TISHK INTERNATIONAL UNIVERSITY
FACULTY OF ENGINEERING
Department of MECHATRONICS ENGINEERING,
2022-2023 Spring
Course Information for ME 423 POWER PLAN ENGINEERING & ENERGY MANAGEMENT

Course Name:	POWER PLAN ENGINEERING & ENERGY MANAGEMENT

Code	Regular Semester	Theoretical	Practical	Credits	ECTS
ME 423	8	3	-	3	4

Name of Lecturer(s):	**Assit. Prof. Dr. Banipal N. Yaqob**
Teaching Assistant:	None
Course Language:	English
Course Type:	Main
Office Hours	
Contact Email:	Banipal.yaqob@tiu.edu.iq Tel: 0750 745 6638
Teacher's academic profile:	*Please, see attached C.V.*
Course Objectives:	*To acquaint students with both steam generation and electricity production and to present some of the engineering calculations encountered in practice.* *This course deals with the application of thermal engineering and fluid mechanics to different thermo-fluid systems. It is concerned with the types, construction, working principles, and performance of boilers, heat exchangers, turbines, power plants, overall plant performance, load curves, and economics of power plants.*
Course Description (Course Overview):	To enable the students to: • Describe sources of energy and types of power plants • Analyze different types of steam cycles and estimate efficiencies in a steam power plant • Describe the basic working principles of gas turbine and diesel engine power plants. Define the performance characteristics and components of such power plants • Classify different types of coupled vapor cycles and list the advantages of combined power plant cycles. • List different types of fuels used in power plants and estimate their heating values. • List types, principles of operations, components and applications of steam turbines, steam generators, condensers, feed water, and circulating water systems. Estimate different efficiencies associated with such systems • Define terms and factors associated with power plant economics. Calculate present worth depreciation and cost of different types of power plants. Estimate the cost of producing power per kW.

COURSE CONTENT

Week	Hour	Date	Topic
1	3	6-10/2/2023	Introduction
2	3	13-17/2/2023	Steam power plant
3	3	20-24/2/2023	Boilers and steam turbines
4	3	27/2-3/3/2023	Diesel power plant
5	3	6-10/3/2023	Gas turbine power plants
6	3	27-31/3/2023	Hydroelectric power station
7	3	3-7/4/2023	Hydraulic turbines
8	3	10-14/4/2023	Midterm Exam
9	3	17-21/4/2023	Nuclear power plant
10	3	24-28/4/2023	Introduction to non-conventional power plants
11	3	8-12/5/2023	Solar power plant and Wind power plant
12	3	15-19/5/2023	Geothermal power plant and Tidal power plant
13	3	22-26/5/2023	Energy management
14	3	29/5-2/6/2023	Load curve and Load duration curve
15	3	5-9/6/2023	Final Exam
16	3	12-16/6/2023	Final Exam

COURSE/STUDENT LEARNING OUTCOMES

After completion of this course, the students should be able to:

- Become familiar with power plant systems, terms and definitions, and basic power plant engineering design calculations.
- Become familiar with the proper design and application of power plant related equipment.
- Determine the efficiency and output of a modern Rankine cycle steam power plant from given data, including superheat, reheat, regeneration, and irreversibilities.
- Calculate the heat rate, fan power consumption, heating value, and combustion air requirements of conventional steam generators (boilers).
- Select the heat transfer tubes needed for condensers and feed water heaters.
- Explain the blade shapes, and calculate the work output of typical turbine stages.
- Calculate the performance of gas turbines with reheat and regeneration, and discuss the performance of combined cycle power plants.
- Discuss the control methods of major pollutants emitted from fossil fuel power plants.
- Interpret experimental and test results and present these in an appropriate engineering report format
- Collaborate with others in a team project environment to conduct engineering investigations and produce engineering reports.
- Remember different types of energy sources and mathematical expressions related to thermodynamics that influence power plant operation.
- Understand the working principles and layout of various power plants
- Apply concepts of previously learned courses to define the working principle of Gas and diesel power plants and nuclear power safety principles.
- Analytical ability to find efficiencies of conventional and renewable energy sources.
- Able to create solutions for improving the performance of conventional and renewable energy sources.

COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES

(Blank: no contribution, I: Introduction, P: Proficient, A: Advanced)

Program Learning Outcomes	Cont.
1. Apply the knowledge as well as the ability to implement mathematics, science, and engineering fundamentals and construct solutions of complex engineering problems.	I
2. Analyze and synthesize systems and/or sub-systems that can function in coherence with a variety of initial states and boundary conditions.	I
3. Analyze data produced by acquisition systems for both localized and/or remote applications.	I
4. Apply the knowledge about environmental issues which they are capable of embracing in their solution constructs coupled with public health and safety requirements.	P
5. Identify various parameters of physical quantities such as: temperature, pressure, and displacement,	
6. Through the use of appropriate sensors, transducers, and actuators to different processors and provide suitable control for that.	
7. Apply the knowledge about the energy demand and the sustainability requirements which can be addressed in any proposed engineering project to achieve and optimized solution.	
8. Communicate effectively and work collaboratively with other engineers and technical personnel.	
9. Apply the traits of good leadership, responsibility, passion, and active engagement in both professional and community assignments.	
10. Apply personal and industrial safety at work standards.	
11. draw all necessary plans and procedures to meet good satisfaction based on customer feedback.	
12. Apply competency based marketing within the corporate domain that matches standards beyond the local arena.	
13. Apply basic organizational and project knowledge skills; and effectively manage resources, tasks,and time.	

Prerequisites (Course Reading List and References):	Thermodynamics
Student's obligation (Special Requirements):	**In this course students are expected to:** • Attend all classes. In the event you miss a class, you are responsible for the assignments and announcements made during your absence. • Participate actively in discussions and group exercises. • Prepare for class sessions by reading text assignments. • Attendance at all exams is required. Makeup exams will be given only in emergency cases (proof required). Vacation arrangements are not emergencies. Students who have unexcused absences will receive the grade of zero ("0") for all tests, quizzes, and/or lab experiments missed. • Feel free to raise questions (even if you suspect you are the only one who does not know the answer) to ensure that you thoroughly understand and are able to apply the theory in real engineering applications.
Course Book/Textbook:	▪ **Key references:** 1. "***Power Plant Technology***", by M.M. EL-Wakil, McGraw Hill, 1st Edition, 1984. 2. "***Power Plant Engineering***" by Frederick T. Morse, 3rd Ed. 1953. 3. "***Power Plant Engineering***" by G.R. Nagpal, Khanna Publishers, 1998. 4. "***A Course in Power Plant Engineering***" by Arora S.C. and Domkundwar S, Dhanpat Rai, 2001. 5. "***Power Plant Engineering***", by P.K. Nag Tata, McGraw Hill, 3rd Edition, 2008. 6. "***Applied Thermodynamics for Engineering Technologists***" by T.D. EASTOP, A. McCONKY, 5th Ed., Person Education, 2009.
Other Course Materials/References:	Online video lecture PPT Steam tables
Teaching Methods (Forms of Teaching):	Lectures, Project, Assignments, , ,

COURSE EVALUATION CRITERIA		
Method	**Quantity**	**Percentage (%)**
Seminar	1	10
Quiz	3	15
Homework	3	10
Midterm Exam	1	25
Final Exam	1	40
Total		**100**

Examinations: Essay Questions, Multiple Choices, Short Answers, , ,

Extra Notes:

ECTS (ALLOCATED BASED ON STUDENT) WORKLOAD			
Activities	**Quantity**	**Workload Hours for 1 quantity***	**Total Workload**
Theoretical Hours	16	3	48
Practical Hours	16	0	0
Final Exam	1	20	20
Seminar	1	3	3
Quiz	3	3	9
Homework	3	4	12
Midterm Exam	1	10	10
Total Workload			**102**
ECTS Credit (Total workload/25)			**4**

Peer review

Signature:	Signature:	Signature:
Name:	Name:	Name:
Lecturer	Head of Department	Dean