



Program Engineering

Specialization	Energy Technology
Course Number	020304122
Course Title	Electrical Power Plants Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3

Brief Course Description:

- ❖ Experiments on steam power plant: parts and components, operation, water treatment unit, Rankine cycle efficiency.
- ❖ Gas turbine power plants, combined cycle, diesel power stations, hydro-electric power stations, operation and maintenance of gas turbine based power plants, environmental impacts of power generation.

Course Objectives:

To provide students with basic understanding of main parts and operation of steam power stations.

Upon completion of this course the student should achieve the following goals:

1. Understands different subjects and content of the study plan.
2. To be familiar with used terminology.
3. Work with other students to determine main operational parameters of steam power plants.
4. Establish heat and mass balances of various components.

Detailed Course Description:

Lab Number	Lab name	Lab content	Time Needed
1.	Main components of steam power plants		
2.	Water treatment units: classification, maintenance and operation		
3.	Operation and shut down of steam power plants		
4.	Steam boiler's efficiency		
5.	Rankine cycle efficiency: effects of pressure and temperature		
6.	Steam turbine efficiency: input, output, speed and torque, mechanical efficiency		
7.	Generator efficiency, input, output, efficiency		
8.	Condenser thermal balance		

Evaluation Strategies:

Exams		Percentage	Date
Exams	Med-term Exam	40%	--/--/----
	Reports	10%	--/--/----
	Final Exam	50%	--/--/----

Teaching Methodology:

- ❖ Laboratory

Text Books & References:

References:

1. Power Plant Technology, by M.M. El-Wakil, McGraw Hill, New York, USA.
2. Power Plant Engineering, G.R. Nagpal, Khanna Publishers, Delhi, India.
3. Advanced Energy Systems, N.V. Khartchenko, Taylor & Francis, Washington, DC, USA.
4. Principles of Energy Conversion, by Archie W. Culp, 2nd edition, McGraw-Hill, Inc., New York, USA.



Program Engineering

Specialization	Power Plants
Course Number	20206223
Course Title	Power Plants 2
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

Brief Course Description:

- ❖ Gas turbine power plants, combined cycle, diesel power stations, hydro-electric power stations, operation and maintenance of gas turbine based power plants, environmental impacts of power generation.

Course Objectives:

To provide students with basic understanding of main parts and operation of steam power stations. Upon completion of this course the student should achieve the following goals:

1. Understands different subjects and content of the study plan.
2. To be familiar with used terminology and diagrams.
3. Work with other students to determine main operational parameters of gas turbines and diesel power plants.
4. Get familiar with new and modern energy systems (wind, solar, etc.).

Detailed Course Description:

Unit. Number	Unit name	Unit content	Time Needed
1.	Gas turbines	<ul style="list-style-type: none"> Introduction and principles, Bryton cycle, performance and efficiency 	
2.	Efficiency improvement of gas turbines	<ul style="list-style-type: none"> Regenerative cycle, reheat cycle, inter-cooled compression 	
3.	Gas turbine operation and accessories	<ul style="list-style-type: none"> Starters, standard procedures of operating and shutting down gas turbine plant, intake filters, exhaust, lubrication, fire-fighting and control systems 	
4.	Combined cycle	<ul style="list-style-type: none"> Main components, waste heat recovery steam generator, thermal efficiency and performance 	
5.	Diesel power stations	<ul style="list-style-type: none"> Introduction and classification of internal combustion engines, main components, accessories, intake and fuel systems, lubrication, exhaust, cooling system, electrical equipment, operational and maintenances guidelines 	
6.	Renewable energy systems	<ul style="list-style-type: none"> Types and advantages, wind turbines, solar thermal power systems, photo-voltaic and fuel cells, hydro-electric plants 	
7.	Environmental impacts of power generation	<ul style="list-style-type: none"> Air pollution, liquid and solid waste, greenhouse gases and climate change, thermal pollution, air pollution control technologies 	

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homework and Projects		10%	

Teaching Methodology:

1. Lecture
2. Power Point Presentation
3. Discussion

Text Books & References:

Textbook:

1. Power Plant Technology, by M.M. El-Wakil, McGraw Hill, New York, USA.

References:

1. Power Plant Engineering, G.R. Nagpal, Khanna Publishers, Delhi, India.
2. Advanced Energy Systems, N.V. Khartchenko, Taylor & Francis, Washington, DC, USA.
3. Principles of Energy Conversion, by Archie W. Culp, 2nd edition, McGraw-Hill, Inc., New York, USA.



Program Engineering

Specialization	Power Plants
Course Number	20206224
Course Title	Power Plants 2 Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3

Brief Course Description:

- ❖ Experiments on gas turbine and diesel engine power stations: parts, operation and efficiency.

Course Objectives:

To provide students with basic understanding of main parts and operation of steam power stations. Upon completion of this course the student should achieve the following goals:

1. Understands different subjects and content of the study plan.
2. To be familiar with used terminology.
3. Work with other students to determine main operational parameters of gas turbines and diesel power plants.
4. Establish heat and mass balances of various components.

Detailed Course Description:

Lab Number	Lab name	Lab content	Time Needed
1.	Main components of a gas turbine power plant		
2.	Operation and shutdown of a gas turbine power plants		
3.	Gas turbine performance		
4.	Main components of a diesel engine power plants		
5.	Operation and shut down of a diesel engine power plants		
6.	Diesel engine performance		
7.	Thermal efficiency, heat rate and specific fuel consumption		
8.	Air/fuel ratio		
9.	Exhaust gas analysis		

Evaluation Strategies:

Exams		Percentage	Date
Exams	Med-term Exam	20%	--/--/----
	Reports	30%	--/--/----
	Final Exam	50%	--/--/----
Homework and Projects			

Teaching Methodology:

- ❖ Laboratory

Text Books & References:

References:

1. Power Plant Technology, by M.M. El-Wakil, McGraw Hill, New York, USA.
2. Power Plant Engineering, G.R. Nagpal, Khanna Publishers, Delhi, India.
3. Advanced Energy Systems, N.V. Khartchenko, Taylor & Francis, Washington, DC, USA.
4. Principles of Energy Conversion, by Archie W. Culp, 2nd edition, McGraw-Hill, Inc., New York, USA.