**b1-1-1** select the suitable solution methods for pumps control problems based on the governing momentum, energy, and mass equations together with the boundary conditions.	**x**	**X**	**X**	**x**
	b5-1-1 show how, with the aid of a computer, numerically (finite-difference) methods may be used to accurately predict performance of pumps control within the medium.	**x**	**X**	**X**	**x**
Professional Skill	**c1-1-1** Apply the knowledge of mathematics (differential equations) and fluid mechanics to derive the differential equation models that describe the flow for different materials inside pumps.	**x**	**X**	**X**	**x**

	c2-1-1 apply the numerical methods and/or appropriate software package pertaining to pumps control problems.	**x**	**X**	**X**	**x**
General Skills	**d5-1-1** Work in a team through the preparation of pumps control reports which are required from the students.	**x**	**X**	**X**	**x**
	d8-2-1 Share ideas and communicate effectively in written, oral and graphical forms.	**x**	**X**	**X**	**x**

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**8- Teaching and Learning Method:**												
		Lecture	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self learning**	**Cooperative**	**Discovering**	**Modelling**	**Playing**
Knowledge & understanding	a1-1-1	X				x								
	a3-1-1	X				x								
Intellectual Skills	b1-1-1	X				x								
	b5-1-1	X				x								
Professional Skills	c1-1-1	X				x							x	
	c2-1-1	X				x							x	
General Skills	d5-1-1		X							X	x			
	d8-2-1									x	x			

			X											

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods												
		Wirtten Exam	Oral Exam	Tutorial Assessment	Proiect Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-1-1	X											
	a3-1-1	X											
Intellectual Skills	b1-1-1	X											
	b5-1-1	X											
Professional Skills	c1-1-1	X											
	c2-1-1	X											
General Skills	d5-1-1	X											
	d8-2-1	X											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	**100**	**32th**
Final Oral Examination		
Mid term written Examination		
Tutorial discussion, presentation, and report assessment		
Total	**100%**	

12- Facilities required for teaching and learning:

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

1- "Slurry Transport Using Centrifugal Pumps" by Wilson K C et al. Elsevier Scince Publishers Ltd, England, 1992.
2- "A Design Handbook for Slurry Transfer Systems" by Ed N P Brown et al. Elsevier Scince Publishers Ltd, England, 1990..

Course coordinator: Prof. IMAM AHMED EL_SAWAF
Programme coordinator: : Prof. IMAM AHMED EL_SAWAF
Head of the Department: Prof. KAMAL MORAD

Date:

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	2nd year
Date of specification approval	***2020***

A- Basic Information

Title: Pumping Stations	**Code Symbol**: **MEP 513**	
Lecture	3 hours	
Tutorial & Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The aims of this course are to provide the student, upon completing the Mechanical Power Engineering Program, with the basic knowledge and skills of pumping stations, and classifications of different pump types. Design, selection, control of pumps includes vibrations, noise, and maintenance. Moreover, the course covers topics such as: Pumps classification, theory, design, selection, and performance.

2- Course Objectives

1- **Demonstration of the knowledge and understanding of the importance of pumping stations.**
2- **Recognizability of diferent types of pumping stations.**
3- **Evaluation of the performance of diffrent pumping stations.**
4- **Analysis of different pumps problems and suggesing solution forsuch problems.**

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-4 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Fluids Engineering and Pumping**.	a-1-4-1 Define the concepts of physical meaning and phenomena are used in pumping stations. a1-4-2 Classify the types of pumping stations.
B. Intellectual skills		
B1- Analyze and evaluate the information in the field of specialization, and relate it to solve problems.	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to pumping stations based on the flow equations analysis and size.
B2- Solve specialized problems in the field of practice.	b2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with incomplete data) related to mechanical power engineering.	b2-1-1 Select the suitable solution methods (Analytical technique and modern computational) for design of pumping stations problems based on the dimension analysis.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to pumping stations problems,

	solutions, using latest engineering techniques, skills, and tools.	using latest engineering techniques, skills, and tools.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on pumping stations Construction and Instrumentation.
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to pumping stations.
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about pumping stations.
D7- Learn independently and seek continuous learning.	d7-2 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.	d7-2-1 Exhibit the ability to learn more about pumping stations.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1 : 4	Pump classifications, pump selection	12	12	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-5 : 8	Pump prime, movers, water pumping	12	12	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-9 : 12	Waste water pumping, instruments and control	12	12	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1, d7-2-1
Week-13 : 16	Vibrations and noise, design for easy operation and maintenance	12	12	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, d2-1-1, d4-1-1
Week-17 : 22	Design concept considerations, station site	12	12	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, d2-1-1, d4-1-1
Week-23 : 30	Contract documents, station economics	12	12	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1, d7-2-1
Total		**72**	**72**	–	–	

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	A1 (a1-4)	B1 (b1-1), B2 (b2-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D4 (d4-1), D7 (d7-2)

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**50%**		**20%**		**100 %**

7- Course Topics.

Topic No.	Topic	Weeks

1st	Pump classifications, pump selection	**1-4**
2nd	Water pumping	**5-8**
3rd	Waste water pumping, instruments and control	**9-12**
4th	Design for easy operation and maintenance	**13-23**
5th	Station economics	**24-30**

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	5th
Knowledge & Understanding	a-1-4-1 Define the concepts of physical meaning and phenomena are used in pumping stations.	x	x	x	x	x
	a1-4-2 Classify the types of pumping stations.	x	x	x		
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to pumping stations based on the flow equations analysis and size.	x	x	x	x	x
	b2-1-1 Select the suitable solution methods (Analytical technique and modern computational) for design of pumping stations problems based on the dimension analysis.			x	x	
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to pumping stations problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x
	c2-1-1 Write and evaluate a professional report on pumping stations Construction and Instrumentation.	x	x			x

General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to pumping stations.	x	x	x	x	x
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about pumping stations.	x	x	x	x	x
	d7-2-1 Exhibit the ability to learn more about pumping stations.			x	x	

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-4-1	x		x										
	a1-4-2	x		x		x								
Intellectual Skills	b1-1-1	x		x	x	x								
	b2-1-1	x		x	x	x			x					
Professional Skills	c1-1-1			x	x	x	x		x	x	x			
	c2-1-1	x		x	x	x								
General Skills	d2-1-1	x		x	x	x			x	x	x			
	d4-1-1			x	x				x	x	x			
	d7-2-1			x	x				x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.

	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Wirtten Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-4-1	x											
	a1-4-2	x											
Intellectual Skills	b1-1-1	x											
	b2-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											
	d7-2-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	

laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

13.1- Course Notes & Presentations

13.2- Essential Books (Text Books)

1- A., Esposito, "Fluid Power with Applications", 7th ed., Pearson Education, 2009.

2- R. S., Khurmi, "A Textbook of Hydraulics, Fluid mechanics and Hydraulic Machines", S. Chand & Company LTD., 2003.

3- I. J., Karassik, J. P., Messina, P., Cooper, and C. C., Heald," Pump Handbook", 3rd ed., MacGraw-Hill, 2001.

Course coordinator. Prof. / Abdoelhady Elabady

Head of the Department: Prof. Kamal Ameen Murad

Date:

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	2nd year
Date of specification approval	***2020***

A- Basic Information

Title: Pump Design (2)	**Code Symbol**: **MEP 514**	
Lecture	3 hours	
Tutorial & Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The aims of this course are to provide the student, upon completing the Mechanical Power Engineering Program, with the basic knowledge and skills of pump design, and classifications of different pump types. Design of axial flow and positive pumps includes shaft, impeller, and casing. Moreover, the course covers topics such as: Pumps classification, theory, design, selection, and performance.

2- Course Objectives

1- **Demonstration of the knowledge and understanding of the importance of pump design.**
2- **Recognizability of diferent types of pumps.**
3- **Evaluation of the performance of diffrent pumps.**
4- **Analysis of different pumps problems and suggesing solution forsuch problems.**

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-4 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Fluids Engineering and Pumping**.	a-1-4-1 Define the concepts of physical meaning and phenomena are used in pump design. a1-4-2 Classify the types of pumps.
B. Intellectual skills		
B1- Analyze and evaluate the information in the field of specialization, and relate it to solve problems.	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to pump design based on the flow equations analysis and size.
B2- Solve specialized problems in the field of practice.	b2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with incomplete data) related to mechanical power engineering.	b2-1-1 Select the suitable solution methods (Analytical technique and modern computational) for design of pump problems based on the dimension analysis.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to pump design problems,

	solutions, using latest engineering techniques, skills, and tools.	using latest engineering techniques, skills, and tools.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on Pump Construction and Instrumentation (shaft, impeller, and vanes).
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to pump design.
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about pump design.
D7- Learn independently and seek continuous learning.	d7-2 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.	d7-2-1 Exhibit the ability to learn more about pump design.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1 : 10	Airfoil theory for propeller pump design	18	18	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-11 : 20	Design of axial flow pumps	18	18	–	–	a1-4-1, a1-4-2, b1-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week-21 : 30	Design of different types of positive pumps	18	18	–	–	a1-4-1, b1-1-1, b2-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1, d7-2-1
Total		**54**	**54**	–	–	

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	A1 (a1-4)	B1 (b1-1), B2 (b2-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D4 (d4-1), D7 (d7-2)

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**50%**		**20%**		**100 %**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Airfoil theory for propeller pump design	**1-10**
2nd	Design of axial flow pumps	**11-20**
3rd	Design of different types of positive pumps	**21-30**

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics		
		1st	2nd	3rd
Knowledge & Understanding	a-1-4-1 Define the concepts of physical meaning and phenomena are used in pump design.	x	x	x
	a1-4-2 Classify the types of pumps.	x	x	x
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to pump design based on the flow equations analysis and size.	x	x	x
	b2-1-1 Select the suitable solution methods (Analytical technique and modern computational) for design of pump problems based on the dimension analysis.			x
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to pump design problems, using latest engineering techniques, skills, and tools.	x	x	x
	c2-1-1 Write and evaluate a professional report on Pump Construction and Instrumentation (shaft, impeller, and vanes).	x	x	
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to pump design.	x	x	x
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about pump design.	x	x	x

	d7-2-1 Exhibit the ability to learn more about pump design.			x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-4-1	x		x										
	a1-4-2	x		x		x								
Intellectual Skills	b1-1-1	x		x	x	x								
	b2-1-1	x		x	x	x			x					
Professional Skills	c1-1-1			x	x	x	x		x	x	x			
	c2-1-1	x		x	x	x								
General Skills	d2-1-1	x		x	x	x			x	x	x			
	d4-1-1			x	x				x	x	x			
	d7-2-1			x	x				x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-4-1	x											
	a1-4-2	x											
Intellectual Skills	b1-1-1	x											
	b2-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											
	d7-2-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

13.1- Course Notes & Presentations

13.2- Essential Books (Text Books)

1- A., Esposito, “Fluid Power with Applications”, 7th ed., Pearson Education, 2009.

2- R. S., Khurmi, “A Textbook of Hydraulics, Fluid mechanics and Hydraulic Machines”, S. Chand & Company LTD., 2003.

3- I. J., Karassik, J. P., Messina, P., Cooper, and C. C., Heald,” Pump Handbook”, 3rd ed., MacGraw-Hill, 2001.

Course coordinator. Prof. / Abdoelhady Elabady

Head of the Department: Prof. Kamal Ameen Murad

Date:

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	Second year
Date of specification approval	***2020***

A- Basic Information

Title: **Computer Applications in Fluids Engineering and Pumping**	**Code Symbol**: **MEP517**	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The aims of this course are to provide the Student with the basics of the logic of computer programming for numerical solution of some engineering problems encountered in fluids engineering and pumping applications.

The Course intends the student to practice the development of computer programs, using the Visual Basic language as the highest level programming language that can make use of software packages available in the market and to use the Engineering Equations Solver (EES) as a powerful Mechanical Engineering Tool for solving problems related to the Fluids engineering.

The Course intends the student to develop programs for numerical analyses and programming for Pumping Power Calculation, Fluid Flow Networks Design, fluids dynamics applications.

2- Course Objectives

- **Knowledge and practice the features of VB programming language**
- **Knowledge and understanding the methodologies of solving engineering problems in fluid engineering applications**
- **Knowledge and understanding of the different numerical solutions and programming methods**

3- Intended Learning Outcomes (ILOs)

Field	Programme ILOs that the course contribute in achieving	Course ILOs
Knowledge& Understanding	**a1- Essential facts, fundamentals, concepts, principles and theories relevant to mechanical engineering.** **a2- The constraints which mechanical power engineers have to judge to reach at an optimum solution.**	**a-1-1 Knowledge and practice the features of VB programming language.** **a-2-1 Understanding the logic of computer programming and computer planning techniques**
Intellectual skills	**b1 Solve engineering problems and design mechanical power and energy systems, components and elements in a creative and innovative attitude.** **b3 Evaluate mechanical power and energy engineering designs, processes and performances and propose improvements.**	**b1-1 Select the suitable numerical analysis method for the specified problem.** **b3-1 Creation and invoking of library programs during building a project program**
Professional skills	**c2 Use computational tools and packages and write computer programs pertaining to mechanical power and energy engineering.** **c4 Search for information**	**c2-1 Applying the numerical modelling method using the finite difference technique to engineering problems with programming** **c4-1** search for innovative program packages and softwares related to Fluids engineering
General skills	**d1 Work effectively in a team and in multi-disciplinary technical and non-technical environments.** **d2 Share ideas and communicate effectively in written, oral and graphical**	**d1-1** Work in a team through the preparation of reports which are required from the students. **d2-1** Share ideas and communicate effectively in

	forms. **d3 Cope with rapid change in technology and recognize the need to engage in life-long learning.**	written, oral and graphical forms. **d3-1** recognise the innovative program packages and softwares related to fluids engineering

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1	**1. Introduction to programming**	3	3	-	-	a1-1, a2-1, c2-1, c4-1
Week-2	**2. Overview for VB Programming Language**	3	3	-	-	a1-1, a2-1, c2-1
Week-3	Relational Expressions (Intrinsic Logical Operators)- Input/Output-	3	3	-	-	a1-1, a2-1, c2-1
Week-4	Flow control - Arrays- Sub-programs	3	3	-	-	a1-1, a2-1, c2-1
Week-5	**3. Numerical Solution of Equations and Iteration** 3.1 Bisection Method	3	3	-	-	b1-1, b3-1
Week-6	3.2 Newton's Method	3	3	-	-	b1-1, b3-1
Week-7	**4. Numerical Solution of Sets of Linear Algebraic Equations**	3	3	-	-	b1-1, b3-1
Week-8	Programming for Pumping Power Calculations	3	3	-	-	b3-1, d1-1, d2-1
Week-9	duct design concepts and programming	3	3	-	-	b3-1, d1-1, d2-1
Week-10-14	Programming for Flow Networks Solving.	3	3	-		b3-1, d1-1, d2-1
Week-15-20	EES examples in Fluids Engineering	3	3	-		c4-1, d3-1
Week-21-26	commercial software packages for Pumping power Calculation and Piping Systems.	3	3	-		c4-1, d3-1
Week-27-30	commercial software packages for Pumping power Calculation and Piping	3	3	-		c4-1, d3-1

	Systems.					

5- Relationship between the course and the programme

Field	Academic Reference Standard (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	**a1** and **a2**	**b1** and **b3**	**c2** and **c4**	**d1, d2** and **d3**

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	15%		35%	50			100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	**VB Programming**	**1-4**
2nd	**Numerical methods Programming**	**5-10**
3rd	**programming for Fluids Engineering applications**	**10-19**
4th	**Other softwares for Piping Systems**	**20-30**

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		**Course topics**			
		1st	**2nd**	**3rd**	**4th**
Knowledge & Understanding	**a-1-1 Knowledge and practice the features of VB programming language.**	**x**			

	a-2-1 Understanding the logic of computer programming and computer planning techniques	**x**			
Intellectual Skills	**b1-1 Select the suitable numerical analysis method for the specified problem.**		**x**		
	b3-1 Creation and invoking of library programs during building a project program		**x**	**x**	
Professional Skill	**c2-1 Applying the numerical modelling method using the finite difference technique to engineering problems with programming**	**x**			
	c4-1 search for innovative program packages and softwares related to Fluids Engineering				**x**
General Skills	**d1-1** Work in a team through the preparation of reports which are required from the students.			**x**	
	d2-1 Share ideas and communicate effectively in written, oral and graphical forms.			**x**	
	d3-1 recognise the innovative program packages and softwares related to air conditioning				**x**

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		8- Teaching and Learning Method:												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-1	x				x								
	a2-1	x				x								
Intellectual Skills	b1-1	x				x								
	b3-1	x				x								
Professional Skills	c2-1	x				x								
	c4-1	x				x								
General Skills	d1-1										x			
	d2-1													
	d3-1										x			

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Wirtten Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-1	x											
	a2-1	x											

Intellectual Skills	b1-1	x											
	b3-1	x											
Professional Skills	c2-1	x								**x**			
	c4-1	x								**x**			
General Skills	d1-1									**x**			
	d2-1									**x**			
	d3-1									**x**			

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	**100**	**32th**
Final Oral Examination		
Mid term written Examination		
Tutorial discussion, presentation, and report assessment		
Total	**100%**	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

13.1 Text books and Documentations

[1] John Walkenbach, "Excel 2010 Power Programming with VBA ",John Willy & Sons, lnk, 2010.

[2] EES Documentation

[3] Hoffman, J.D., Numerical methods for Engineers and Scientists, New York McGraw-Hill, (1992).

[4] Croft, D. R.; D. G. Lilly:" Heat Transfer Calculations Using Finite Difference Equations", Applied Science Publishers LTD, London (1977).

13.2- Software Packages

1- Microsoft Office.
2- Engineering Equation Solver (EES).

13.3- Web sites

1- http://www.microsoft.com/
2- http://www.archoneng.com
3- http://www.intel.com/

4- http://web.mit.edu/sunsoft_v5.1/www/index.html
5- http://orion.math.iastate.edu
6- http://www.joshmadison.com/software
7- http://www.amath.washington.edu
8- http://www.cs.mtu.edu
9- http://www.VB.com
10- http://www.liv.ac.uk
11- http://www.star.le.ac.uk
12- http://www.southalabama.edu/engineering/solver.shtml

Course coordinator: Dr. Amany Saif
Programme coordinator: Prof. Kamal Morad
Head of the Department: Prof. Kamal Morad

Date:

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	1st year
Date of specification approval	***2020***

A- Basic Information

Title: **Advanced Fluid Mechanics**	**Code Symbol**: **MEP526**	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The major aim of this course is to understand the basic concepts of fluid dynamics, thermal fluid and get better understanding of different flow regimes. To help the post graduate students to add more information about laminar and turbulent flows, viscous and non-viscous fluids, Laminar and turbulent flows, Turbulence modeling, fluid measurements, and Multiple-pipe systems. Also, get more knowledge about the Total head losses in pipe systems and its engineering application. Analyze the fluid around immersed bodies. This course will also provide students with the ability to select and design of the experimental model by using dimensional analysis and similarity. Discuss the all phenomena associated with such type of flows and different parameters.

2- Course Objectives

1- Demonstration of the knowledge and understanding of the importance of study of advanced fluid mechanics
2- Definitions of the viscous flows, dimensional analysis and similarity, and fluid around immersed bodies as related to practical applications.
3- Reconcilability of the different equations for fluid flow with different applications.
4- Analysis of different fluid mechanics problems.

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-4 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Fluids Engineering and Pumping**.	a1-4-1 Understand basics of fluid mechanics and hydraulics
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to fluid mechanics and mechanical power engineering.
B3- Analytical reading researches and subjects relevant to the field of specialization**.**	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	b3-1-1 Select the suitable measuring scheme for boundary layer thickness based on analysis.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques,	c1-1-1 Apply the knowledge of mathematics and fluid mechanics to fluid flow in motion.

	skills, and tools.	
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on fluid mechanics problems.
D. General and transferable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to fluid mechanics.
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about advanced fluid mechanics.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1:4	**Kinematics of fluid motion**	**12**	**9**	**3**	-	a1-4
Week-5:8	**Flow of incompressible ideal fluids**	**12**	**9**	**3**	-	a1-4,b-1-1,b3-1
Week-9:12	**Flow of compressible ideal fluids**	**12**	**9**	**3**	-	a1-4, b1-1, c1-1
Week-13:16	**Impulse momentum principle**	**12**	**9**	**3**	-	a1-4, b1-1, c1-1
Week-17:19	**Similitude and dimensional analysis**	**9**	**6**	**3**		a1-4, b1-1, c1-1

Week20:22	**Fluid flow in pipes**	**9**	**6**	**3**	-	a1-4, b1-1, c2-1
Week23:25	**Fluid flow around immersed bodes**	**9**	**6**	**3**	-	a1-4, b3-1, c2-1
Week26:30	**Fluid measurements**	**9**	**6**	**3**	-	a1-4,b1-1, c2-1, d2-1
Total		**84**	**60**	**24**		

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	A1	B1 & B3	C1 & C2	D1 & D4

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	**30%**	**70%**	---	---	---	**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	**Kinematics of fluid motion**	**1-5**
2nd	**Flow of incompressible ideal fluids**	**6-13**
3rd	**Flow of compressible ideal fluids**	**16-21**
4th	**Similitude and dimensional analysis**	**22-24**
5th	**Fluid flow in pipes**	**25,26**
6th	**Fluid flow around immersed bodies**	**27,30**

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		**Course topics**					
		1st	**2nd**	**3rd**	**4th**	**5th**	**6th**
Knowledge & Understanding	**a1-4-1 Understand basics of fluid mechanics and hydraulics**	**x**	**x**	**x**	**x**	**x**	**x**
Intellectual Skills	**b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to fluid mechanics. and mechanical power engineering.**			**x**	**x**		

	b3-1-1 Select the suitable measuring scheme for boundary layer thickness based on analysis.			**x**	**x**		
Professional Skill	**c1-1-1 Apply the knowledge of mathematics and fluid mechanics to fluid flow in motion.**				**x**		**x**
	c2-1-1 Write and evaluate a professional report on fluid mechanics problems.					**x**	
General Skills	**d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to fluid mechanics.**		**x**	**x**			
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about advanced fluid mechanics.			**x**	**x**		**x**

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-4-1	x												
Intellectual Skills	b1-1-1	x				x								
	b3-1-1	x				x			x					
Professional Skills	c1-1-1	x				x	x		x	x	x	x		
	c2-1-1	x				x								
General Skills	d2-1-1		x	x		x			x	x	x			
	d4-1-1		x	x					x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.

	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-4-1	x											
Intellectual Skills	b1-1-1	x											
	b3-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

Essential Books (Text Books)

1- White, F. M. (2008), Fluid Mechanics, Sixth Edition, McGraw-Hill.
2- Irving H. Shames, "Mechanics of Fluids", 3rd ed. McGraw-Hill, INC. 1992.
3- Yunus A. Gengel and Robert H. Turner, "Fundamentals of Thermal – Fluid Sciences ", McGraw-Hill, INC. 2001.

Recommended Books

1- Potter, M.C., " Mechanics of Fluids ", 4th ed., Prentice-Hill, INC. 1997.
2- Stephen R. Turns, " Thermal – Fluid Sciences", Cambridge University Press, 2006.

Periodicals, Web sites, etc

- Journal of Fluid and Thermal Engineering.
- http://cms.nelc.edu.eg/course/view.php?id=114

Course Coordinator : Dr / Yassen El-Sayed Yassen
E-mail: y_yassen70@yahoo.com

Head of Department : Prof. Dr. Kamal Ameen Morad

Date :

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	first year
Date of specification approval	***2020***

A- Basic Information

Title: Heat and mass Transfer	**Code Symbol**: **MEP532**	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The first aim of this course is to develop, from the basic principles, the deferential equation of heat conduction, which governs the temperature distribution in a medium under steady state conditions. The solution to this equation provides knowledge of the temperature distribution, which may then be used with Fourier's law to determine the heat flux. Many heat transfer problems are time depends, such as, *unsteady* or *transient* problems typically arise when boundary conditions of a system are changed.

Under conditions for heat transfer within the solid is two or three dimensional, exact solutions to the heat equation may be used to compute the dependence of temperature on both location and time. Such solutions are considered for *finite solids* (plane walls, long cylinders and spheres). The transient heat conduction in one, two or periodic heat flow are examined analytically, numerically and graphically.

2- Course Objectives

On completion of this course, the student should have sufficient broad knowledge in mechanical engineering to:

1- Demonstrate knowledge of differential equation of heat conduction definitions and terminology.
2- Demonstrate knowledge of steady state heat conduction in two and three dimensions in analytical, numerical and graphical methods.
3 - Apply this knowledge on various engineering applications.
4- Use correlations to calculate the transient heat conduction in one and multi dimensions.
5- Determine the lumped capacity system analysis.

3-Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-1 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **heat and mass transfer**.	a1-1-1 Understand how the conduction differential equation can be used to obtain the temperatue distribution within different engine elements.
A2- Mutual relation between professional aspects of professional practice and its effects on the Environment.	a2-1 Discuss Social effects of mechanical power egineering technologies.	a2-1-1 Discuss and recognize the social effects of heat and mass transfer technology
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 select the suitable solution methods for heat and mas transfer problems based the heat conduction equation with the initial and boundary conditions.
B3- Analytical reading researches and subjects relevant to the field of specialization	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it heat and mass transfer problems.
C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques,	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating

	skills, and tools.	engineering solutions related to heat and mass transfer, using latest engineering techniques, skills, and tools.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power egineering technical matters.	c2-1-1 Write and evaluate a professional report on heat and mass transfer problems.
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power egineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to heat and mass transfer problems.
D4- Use different resources to obtain knowledge and information.	d4-1 Use different resources of information like libraries, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about heat and mass transfer.

4-Course Contents

Week No.	***Topic***	***Total Hours***	***Contact hrs***			***Course ILOs Covered (By No.)***
			Lec.	**Tut.**	**Lab.**	
Week-2 1	The differential equation of heat conduction	6	4	2	-	a1-1-1, a2-1-1
Week3-14	Steady state heat conduction in two and three dimensions analytical numerical and graphical methods.	36	24	12	-	a1-1, a2-1-1, b-1-1, b2-1, c1-1, c7-1
Week 15-16	Transient heat conduction in one and multi dimensions fluid :Analytical, Numerical Heisler chart and graphical methods.	6	4	2	-	a1-1-1, a2-1-1, b1-1-1, b3-1-1, c1-1-1, c2-1-1, d2-1-1, d4-1-1
Week 17-18	Transient heat conduction in one and multi dimensions fluid :Analytical, Numerical Heisler chart	6	4	2	-	A1-1-1, a2-1-1, b1-1-1, b3-1-1, c1-1-1, c2-1-1

	and graphical methods.					
Week 19-24	One , Two and periodic heat flow	15	9	6	-	a1-1-1, a2-1-1, b1-1-1, c1-1-1
Week25-30	The Lumped Capacitance Method	12	8	4	-	a1-1-1, a2-1-1, b1-1-1, b3-1-1, c1-1-1, c2-1-1 d2-1-1, d4-1-1

5- Relationship between the course and the programme

Field	Academic Reference Standard (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	**A1(a1-1)** and **A2(a2-1)**	**B1(b1-1)** and B3(**b3-1)**	**C1(c1-1)** and C2(**c2-1)**	**D2(d2-1)** and D4(**d4-1)**

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	30%		70%				100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	**Differential equation of heat conduction**	**2**
2nd	**Steady state heat conduction in two and three dimensions in analytical, numerical and graphical methods.**	**3-10**
3rd	**transient heat conduction in one and multi- dimensions analytical, numerical and graphical methods.**	**11-22**
4th	**The Lumped Capacitance Method**	**23-30**

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)	Course topics

		1st	2nd	3rd	4th
Knowledge & Understanding	**a1-1-1** Understand how the law of energy conservation with the differential equations can be used to obtain the heat equation under transient conditions.	x	x	x	x
	a2-1-1 Discuss and recognize the social effects of transient heat transfer technology.	x	x	x	x
Intellectual Skills	**b1-1-1** select the suitable solution methods for transient problems based the heat conduction equation with the initial and boundary conditions.	x	x	x	x
	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to transient heat transfer.	x	x	x	x
Professional Skill	**c1-1-1** Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to transient heat transfer, using latest engineering techniques, skills, and tools.	x	x	x	x
	c2-1-1 Write and evaluate a professional report on transient heat transfer problems.	x	x	x	x
General Skills	**d2-1-1** Use state-of-the-art computer aided design tools for solving professional problems related to Transient heat transfer problems.		x		x

	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about transient heat transfer.		**x**		**x**

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**8- Teaching and Learning Method:**												
		Lecture	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self learning**	**Cooperative**	**Discovering**	**Modelling**	**Playing**
Knowledge & understanding	a1-1-1	x				x								
	a2-1-1	x				x								
Intellectual Skills	b1-1-1	x				x								
	b3-1-1	x				x								
Professional Skills	c1-1-1	x				x							x	
	c2-1-1	x				x							x	
General Skills	d2-1-1		x							x	x			
	d4-1-1		x							x	x			

10- Assessment

10.1 Assessment Methods

Course Intended	**Assessment Methods**

Learning Outcome (ILOs)		Wirtten Exam	Oral Exam	Tutorial Assessment	Proiect Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-1-1	x											
	a2-1-1	x											
Intellectual Skills	b1-1-1	x											
	b3-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	**100**	**32th**
Final Oral Examination		
Mid term written Examination		
Tutorial discussion, presentation, and report assessment		
Total	**100%**	

11- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

12- List of references:

1- "Fundamentals of Heat and Mass Transfer" by Frank P. Incropera and David P. Dewitt, Seventh Edition, 2011

2- "Heat Transfer; A Practical Approach" by Yunus A. Cengel, Second edition, 2009.
3- Holman, J.P., " Heat Transfer"., McGraw-Hill Book Company, Inc. 1992.

Course Prof. Ibrahim Abdel-Rahman Ibrahim
Programme coordinator:
Head of the Department: Prof. Dr. Kamal Ameen Morad

Date: .

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	2nd year
Date of specification approval	***2020***

A- Basic Information

Title: Energy and environment	**Code Symbol**: MEP537	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The aims of this course are to provide the post graduate student, upon completing the course program, with the basic knowledge and skills of definitions, principles and applications of Energy and environment and the problems associated with it within the following topics:
Gaseous and solid pollutants, formation mechanism and gaseous and solid pollutants during combustion processes within boilers, industrial furnace and gas turbine, formation mechanism of pollutants in internal combustion engines, control of pollutants formation in boilers , industrial furnace and gas turbine, control of pollutants in internal combustion engines, thermal pollution from cooling processes of power producing equipment.

Solved examples enable the post graduate students to interpret the working cycles configurations of the pollution in thermal power plant and characteristic study of some individual components.

2- Course Objectives

1- the first objective is to cover cover the basic principles of Energy and environment and to present a wealth of real-world engineering applications to give students a feel for engineering practice .
2- Is to develop an understanding of power plants, examine the differential equations that govern The Improvements of electrical system and thermal

pollution and determine important dimensionless parameters associated with energy Rationalization.

3- is to learn how to estimate the different parameters in order to perform analyses on formation mechanism of pollutants in internal combustion engines.

4- Is to delineate pertinent trasport phenemena for any process or system involving control of pollutants formation in boilers , industrial furnace and gas turbine.

5- The student should be able to develop representative models for real processes and system and draw conclusions concerning process/system design or performance from the attendant analysis.

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-5 Understand the theories, basics and specialized knowledge in the field of gas turbine ,boiler and internal combustion engine.	a-1-2-1 Define the concepts of physical meaning and phenomena are used in Gaseous and solid pollutants.
A2- Mutual relation between professional aspects of professional practice and its effects on the Environment.	a2-1 Discuss Social effects of mechanical power engineering technologies.	a2-2-1 Report and recognize the professional aspects of energy rationalization applications and their effects on the Environment.
B. Intellectual skills		
B1- Analyze and evaluate the information in the field of specialization, and relate it to solve problems.	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to applications of Energy and environment engineering based on the pollution effect analysis.

B3- Link and integrate diverse knowledge to solve professional problems.	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Energy and environment.
B5- Assess risks in professional practice in the field of specialization.	b5-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.	b5-1-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.
C. Professional and practical skills		
C1- Master the basic as well as the latest professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Energy and environment problems, using latest engineering techniques, skills, and tools.
C2- Write and evaluate technical and professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on Energy and environment
D. General and transferrable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to Energy and environment.

D5- Use different sources to obtain knowledge and information.	d5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about Energy and environment.
D8- Learn independently and seek continuous learning.	d8-2 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.	d8-2-1 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1 and 3	Gaseous and solid pollutants	9	9	–	–	a1-5-1, a2-1-1, b1-1-1, b3-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-4 and 6	formation mechanism and gaseous and solid pollutants during combustion processes within boilers	9	9	–	–	a1-5-1, a2-1-1, a5-1-1, b1-1-1, b3-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-7 and 9	industrial furnace and gas turbine	9	9	–	–	a1-5-1, a2-1-1, a5-1-1, b1-1-1, b3-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-10 and 12	formation mechanism of pollutants in internal combustion engines	9	9	–	–	a1-5-1, a5-1-1, b1-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-13 and 15	formation mechanism of pollutants in internal combustion engines	9	9	–	–	a1-5-1, a2-1-1, a5-1-1, b1-1-1, b3-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1
Week-16 and 18	control of pollutants formation in boilers	9	9	–	–	a1-5-1, a2-1-1, b1-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-19 and 21	industrial furnace and gas turbine	9	9	–	–	a1-5-1, a2-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-22 and 24	control of pollutants in internal combustion engines	9	9	–	–	a1-5-1, a2-1-1, , b1-1-1, b3-1-1, b5-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1
Week-25 and 27	control of pollutants in internal combustion engines	9	9	–	–	a1-5-1, a2-1-1, a5-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1, d5-1-1
Week-28 and 30	thermal pollution from cooling processes of power producing	9	9	–	–	a1-5-1, a2-1-1, b1-1-1, b3-1-1, c1-1-1, d2-1-1, d5-1-1, d8-2-1

	equipment.					
Total		**90**	**90**	–	–	

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contributes in achieving.	A1 (a1-5), A2 (a2-1),	B1 (b1-1), B3 (b3-1), B5 (b5-1)	C1 (c1-1), C2 (c2-1)	D2 (d2-1), D5 (d5-1), D8(d8-2)

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	**30%**	**70%**	---	---	---	**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Gaseous and solid pollutants, formation mechanism and gaseous and solid pollutants during combustion processes within boilers	1-6
2nd	formation mechanism of pollutants in internal combustion engines	7-12
3rd	control of pollutants formation in boilers	13-18
4th	control of pollutants in internal combustion engines	19-24
5th	thermal pollution from cooling processes of power producing equipment.	25-30

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	5th
Knowledge & Understanding	a-1-2-1 Define the concepts of physical meaning and phenomena are used in Gaseous and solid pollutants.	x	x	x	x	x

	a2-2-1 Report and recognize the professional aspects of energy rationalization applications and their effects on the Environment.	x		x		
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to applications of Energy and environment engineering based on the pollution effect analysis.	x	x	x	x	x
	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Energy and environment.				x	x
	b5-1-1 Evaluate pros and cons of given methodologies for mechanical power engineering systems development.			x	x	x
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Energy and environment problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x
	c2-1-1 Write and evaluate a professional report on Energy and environment				x	
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to Energy and environment.	x	x	x	x	x
	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and	x	x	x	x	x

	enhance their conceptual knowledge about Energy and environment.					
	d8-2-1 Seek continuous learning through continuous education, organizing and participating in seminars, workshops, national and international conferences.	x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-5-1	x		x		x								
	a2-2-1	x		x		x								
Intellectual Skills	b1-1-1	x		x	x	x								
	b3-1-1	x		x	x	x			x					
	b5-1-1	x		x	x	x			x	x				
Professional Skills	c1-1-1			x	x	x	x		x	x	x			
	c2-1-1	x		x	x	x								
General Skills	d2-1-1	x		x	x	x			x	x	x			
	d5-1-1			x	x				x	x	x			
	d8-1-1			x	x				x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.

	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-5-1	x											
	a2-2-1	x											
Intellectual Skills	b1-1-1	x											
	b3-1-1	x											
	b5-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d5-1-1	x											
	d8-1-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

Essential Books (Text Books)

1- Fundamentals of Energy rationalization (McGraw-Hill International Editions: Mechanical Engineering Series), Tata McGraw-Hill, 1985.

2- Fundamentals of Energy rationalization (Mcgraw Hill Series in Aeronautical and Aerospace Engineering), John Anderson, 2010.

Recommended Books

1- "Industrial and Process Furnaces Principles, Design and Operation", by Peter Mullinger and Barrie Jenkins, 2008.

2- "Industrial Furnaces" by W.Trinks, M.H.Mawhinney, R.A.Shannon, R.J.Reed, Sixth edition, 2004.

3- "Power Plant Engineering" by A. K. Raja, Amit Prakash Srivastava and Manish Dwivedi, 2006.

Course coordinator: Prof. Dr. Nabil Ahmed Elminsawy

Head of the Department: Prof. Dr. Kamal Kamal Amin Morad

Date :

Course Specification

Program on which the course is given	Diploma in Mechanical Power Engineering
Major or minor element of program	Major
Department offering the program	Mechanical Power Engineering
Department offering the course	Mechanical Power Engineering
Academic year/Level	1st year
Date of specification approval	***2020***

A- Basic Information

Title: Advanced Thermodynamic	**Code Symbol**: MEP564	
Lecture	3 hours	
Tutorial		
Laboratory		
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

The aims of this course are to provide the post graduate student, upon completing the course programme, with the basic knowledge and skills of definitions, principles and applications of advanced thermodynamic and the problems associated with it.

2- Course Objectives

On completion of this course, the post graduate student should have sufficient broad knowledge in mechanical engineering to:

1- The course aims at acquiring the student advanced thermodynamics.
2- Studying the basics of thermo-dynamic
3- Isentropic flow waves.
4- Adiabatic flow.
5- Applications of adiabatic flow.
6- Flow with friction.
7- Thermodynamics of turbo-machines

3- Intended Learning Outcomes (ILOs)

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1. Theories, basics and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	a1-2 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Air Conditioning and Ventialation**. a1-3 Demonstrate sufficient essential knowledge and a deep understanding of the theories, basics and specialized knowledge in the field of **Thermal Power Plants**.	a1-2-1 Understand basics of thermodynamics. a1-3-1 Understand the isentropic and adiabatic flow to support more knowledge for combustion engines.
B. Intellectual skills		
B1- Define and analyze problems in the field of specialization and sorting them according to priorities	b1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to mechanical power engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to thermodynamics and mechanical power engineering.
B3- Analytical reading researches and subjects relevant to the field of specialization**.**	b3-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems.	b3-1-1 Select the suitable solution methods (Analytical technique and modern computational) for predict adiabatic and isentropic flow.

C. Professional and practical skills		
C1- Apply professional skills in the field of specialization.	c1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1 Apply the knowledge of mathematics and thermodynamics to isentropic and adiabatic flow.
C2- Write professional reports.	c.2-1 Write and evaluate a professional report on specialized related to mechanical power engineering technical matters.	c2-1-1 Write and evaluate a professional report on thermodynamics problems.
D. General and transferable skills		
D2- Use information technology to improve his/her professional practice.	d2-1 Use state-of-the-art computer aided design tools for solving mechanical power engineering problems.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to thermodynamics.
D4- Use different sources to obtain knowledge and information.	d4-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about advanced thermodynamics.

4- Course Contents

Week No.	*Topic*	*Total Hours*	*Contact hrs*			*Course ILOs Covered (By No.)*
			Lec.	Tut.	Lab.	
Week-1 and 2	Thermodynamics system, properties and processes.	6	6	-	-	a1-2, a1-3
Week-3 and 4	Ideal gases, property relationships, and equations of states.	6	6	-	-	a1-2, a1-3, b-1-1, b3-1
Week-5 and 6	Internal energy, enthalpy, process path, and steady state equation.	6	6	-	-	a1-2, a1-3, b1-1, c1-1
Week-7 and 8	First and second law of thermodynamics.	6	6	-	-	a1-2, a1-3, b1-1, c1-1
Week-9 and 11	Iso-entropic process .	6	6	-	-	a1-2, a1-3, b3-1, c2-1
Week-12 and 14	Thermo-chemical calculation..	6	6	-	-	a1-2, a1-3, b1-1, c2-1
Week-15 and 17	Adiabatic flame temperatures and enthalpy of combustion.	6	6	-	-	a1-2, a1-3, b3-1, c2-1
Week-18 and 19	Combustion efficiencies and air standard and actual engine cycles.	6	6	-	-	a1-2, a1-3, b1-1, c2-1, d2-1
Week-20 and 22	Reversible engine cycles.	9	9	-	-	a1-2, a1-3, b1-1, c2-1, d2-1
Week-23 and 24	Isentropic flow waves.	9	6	-	3	a1-2, a1-3, b1-1, c2-1, d4-1
Week-25 and 26	Thermodynamics of turbo-machines.	6	6	-	-	a1-2, a1-3, b1-1, c2-1, d2-1, d4-1
Week-27 and 28	Calculation for engine cycles.	9	6	-	3	a1-2, a1-3, b1-1, c2-1, d2-1, d4-1
Week-29 and 30	Applications..	9	6	-	3	a1-2, a1-3, b1-1, c2-1, d2-1, d4-1

5- Relationship between the course and the programme

Field	National Academic Reference Standard(NARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Programme Academic Standards that the course contribute in achieving	A1 (a2-a3)	B1 & B3	C1 & C2	D1 & D4

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	**30%**	**70%**	---	---	---	**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Basic thermodynamics	1-6
2nd	Isentropic flow	7-12
3rd	Adiabatic flow	13-18
4th	Air standard and actual engine cycles	19-24
5th	Thermodynamics of turbo-machines	25-30

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics				
		1st	2nd	3rd	4th	5th
Knowledge & Understanding	a1-2-1 Understand basics of thermodynamics.	x	x	x	x	x
	a1-3-1 Understand the isentropic and adiabatic flow to support more knowledge for combustion engines.	x	x	x	x	x
Intellectual Skills	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to thermodynamics and mechanical power engineering.	x	x	x	x	x

	b3-1-1 Select the suitable solution methods (Analytical technique and modern computational) for predict adiabatic and isentropic flow.	x	x	x	x	x
Professional Skill	c1-1-1 Apply the knowledge of mathematics and thermodynamics to isentropic and adiabatic flow.	x	x	x	x	x
	c2-1-1 Write and evaluate a professional report on thermodynamics problems.	x	x	x	x	x
General Skills	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to thermodynamics.				x	x
	d4-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about advanced thermodynamics.				x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Modelling	Playing
Knowledge & understanding	a1-2-1	x												
	a1-3-1	x				x								
Intellectual Skills	b1-1-1	x				x								
	b3-1-1	x				x			x					
Professional Skills	c1-1-1	x				x	x		x	x	x	x		
	c2-1-1	x				x								
General Skills	d2-1-1		x	x		x			x	x	x			
	d4-1-1		x	x					x	x	x			

10- Teaching and learning method for low capacity and outstanding Student

For low capacity students	Assign a portion of the office hours for those students.
	Give them specific tasks.
	Repeat the explanation of some of the material and tutorials.
	Assign a teaching assistance to follow up the performance of these groups of students.
For outstanding Students	Hand out project assignments to those students.
	Give them some research topics to be searched using the internet and conduct presentation.
	Encourage them to take parts in the running research projects.

11- Assessment

11.1 Assessment Methods

Course Intended Learning Outcome (ILOs)		Assessment Methods											
		Written Exam	Oral Exam	Tutorial Assessment	Project Assessment	Model Assessment	Report Assessment	Quiz assessment	Presentation Assessment	Discussion	Laboratory Test	Home Exm	Monitoring
Knowledge & Understanding	a1-2-1	x											
	a1-3-1	x											
Intellectual Skills	b1-1-1	x											
	b3-1-1	x											
Professional Skills	c1-1-1	x											
	c2-1-1	x											
General Skills	d2-1-1	x											
	d4-1-1	x											

11.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	32 th
Mid term written Examination	---	
Quizzes	---	
laboratory examination	---	
Oral examination	---	
Semester work	---	
Total	100%	

12- Facilities required for teaching and learning

Teaching aids like, lecture room with audio-visual facilities, white board.

13- List of references:

"An Introduction to Combustion" By: Stephen Turns, 2nd Edition, 2000
Publisher: McGraw Hill Comp.
"Thermodynamics, An Engineering Approach", Yunus A. Gengel, and Michael A. Boles, McGraw Hill, ISBN: 0072884959 (2006).
"Fundamentals of Thermodynamics", John Wiley, 2003.

"Fundamentals and Technology of Combustion" By: El-Mahallawy and Habik, Elsevier 2002

Course coordinator: Prof. Saad Habik
Programme coordinator: Saad Habik
Head of the Department: Prof. Kamal Morad

Date: