MODULEDESCRIPTION FORM
وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**POWER PLANTS**			**Module Delivery**	
Module Type	BASIC			**Theory** **Lecture** **Tutorial**	
Module Code	**EPE 211**				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		**Semester (s) offered**		2'nd	
Administering Department	Power & Electrical Machines Eng.	**College**	Engineering		
Module Leader	Ibrahim I. Ibrahim	**e-mail**	Ibrahem_a@uodiyala.edu.iq		
Module Leader's Acad. Title	Assist. Lect.	**Module Leader's Qualification**		M.Sc. in Electrical & Electronic Eng.	
Module Tutor	Assist. Lect. Ibrahim I. Ibrahim	**e-mail**	Ibrahem_a@uodiyala.edu.iq		
Peer Reviewer Name		**e-mail**			
Review Committee Approval		**Version Number**	1.0		

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**None**	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	This module aims to provide students with a comprehensive understanding of the principles and applications of thermodynamics in power plant engineering. The course is designed to equip students with the knowledge of different types of power plants, their components, and the thermodynamic cycles they operate on. Students will also learn about the environmental and economic considerations of power generation, as well as recent technological advancements in the field.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand and apply the basic concepts of thermodynamics in the context of power plants. 2. Analyze the operation and efficiency of various thermodynamic cycles used in power plants. 3. Identify and explain the function of major power plant components. 4. Evaluate the performance of different types of power plants (steam, gas turbine, hydro) based on thermodynamic principles. 5. Assess the environmental and economic impacts of power plants and explore sustainable alternatives. 6. Understand recent advancements in power plant technologies and their implications for future power generation.
Indicative Contents المحتويات الإرشادية	The topics listed under the indicative content below are the underpinning areas of knowledge and understanding that will be obtained from successful completion of the module. The topics are illustrated in the context of relevant engineering scenarios. 1. **Introduction to Thermodynamics and Power Plants** 2. **Basic Thermodynamic Principles** 3. **The First Law of Thermodynamics** 4. **The Second Law of Thermodynamics and Entropy** 5. **Thermodynamic Cycles and Heat Engines** 6. **Ideal Gases and Real Fluids** 7. **Introduction to Power Plant Components** 8. **Steam Power Plants** 9. **Gas Turbine Power Plants** 10. **Hydro Power Plants** 11. **Thermodynamic Analysis of Power Plants** 12. **Environmental and Economic Considerations** 13. **Advances in Power Plant Technology** 14. **Case Studies and Practical Applications** 15. **Review and Examination Preparation**
Course Description	The "Power Plants" module is a 15-week course designed to provide students

	with an in-depth understanding of thermodynamic principles as they apply to power generation. The course covers the fundamentals of thermodynamics, the operation and efficiency of various power plant types, and the environmental and economic impacts of power plants. Through theoretical instruction and practical case studies, students will learn to analyze and evaluate the performance of power plant systems and explore recent technological advancements in the field.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• **Lectures:** To introduce and explain core concepts and theories related to thermodynamics and power plants. • **Tutorials:** For detailed problem-solving sessions and discussions on practical applications of theoretical principles. • **Case Studies:** To analyze real-world examples of power plants and understand the application of theoretical knowledge in practical scenarios. • **Group Projects:** To foster collaborative learning and application of course content to design and evaluate power plant systems. • **Quizzes and Assignments:** To reinforce learning and ensure continuous assessment throughout the course. • **Examination Preparation:** Review sessions and practice problems to prepare students for final assessments.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **30** **In class tests** **10** **Tutorial** **12**	52	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Assignment** **20** **Preparation for tests** **20** **Homework**	48	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1

8			
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	3,5, 10, 12, 14	LO #1, 2, 3, 4 ,5 and 6
	Assignments	6	20% (20)	4, 8, 12	LO # 1, 2, 3, 4, 5 and 6
Summative assessment	**Midterm Exam**	2	20% (20)	7	LO # 1,4
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	**Introduction to Thermodynamics and Power Plants** • Definitions and Basic Concepts: Dimensions, Units, Mass, Force, Work, Power, Energy. • Overview of Power Plants: Definition, Types, and Energy Sources.
Week 2	**Basic Thermodynamic Principles** • Properties of Substances: State, Path, Process, Cycle. • State Functions and Heat Transfer: Conduction, Convection, Radiation. • Thermal Equilibrium.
Week 3	**The First Law of Thermodynamics** • Energy Conservation: Internal Energy, Work, and Heat. • Steady Flow Energy Equation: Practical Applications (Nozzle, Throttling, etc.).
Week 4	**The Second Law of Thermodynamics and Entropy** • Concepts of Reversibility and Irreversibility. • Carnot Cycle and Entropy. • Entropy Changes in Various Processes.

Week 5	**Thermodynamic Cycles and Heat Engines** • Overview of Thermodynamic Cycles: Carnot, Ideal Rankine. • Heat Engines and Their Efficiency. • Practical Applications: Boilers, Compressors, Turbines.
Week 6	**Ideal Gases and Real Fluids** • Ideal Gas Laws: Boyle's Law, Charles's Law, Joule's Law. • Real Fluid Flow: Compressibility, Pascal's Law. • Continuity Equation and Bernoulli's Equation.
Week 7	**Introduction to Power Plant Components** • Major Components: Pump, Boiler, Turbine, Condenser. • Basic Operation and Function of Each Component. • Power Plant Layout and Working Principle.
Week 8	**Steam Power Plants** • Detailed Study of the Rankine Cycle. • Modifications for Efficiency: Superheating, Reheating, Regenerative Heating. • Mollier Chart and Steam Properties.
Week 9	**Gas Turbine Power Plants** • Working Principle and Basic Components. • Brayton Cycle: Efficiency and Performance. • Methods to Enhance Efficiency: Intercooling, Reheating, Regeneration.
Week 10	**Hydro Power Plants** • Basics of Hydropower: Components and Working. • Types of Hydro Turbines: Pelton, Francis, Kaplan. • Efficiency and Energy Conversion.
Week 11	**Thermodynamic Analysis of Power Plants** • Isentropic Efficiency and Work Ratio. • Thermal Efficiency of Different Power Cycles. • Energy Balance and Heat Exchangers.
Week 12	**Environmental and Economic Considerations** • Environmental Impact of Power Plants: Emissions, Thermal Pollution. • Renewable vs. Non-Renewable Sources. • Economic Analysis and Load Management.
Week 13	**Advances in Power Plant Technology** • Combined Cycle Power Plants. • Integration of Renewable Energy Sources. • Smart Grids and Future Trends in Power Generation.
Week 14	**Case Studies and Practical Applications**

	• Case Studies of Modern Power Plants. • Problem-Solving Sessions on Thermodynamic Cycles. • Real-Life Applications and Project Discussions.
Week 15	**Review and Examination Preparation** • Comprehensive Review of All Topics Covered. • Sample Problems and Solutions. • Examination Guidelines and Preparation Tips.
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Yunus A Çengel, Michael A Boles, Mehmet Kanoğlu, "Thermodynamics: an engineering approach", McGraw Hill Education, 9th edition, 2019.	No
Recommended Texts	Michael J. Moran, Howard N. Shapiro, Bruce R. Munson, and David P. DeWitt, "Introduction to Thermal Systems Engineering: Thermodynamics, Fluid Mechanics, and Heat	No

	Transfer"	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.