COURSE DESCRIPTION

Faculty	Engineering				
Department	Renewable Energy Engineering			**NQF level**	7
Course Title	Energy Productioin	**Code**	703447	**Prerequisite**	Thermodynamics
Credit Hours	3	**Theory**	3	**Practical**	0
Course Leader	Dr. Ayman Alrawashdeh	**Email**	a.alrawashdeh@jadara.edu.jo		
Lecturers	Dr. Amer Al-Canaan	**Email**	a.alcanaan@jadara.edu.jo		
Lecture time	08:30- 09:45 Sun-Wed	**Classroom**	D 10	**Attendance**	On campus
Semester	Summer 2021/2022	**Production**	October 2021	**Updated**	July 2022

Short Description
This introduces the basic principles and analysis of energy production and Power-Plant Systems. Topics include: importance of energy in modern society; the relationship between various forms of energy and greenhouse gases; the laws of thermodynamics and equations relating energy, work and power; active and passive solar technology; wind, hydro, wave, geo and ocean thermal renewable energy schemes; the fuel cell and the new generation of electromechanical propulsion;
Course Objectives
1. Understand the origin and development of Power-Plant Systems. 2. Understand the first attempts of electrical power generation from conventional Power-Plant 3. Understand the main components of Power-Plant Systems 4. Understand the transmission system of electrical energy 5. Learn the different types of steam and gas turbines 6. Understand the different types of the renewable energy resources

Course Intended Learning Outcomes (CILOs)
A. Knowledge - Theoretical Understanding
a.1 Learn/understand the development and operation principles of Power-Plant Systems. (K1)
B. Knowledge – Practical Applications
a.2 Compare the different types of the renewable energy production technologies and energy resources (K2)
C. Skills - Generic Problem Solving and Analytical Skills
b.1 Calculate Analyze and conduct appropriate data, and use engineering judgment. Discover, analyze and solve broadly-defined problems of electrical energy transmission systems. (S1)
D. Skills - Communication, ICT, and Numeracy

b.3 Work in groups and **Write** technical **report** and perform **oral presentations** related to energy production. (S3)
Teaching and Learning Methods
E-learning (Blackboard), Engaged learning, Problem-based learning (PBL), and Project-based learning:
Assessment Methods
Class Participation and Assignments
Term Project/Presentation
HW
Quizzes
Midterm Exam
Final Exam

Course Contents					
Week	**Hours**	**CLOs**	**Topics**	**Teaching & Learning Methods**	**Assessment Methods**
1.	5	a1	**Chapter 1: Fundamental of Power Plant** 1.1 Introduction 1.2 Concept of Power Plants 1.3 Classification of Power Plants 1.4 Energy 1.5 Types of Energy 1.6 Power	Lectures, presentations	
2.	5	a1	1.12 Review of Thermo dynamics Cycles Related to Power Plants 1.13 Classification of Power Plant Cycle 1.14 Fuels and Combustion 1.15 Steam Generators 1.16 Steam Prime Movers 1.17 Steam Condensers 1.18 Water (Hydraulic) Turbines **Chapter 2: Non-Conventional Energy Resources and Utilisation** 2.1 Introduction 2.2 Energy Science 2.3 Various Energy Science 2.4 Energy Technology	Lectures, presentations	

			2.5 Energy Technology and Energy Sciences 2.6 Law of Conservation of Energy 2.7 Facts and Figures about Energy 2.12 Introduction to Various Sources of Energy 2.13 Introduction to Various Non-Conventional Energy Resources 2.14 Bio-Gas 2.15 Wind Energy 2.16 Solar Energy 2.17 Electrochemical Effects and Fuel Cells 2.18 Thermionic Systems and Thennionic Emission 2.22 Other Energy Technology		
3.	4.5	a2, b1, b3	**Chapter 4 : Steam Power Plant** 4.1 Introduction 4.2 Essentials of Steam Power Plant Equipment 4.4 Fuel Burning Furnaces 4.5 Method of Fuel Firing 4.6 Automatic Boiler Control 4.7 Pulverized Coal 4.8 Pulverized Coal Firing 4.9 Pulverized Coal Burners 4.11 Ash Disposal 4.12 Smoke and Dust Removal 4.13 Types of Dust Collectors	Lectures, presentations	**Group work #1** **Quiz #1**
4.	4	a1, a2, b1	**Chapter 5 : Steam Generator** 5.1 Introduction 5.2 Types of Boilers 5.3 Cochran Boilers 5.4 Lancashire Boiler 5.5 Locomotive Boiler 5.6 Babcock Wilcox Boiler 5.7 Industrial Boilers 5.8 Merits and Demerits of Water Tube Boilers over Fire Tube Boilers Mertis 5.9 Requirements of a Good Boiler 5.10 High Pressure Boilers **Chapter 6 : Steam Turbine**	Lectures, presentations	**Midterm exam**

			6.1 Principle of Operation of Steam Turbine 6.2 Classification of Steam Turbine 6.3 The Simple Impulse Turbine 6.4 Compounding of Impulse Turbine 6.5 Pressure Compounded Impulse Turbine 6.6 Simple Velocity-Compounded Impulse Turbine 6.7 Pressure and Velocity Compounded Impulse Turbine 6.8 Impulse-Reaction Turbine 6.9 Advantages of Steam Turbine over Steam Engine 6.10 Steam Turbine Capacity 6.11 Capability 6.12 Steam Turbine Governing 6.13 Steam Turbine Performance 6.14 Steam Turbine Testing 6.15 Choice of Steam Turbine 6.16 Steam Turbine Generators 6.17 Steam Turbine Specifications **Midterm exam**		
5.	4.5	a1, a2, b1	**Chapter 8 : Diesel Power Plant** 8.1 Introduction 8.2 Operating Principle 8.3 Basic Types of IC Engines 8.4 Advantage of Diesel Power Plant 8.5 Disadvantage of Diesel Power Plant 8.6 Application of Diesel Power Plant 8.7 General Layout of Diesel Power Plant 8.8 Performance of Diesel Engine 8.9 Fuel System of Diesel Power Plant 8.10 Lubrication System of Diesel Power Plant 8.11 Air Intake sand Admission System of Diesel Power Plant 8.12 Supercharging System of Diesel Power Plant 8.13 Exhaust System of Diesel Power Plant 8.14 Cooling System of Diesel Power Plant 8.15 Diesel Plant Operation 8.16 Efficiency of Diesel Power Plant 8.17 Heat Balance Sheet	Lectures, presentations	**Quiz #2**

6.	5	a1, a2, b1, b3	**Chapter 9 : Gas Turbine Power Plant** 9.1 Introduction 9.2 Classification of Gas Turbine Power Plant 9.3 Elements of Gas Turbine Power Plants 9.4 Regeneration and Reheating 9.5 Cogeneration 9.6 AuxiliarySystems 9.7 Control of Gas Turbines 9.8 Gas Turbine Efficiency 9.9 Operations and Maintenance Performance 9.10. Troubleshooting and Remedies 9.11 Combined Cycle Power Plants 9.12 Applications of Gas Turbine **Chapter 10 : Nuclear Power Plant** 10.1 Introduction 10.2 General History and Trends 10.3 The Atomic Structure 10.4 Summary of Nuclear Energy Concepts and Terms 10.5 Ethical Problems in Nuclear Power Regulation 10.6 Chemical and Nuclear Equations 10.7 Nuclear Fusion and Fission 10.8 Energy From Fission and Fuel Burn Up 10.9 Radioactivity 10.10 Nuclear Reactor	Lectures, presentations	**Group work #2**
7.	5	a1, a2, b1	10.11 Conservation Ratio 10.12 Neutron Flux 10.13 Clasification of Reactors 10.14 Cost of Nuclear Power Plant 10.15 Nuclear Power Station in India 10.16 Light Water Reactor (LWR) and Heavy Water Reactor (HWR) 10.17 Site Selection 10.18 Comparison of Nulcear Power Plant and Steam Power Plant 10.19 Multiplication Factor 10.20 Uranium Enrichment 10.21 Reactor Power Control 10.22 Nuclear Power Plant Economics 10.23 Safety Measures for Nuclear Power Plants	Lectures, presentations	

			10.24 Site Selection and Commissioning Procedure 10.25 Major Nuclear Power Disasters 10.26 Chernobyl Nuclear Power Plant 10.27 Safety Problems in Chernobyl Reactor Design 10.28 Other, Earlier, Soviet Nuclear Accidents		
8.	2	a1, a2, b1	**Chapter 11 : Hydro-Electric Power Plants** 11.1 Introduction 11.2 Run-Off 11.3 Hydrograph and Flow Duration Curve 11.4 The Mass Curve 11.5 Selection of Site for a Hydro-Electric Power Plant 11.6 Essential Features of a Water-Power Plant 11.7 Calculations of Water Power Plants 11.8 Classification of Hydro-Plant **Chapter 12 : Electrical System** 12.1 Introduction 12.2 Generators and Motors 12.3 Transformers 12.4 Cooling of Transformers 12.4.1 Simple Cooling 12.5 Bus-Bar 12.6 Busbar Protection **Final Exam**	Lectures	**Final exam**

Infrastructure	
Textbook	1. Power-Plant-Engineering. By A.K. raja
References	1. Principles of Power Systems, 2006 Edition, V.K Mehta.
Required reading	"Radiation Budget". NASA Langley Research Center. 17 October 2006. Retrieved 29 September 2007.
Electronic materials	Ppt, book, lec, charts, tables
Other	NErL

Course Assessment Plan						
Assessment Method		**Grade**	**CLOs**			
			a1	**a2**	**b1**	**b3**
First (Midterm)		**30%**	12	13	5	
Second (if applicable)						
Final Exam		**50%**	25	15	10	
Coursework		**20%**				
Coursework assessment methods	Assignments					
	Case study					
	Discussion and interaction/participation					
	Group work activities					10
	Lab tests and assignments					
	Presentations/attendance					
	Quizzes			5	5	
Total		**100%**	37	33	20	10

Plagiarism
Plagiarism is claiming that someone else's work is your own. The department has a strict policy regarding plagiarism and, if plagiarism is indeed discovered, this policy will be applied. Note that punishments apply also to anyone assisting another to commit plagiarism (for example by knowingly allowing someone to copy your code). Plagiarism is different from group work in which several individuals share ideas on how to carry out the coursework. You are strongly encouraged to work in small groups, and you will certainly not be penalized for doing so. This means that you may work together on the program. What is important is that you have a full understanding of all aspects of the completed program. To allow proper assessment that this is indeed the case, you must adhere strictly to the coursework requirements as outlined above and detailed in the coursework problem description. These requirements are in place to encourage individual understanding, facilitate individual assessment, and deter plagiarism.