Sana'a University
Faculty of Engineering
Mechanical Engineering Department
Mechanical Engineering Program

58. Course Specification of Thermal Power Plants

I. Course Identification and General Information:

1.	Course Title:	Thermal Power Plants.				
2.	Course Code & Number:	ME458.				
3.	Credit Hours:	C.H				TOTAL CR. HRS.
		Th.	Seminar/Tu.	Pr	Tr.	
		2	2	-	-	3
4.	Study level/ semester at which this course is offered:	Fifth Year-First Semester.				
5.	Pre –requisite (if any):	Fluid Mechanics – II (ME242), and Heat and Mass Transfer (ME353).				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered:	Mechanical Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	Location of teaching the course:	Mechanical Engineering Department.				
10.	Prepared By:	Assoc. Prof. Dr. Abdul-Malik Momin.				
11.	Date of Approval					

II. Course Description:

The Thermal Power Production and Distribution module is intended to give the students the fundamentals of energy conversion processes from fossil or renewable sources to thermal power in centralized and distributed generation systems. The course consists of two modules: The first module starts with the description of the main types of the heat exchangers and their performance. This part will focus on heat exchangers and its applications in power plants.
The second module will focus on the generation of the electrical power. Technical aspects of power generation systems and solutions to improve their energy and environmental performance are presented, dealing also with constructive aspects, plant operation and management issues and heat distribution networks.
Conventional and non-conventional sources of energy and their availability. Structure of primary energy sources (coal, oil, hydroelectricity, solar and other renewable). Types of power

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

plants, general layout of thermal power plant, brief description of different parts/systems and their functions, advantages and limitations will be taken.

III. Alignments of the Course Intended learning outcomes (CILOs)		**Referenced PILOs**
a1	Characterize the knowledge of basic sciences subjects relevant to Thermal Power Plants	A1
a2	Express the main working principles of different types of Thermal Power Plants.	A2
b1	Explore different ideas related to the applications and enhancement of the systems in the thermal power plants.	B1
b2	Contrast between different processes for the optimal enhancement during the design of thermal power plants.	B2
c1	Implement different techniques for obtaining best efficiencies.	C1
c2	Perform different analytical work using special software related to the Thermal Power Plants.	C2
d1	Assess to time factor for completion of different processes required in Thermal Power Plants.	D2
d2	Cooperate effectively within the team in presenting the technical reports.	D5

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Characterize the knowledge of basic sciences subjects relevant to Thermal Power Plants **a2-** Express the main working principles of different types of Thermal Power Plants	• Active Lectures. • Tutorials. • Interactive Class Discussions.	• Written Exam Homework. • Presentations.

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Explore different ideas related to the applications and enhancement of the systems in the thermal power plants.	• Active Lectures. • Seminars. • Projects.	• Examination. • Homework. • Project Reports.
b2- Contrast between different processes for the optimal enhancement during the design of the thermal power plants.		

© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
c1- Implement different techniques for obtaining best efficiencies.	• Computer Laboratory Based Session. • Active Lectures. • Seminars. • Projects. • Problem Based Learning.	• Examination. • Presentations. • Individual and Group Project Reports.
c2- Perform different analytical work using special software related to the Thermal Power Plants.		

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Assess to time factor for completion of different processes required in Thermal Power Plants.	• Team Work. • Projects	• Individual and Group Projects Reports.

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

d2- Cooperate effectively within the team in presenting the technical reports.	• Directed Self – Study. • Seminars.	• Presentations

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub -Topics List	Number of Weeks	Contact Hours
1.	Introduction and Orientation of the Course (Heat Exchangers).	a1, a2. b1, b2	• Classifications of Heat Exchangers. • Types of Flow Configuration. • Performance Analysis of Shell and Tube Heat Exchangers.	2	4
2.	Thermal Design of Heat Exchangers and Main Types.	a1, a2. b1, b2, c1, c2	• Effectiveness Method. • LMTD Approach. • Empirical Relations for Forced Convection Heat Transfer. • Liquid to Liquid Heat Exchangers. • Gas to Gas Heat Exchangers. • Liquid to Gas Heat Exchangers, • Materials Selection for Heat Exchangers. • Common Failures in Heat Exchangers	4	8
3.	Introduction and Orientation of the Course (Thermal Power Generation).	a1, a2. b1, b2.	• Thermal Power Plant. • Main Cycles. • Draught System. • Site Selection. • Chimney Design.	1	2

4.	Mid-Term Exam	a1,a2, b1, b2, c1, c2.	• The First Two Chapters.	1	2
5.	Introduction and Orientation of the Course (Thermal Power Generation).	a1, a2. b1, b2.	• Thermal Power Plant. • Main Cycles. • Draught System. • Site Selection. • Chimney Design.	1	2
6.	Main Categories of the Boiler.	a1, a2, b1, b2,c1, c2.	• Boiler Heat Balance. • Enhancement of an Efficiency. • Maintenance of Boilers. • Changing of Loads.	2	4
7.	Steam Power Plant.	a1, a2, b1, b2, c1, c2. d1, d2.	• Introduction. • Essentials of Steam Power Plant Equipment. • Types of Cycles. • Layout of Steam Power Plant.	1	2
8.	Gas Power Plant.	a1, a2, b1, b2, c1, c2. d1, d2.	• Introduction. • Turbine Configuration • Methods of Enhancement. • Auxiliary Systems. • Marib Gas Turbine Power Station. • Layout of Gas Power Plant. • Combined Cycle (Steam and Gas).	2	4
9.	Environmental Effect due to Thermal Power Station.		• Energy Environmental Policy. • Environmental Management. • Fossil Fuels Generate Pollutants. • The Pollutants Degrade the Environment. • Global Warming.	1	2

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

10.	Final Exam.	a1, a2, b1, b2, c1,c2.	• All the Chapters.	1	2
Number of Weeks /and Units Per Semester				**16**	**32**

C– Tutorial Aspect:

Order	Units/Topics List	Learning Outcomes	Sub -Topics List	Number of Weeks	Contact Hours
1.	Introduction and Orientation of the Course (Heat Exchangers).	a1, a2. b1, b2	• Classifications of Heat Exchangers. • Types of Flow Configuration. • Performance Analysis of Shell and Tube Heat Exchangers.	2	4
2.	Thermal Design of Heat Exchangers and Main Types.	a1, a2. b1, b2, c1, c2	• Effectiveness Method. • LMTD Approach. • Empirical Relations for Forced Convection Heat Transfer. • Liquid to Liquid Heat Exchangers. • Gas to Gas Heat Exchangers. • Liquid to Gas Heat Exchangers, • Materials Selection for Heat Exchangers. • Common Failures in Heat Exchangers	4	8
3.	Introduction and Orientation of the Course (Thermal	a1, a2, b1, b2.	• Thermal Power Plant. • Main Cycles. • Draught System. • Site Selection. • Chimney Design.	2	4

	Power Generation).				
4.	Main Categories of the Boiler.	a1, a2, b1, b2,c1, c2.	• Boiler Heat Balance. • Enhancement of an Efficiency. • Maintenance of Boilers. • Changing of Loads.	2	4
5.	Steam Power Plant.	a1, a2, b1, b2, c1, c2. d1, d2.	• Introduction. • Essentials of Steam Power Plant Equipment. • Types of Cycles. • Layout of Steam Power Plant.	1	2
6.	Gas Power Plant.	a1, a2, b1, b2, c1, c2. d1, d2.	• Introduction. • Turbine Configuration • Methods of Enhancement. • Auxiliary Systems. • Marib Gas Turbine Power Station. • Layout of Gas Power Plant. • Combined Cycle (Steam and Gas).	2	4
7.	Environmental Effect due to Thermal Power Station.	a1, a2, b1, b2, c1, c2. d1, d2.	• Energy Environmental Policy. • Environmental Management. • Fossil Fuels Generate Pollutants. • The Pollutants Degrade the Environment. Global Warming	1	2
Number of Weeks /and Units Per Semester				**14**	**28**

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

V. Teaching Strategies of the Course:

- Active Lectures.
- Tutorials.
- Seminars.
- Projects.
- Computer Laboratory Based Session.
- Problem Based Learning.
- Team Work.
- Directed Self –Study.

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Assignment No. 1	a1, a2, b1, b2,c1, c2, d1, d2.	2nd	1.25
2.	Assignment No. 2	a1, a2, b1, b2,c1, c2, d1, d2.	3rd	1.25
3.	Assignment No. 3	a1, a2, b1, b2,c1, c2, d1, d2.	4th	1.25
4.	Assignment No. 4	a1, a2, b1, b2,c1, c2, d1, d2.	5th	1.25
5.	Assignment No. 5	a1, a2, b1, b2,c1, c2, d1, d2.	6th	1.25
6.	Assignment No. 6	a1, a2, b1, b2,c1, c2, d1, d2.	7th	1.25
7.	Assignment No. 7	a1, a2, b1, b2,c1, c2, d1, d2.	8th	1.25
8.	Assignment No. 8	a1, a2, b1, b2,c1, c2, d1, d2.	9th	1.25
9.	Assignment No. 9	a1, a2, b1, b2,c1, c2, d1, d2.	10th	1.25
10.	Assignment No. 10	a1, a2, b1, b2,c1, c2, d1, d2.	11th	1.25
Total				**15**

VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assignment for Each Chapter.	Weekly	15	10 %	a1, a2, b1, b2,c1, c2, d1, d2.
2.	Mid-Term Exam.	8th	25	16.7 %	a1, a2, b1, b2,c1, c2.

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

3.	Course File.	15th	20	13.3 %	a1, a2, b1, b2,c1, c2, d1, d2.
4.	Final Exam.	16th	90	60 %	a1, a2, b1, b2,c1, c2.
Total:			**150**	**100 %**	

VIII. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1. Dipak Sarkar, 2015, Thermal Power Plant, Elsevier.
2. P.C. Sharma, 2009, Power Plant Engineering, S.K. Kataria Publisher.
3. Cuney Ezgi, 2017, Basic Design Methods of Heat Exchanger, Intechopen, U.K.

2- Essential References.

1. P.K.Das and A.K. Das, 2018, An Introduction to Thermal Power Plant Engine Khanna Publisher.
2. Ramesh K. Shah and Dusan P. Sekulic, 2003, Fundamentals of Heat Exch Design, John Wiley and Sons Inc.

3- Electronic Materials and Web Sites *etc*.

1. www. mit.edu.
2. www.quora.com
3. en.wikipedia.org
4. www.intechopen.com.

I. Course Policies:

1	**Class Attendance:** - The student should be attending not less than 75% of total contact hours of the subject, otherwise he will not able to take exam and be considerd as an exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic.
2	**Tardy:** - For lateness in attending the class, the student will be initially notified. If he repeates late in attending class he will be considered absent.
3	**Exam Attendance/Punctuality:**

Head of Department Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

	- The student should attend the exam on time. He is permitted to attend the exam half one hour from exam beginning, after that he/she will not be permitted to take exam and he/she is considered absent in the exam.
4	**Assignments & Projects:** - In general one assignment is given after each chapter of a course. The student should submit the assignment on time, mostly one week after giving the assignment
5	**Cheating**: - For cheating in exam, the student is considered as failure. In case the cheating is repeated three times during study the student will be disengaged from the Faculty
6	**Plagiarism**: Plagiarism is the attending of the student the exam of a course instead of other student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Affair Council of the university.
7	**Other policies:** - The mobile phone is not allowable to be used during class lecture. It must be switched off, otherwise the student will be ordered to leave the lecture room. - The mobile phone is not allowed to be taken during the examination time. - Lecture notes and assignments may be given directly to students using soft or hard copy.

Reviewed By	**Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat** **President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi** **Name of Reviewer from the Department: Asst. Prof. Dr. Eng. Hamoud A. Al-Nahari**
	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa **Assoc. Prof. Dr. Ahmed Mujahed** **Asst. Prof. Dr. Munasar Alsubri**

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

58. Template for Course Plan of Thermal Power Plants

I. Information about Faculty Member Responsible for the Course:

Name of Faculty Member	Dr. Abdul-Malik Momin	**Office Hours**					
Location& Telephone No.	Mechanical Engineering Department- 777943334	**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**
E-mail	dramalikmomin@yahoo.com						

II. Course Identification and General Information:

1.	Course Title:	Thermal Power Plants.				
2.	Course Number & Code:	ME458.				
3.	Credit Hours:	C.H				Total Cr. Hrs.
		Th.	Seminar/Tu.	Pr	Tr.	
		2	2	-	-	3
4.	Study level/year at which this course is offered:	Fifth Year-First Semester.				
5.	Pre –requisite (if any):	Fluid Mechanics – II (ME242), and Heat and Mass Transfer (ME353)..				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered	Mechanical Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	System of Study:	Semesters.				
10.	Mode of delivery:	Lectures and Tutorials.				
11.	Location of teaching the course:	Mechanical Engineering Department.				

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

III. Course Description:

The Thermal Power Production and Distribution module is intended to give the students the fundamentals of energy conversion processes from fossil or renewable sources to thermal power in centralized and distributed generation systems. The course consists of two modules: The first module starts with the description of the main types of the heat exchangers and their performance. This part will focus on heat exchangers and its applications in power plants.
The second module will focus on the generation of the electrical power. Technical aspects of power generation systems and solutions to improve their energy and environmental performance are presented, dealing also with constructive aspects, plant operation and management issues and heat distribution networks.
Conventional and non-conventional sources of energy and their availability. Structure of primary energy sources (coal, oil, hydroelectricity, solar and other renewable). Types of power plants, general layout of thermal power plant, brief description of different parts/systems and their functions, advantages and limitations will be taken.

IV. Course Intended learning outcomes (CILOs) of the course

1.	Characterize the knowledge of basic sciences subjects relevant to Thermal Power Plants
2.	Express the main working principles of different types of Thermal Power Plants.
3.	Explore different ideas related to the applications and enhancement of the systems in the thermal power plants.
4.	Contrast between different processes for the optimal enhancement during the design of the thermal power plants.
5.	Implement different techniques for obtaining best efficiencies.
6.	Perform different analytical work using special software related to the Thermal Power Plants.
7.	Assess to time factor for completion of different processes required in thermal power plants.
8.	Cooperate effectively within the team in presenting the technical reports.

V. Course Content:

- Distribution of Semester Weekly Plan of Course Topics/Items and Activities.

A – Theoretical Aspect:

Order	Units/Topics List	Sub -Topics List	Week Due	Contact Hours
1.	Introduction and Orientation of the Course (Heat Exchangers).	• Classifications of Heat Exchangers. • Types of Flow Configuration. • Performance Analysis of Shell and Tube Heat Exchangers.	1st, 2nd	4
2.	Thermal Design of Heat Exchangers and Main Types.	• Effectiveness Method. • LMTD Approach. • Empirical Relations for Forced Convection Heat Transfer. • Liquid to Liquid Heat Exchangers. • Gas to Gas Heat Exchangers. • Liquid to Gas Heat Exchangers, • Materials Selection for Heat Exchangers. • Common Failures in Heat Exchangers	3rd, 4th, 5th, 6th	8
3.	Introduction and Orientation of the Course (Thermal Power Generation).	• Thermal Power Plant. • Main Cycles. • Draught System. • Site Selection. • Chimney Design.	7th	2
4.	Mid-Term Exam	• The First Two Chapters.	8th	2
5.	Introduction and Orientation of the Course (Thermal Power Generation).	• Thermal Power Plant. • Main Cycles. • Draught System. • Site Selection. • Chimney Design.	9th	2
6.	Main Categories of the Boiler.	• Boiler Heat Balance. • Enhancement of an Efficiency. • Maintenance of Boilers. • Changing of Loads.	10th, 11th	4

7.	Steam Power Plant.	• Introduction. • Essentials of Steam Power Plant Equipment. • Types of Cycles. • Layout of Steam Power Plant.	12th	2
8.	Gas Power Plant.	• Introduction. • Turbine Configuration • Methods of Enhancement. • Auxiliary Systems. • Marib Gas Turbine Power Station. • Layout of Gas Power Plant. • Combined Cycle (Steam and Gas).	13th, 14th	4
9.	Environmental Effect due to Thermal Power Station.	• Energy Environmental Policy. • Environmental Management. • Fossil Fuels Generate Pollutants. • The Pollutants Degrade the Environment. • Global Warming.	15th	2
10.	Final Exam.	• All the Chapters.	16th	2
Number of Weeks /and Units Per Semester			**16**	**32**

B – Tutorial Aspect:

Order	Units/Topics List	Sub -Topics List	Week Due	Contact Hours
1.	Introduction and Orientation of the Course (Heat Exchangers).	• Classifications of Heat Exchangers. • Types of Flow Configuration. • Performance Analysis of Shell and Tube Heat Exchangers.	1st, 2nd	4
2.	Thermal Design of Heat Exchangers and Main Types.	• Effectiveness Method. • LMTD Approach. • Empirical Relations for Forced Convection Heat Transfer. • Liquid to Liquid Heat Exchangers.	3rd, 4th, 5th, 6th	8

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

		• Gas to Gas Heat Exchangers. • Liquid to Gas Heat Exchangers, • Materials Selection for Heat Exchangers. • Common Failures in Heat Exchangers		
3.	Introduction and Orientation of the Course (Thermal Power Generation).	• Thermal Power Plant. • Main Cycles. • Draught System. • Site Selection. • Chimney Design.	8th, 9th	4
4.	Main Categories of the Boiler.	• Boiler Heat Balance. • Enhancement of an Efficiency. • Maintenance of Boilers. • Changing of Loads.	10th, 11th	4
5.	Steam Power Plant.	• Introduction. • Essentials of Steam Power Plant Equipment. • Types of Cycles. • Layout of Steam Power Plant.	12th	2
6.	Gas Power Plant.	• Introduction. • Turbine Configuration • Methods of Enhancement. • Auxiliary Systems. • Marib Gas Turbine Power Station. • Layout of Gas Power Plant. • Combined Cycle (Steam and Gas).	13th	4
7.	Environmental Effect due to Thermal Power Station.	• Energy Environmental Policy. • Environmental Management. • Fossil Fuels Generate Pollutants. • The Pollutants Degrade the Environment. • Global Warming.	14th	2
Number of Weeks /and Units Per Semester			**14**	**28**

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

VI. Teaching strategies of the course:

- Active Lectures.
- Tutorials.
- Seminars.
- Projects.
- Computer Laboratory Based Session.
- Problem Based Learning.
- Team Work.
- Directed Self –Study.

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Assignment No. 1	a1, a2, b1, b2,c1, c2, d1, d2.	2nd	1.25
2.	Assignment No. 2	a1, a2, b1, b2,c1, c2, d1, d2.	3rd	1.25
3.	Assignment No. 3	a1, a2, b1, b2,c1, c2, d1, d2.	4th	1.25
4.	Assignment No. 4	a1, a2, b1, b2,c1, c2, d1, d2.	5th	1.25
5.	Assignment No. 5	a1, a2, b1, b2,c1, c2, d1, d2.	6th	1.25
6.	Assignment No. 6	a1, a2, b1, b2,c1, c2, d1, d2.	7th	1.25
7.	Assignment No. 7	a1, a2, b1, b2,c1, c2, d1, d2.	8th	1.25
8.	Assignment No. 8	a1, a2, b1, b2,c1, c2, d1, d2.	9th	1.25
9.	Assignment No. 9	a1, a2, b1, b2,c1, c2, d1, d2.	10th	1.25
10.	Assignment No. 10	a1, a2, b1, b2,c1, c2, d1, d2.	11th	1.25
Total:				**15**

VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1.	Assignment for Each Chapter.	Weekly	15	10 %
2.	Mid-Term Exam.	8th	25	16.7 %

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

3.	Course File.	15th	20	13.3 %
4.	Final Exam.	16th	90	60 %
Total:			**150**	**100%**

IX. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1. Dipak Sarkar, 2015, Thermal Power Plant, Elsevier.
2. P.C. Sharma, 2009, Power Plant Engineering, S.K. Kataria Publisher.
3. Cuney Ezgi, 2017, Basic Design Methods of Heat Exchanger, Intechopen, U.K.

4. **2- Essential References.**

1. P.K.Das and A.K. Das, 2018, An Introduction to Thermal Power Plant Engine Khanna Publisher.
2. Ramesh K. Shah and Dusan P. Sekulic, 2003, Fundamentals of Heat Exch Design, John Wiley and Sons Inc.

3- Electronic Materials and Web Sites *etc*.

1. www. mit.edu.
2. www.quora.com
3. en.wikipedia.org
4. www.intechopen.com.

II. Course Policies:

1	**Class Attendance:** - The student should be attending not less than 75% of total contact hours of the subject, otherwise he will not able to take exam and be considerd as an exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic.
2	**Tardy:** - For lateness in attending the class, the student will be initially notified. If he repeates late in attending class he will be considered absent.
3	**Exam Attendance/Punctuality:** - The student should attend the exam on time. He is permitted to attend the exam half one hour from exam beginning, after that he/she will not be permitted to take exam and he/she is considered absent in the exam.

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

4	**Assignments & Projects:** - In general one assignment is given after each chapter of a course. The student should submit the assignment on time, mostly one week after giving the assignment
5	**Cheating**: - For cheating in exam, the student is considered as failure. In case the cheating is repeated three times during study the student will be disengaged from the Faculty
6	**Plagiarism**: Plagiarism is the attending of the student the exam of a course instead of other student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Affair Council of the university.
7	**Other policies:** - The mobile phone is not allowable to be used during class lecture. It must be switched off, otherwise the student will be ordered to leave the lecture room. - The mobile phone is not allowed to be taken during the examination time. - Lecture notes and assignments may be given directly to students using soft or hard copy.

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas