



Course Specification

— (Bachelor)

Course Title: Energy Efficiency

Course Code: 382-MEC-2

Program: Bachelor of Science in Engineering

Department: Mechanical Engineering

College: College of Engineering

Institution: Najran University

Version: 1.0

Last Revision Date: 27 February 2024



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A. General information about the course:

1. Course Identification

1. Credit hours: (2)

2. Course type

A. University College Department Track Others
 B. Required Elective

3. Level/year at which this course is offered: (Fourth Year \ Level 8)

4. Course general Description:

The distinction between demand and supply side energy efficiency, Energy efficiency terminology, barriers to energy efficiency, Review of laws of thermodynamics and Carnot efficiency, Modes of heat transfer (conduction, convection, and radiation), Break-down of energy in residential, commercial, and industrial buildings and introduction of the concept of Energy Use Intensity, Thermal insulation – need and types based on building envelopes and setting R/U value, Importance of urban planning and introduction of district cooling, Performance benchmarking and improvement measures in petrochemical or cement industry, Economics of energy efficiency – calculation of pay-back periods and financing, Relative performance of global energy efficiency programs

5. Pre-requirements for this course (if any):

324-MEC-3 (Internal Combustion Engines)

6. Co-requisites for this course (if any):

NIL

7. Course Main Objective(s):

To provide engineering and architect students with the basic principles of energy efficiency, fundamental concepts, sustainability, energy policy, energy finance and energy and environment.



2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	15
5.	Others (specify)	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Have an awareness of the importance of energy efficiency.	1	TS:1-Interactive lectures using PowerPoint slides. TS:2- Engaging the students in problem-based learning through tutorials. TS: 3 – Associating the topics in each chapter with the CLO.	-Test performance evaluation -Evaluation of participation in discussion and group assignments





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			<p>TS:4 – Conducting quizzes by the each chapter.</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	
1.2	Understand the energy value chain for major drivers of energy demand and consumption in the major sectors (buildings, industry and transportation).	7	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Giving more assignment by the each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	<p>-Test performance evaluation</p> <p>-Evaluation of participation in discussion and group assignments</p>
2.0	Skills			
2.1	Learn about methods used to reduce energy consumption in the buildings, industry and transportation sectors	2	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p>	<ul style="list-style-type: none"> •Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			<p>TS:4 – Conducting quizzes for each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	<ul style="list-style-type: none"> •Quizzes
2.2	Be adept at using equipment used to measure energy consumption of products deployed in the buildings, industrial, and transportation sectors.	6	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Conducting quizzes for each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	<ul style="list-style-type: none"> •Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes
3.0	Values, autonomy, and responsibility			
3.1	Be familiar with global energy and energy efficiency policies.	5	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Conducting midterm and Final</p>	<p>Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics</p> <ul style="list-style-type: none"> •Assignments involving critical and logical thinking questions •Quizzes



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			Exam for each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	

C. Course Content

No	List of Topics	Contact Hours
1.	Fundamental Concepts	6
2.	Building Energy Efficiency	4
3.	Urban Planning & District Cooling	8
4.	Industrial Energy Efficiency	7
5.	Energy Auditing	5
6.	Transportation & Behavioral Energy Efficiency	5
7.	Economics of Energy Efficiency	5
8.	Energy policy and Global Programs	5
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	1-10	10%
2.	Quizzes	1-10	10%
3.	Mid-term	7	30%
4.	labs	-	-
5.	Final exam	12	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).





E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	"Sustainable Energy: Choosing Among Options" by J. Tester et al., 2012, 2nd Edition.
Supportive References	"Handbook of Energy Audits" by A. Thumann et al., 2012, 9th Edition. "Fundamentals of Thermal-Fluid Sciences" by Y. Çengel et al., 2012, 4th Edition. "Sustainable Energy - Without the Hot Air" by D. MacKay, 2009, UIT Cambridge Ltd., 1 st Edition. "Energy Efficiency Manual" by D. Wulfinghoff, 2000, Energy Inst Press, 1 st Edition.
Electronic Materials	Online custom books
Other Learning Materials	NA

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms and laboratories
Technology equipment (projector, smart board, software)	--
Other equipment (depending on the nature of the specialty)	--

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders and Peer Reviewer	Direct, Indirect
Effectiveness of Students assessment	Students & Faculty	Direct and Indirect
Quality of learning resources	Students & Faculty	Direct and Indirect
The extent to which CLOs have been achieved	Students & Faculty	Direct and Indirect
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)





G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT OF MECHANICAL ENGINEERING
REFERENCE NO.	
DATE	27/02/2024

