T.R.
ISTANBUL GEDIK UNIVERSITY

COURSE INFORMATION FORM

Course Title	Course Code	Semester	L+P	Credit	ECTS Credits
Green Transition and Sustainability	TBD	All	3+0(3/1)	3	7

Department / Program	Mechanical Engineering Department
Prerequisites and co-requisities	None
Type of Course and Level of Course Unit	Elective – Undergraduate
Language of Instruction	English
Academic Year and Semester	2025-2026 / Fall Semester
Class Hours	TBD
Aim of the Course	The main objective of this course is to provide students with profound insight into the global energy transition and how sustainable technologies are positioned to shape the future in the production and consumption of energy. This course incorporates engineering and policy analysis and advanced manufacturing in order to provide students with the knowledge and competencies relating to sustainability challenges facing the various sectors.
Course Content	The course covers key issues in the field of energy transition and explores the role that can be played by sustainable technologies within modern industry. The program offers an interdisciplinary view on the main issues to do with sustainability: renewable sources, advanced manufacturing, robotics, AI and circular economy models. Students shall study energy policy and climate protection as well as innovation in digital manufacturing that contribute to energy efficiency. By case studies, life cycle assessment and hands-on analysis, participants will develop practical insights into how sustainable solutions in energy production and industrial processes can be put into practice.
Course Learning Outcomes	Course Learning Outcomes: Upon the successful completion of this course, students will be able to:

Learning Outcomes	Evaluation Methods
1. Overview of the historic change in energy systems and sustainability principles.	Course Project
2. Energy systems are complicated and interact within policy, technology and the environment	Course Project
3. To identify current challenges regarding energy transition and apply theoretical frameworks to analyze sustainable solutions.	Course Project

	4. Understand the role of policy and governance in energy transitions and sustainability	Course Project
	5. Assess the energy systems at sectoral level (industry, transportation, buildings) by means of model and sustainability assessment tools	Course Project
	6. Analyze, discuss, and critically evaluate energy policies and their implications about sustainable development.	Course Project
Assessment Methods and Criteria	Suitable technology feasibility platforms with projects	

LECTURER

Name of Lecturers	Assoc. Prof. Dr. Egemen Sulukan
Office Hours	Monday 09.00-12.00 / Wednesday 12.00-15.00
E-Mail	egemen.sulukan@gedik.edu.tr
Assistants	TBD
E-Mail	TBD

WEEKLY DETAILED COURSE CONTENTS

Session	Topics	Study Materials	No. of Learning Outcomes
1.	Introduction to Energy Transition & Sustainability	**Sulukan, 2016, Energy Modelling and Applications (LAP LAMBERT Academic Publishing).**	1,2
2.	Climate Change & Energy Policy & Renewable Energy Technologies	**Sulukan, 2016, Energy Modelling and Applications (LAP LAMBERT Academic Publishing).**	2,3
3.	Local Governance, Environmental Regulations & Waste Management	**Sulukan, 2016, Energy Modelling and Applications (LAP LAMBERT Academic Publishing).**	4

4.	CNC Machining & Traditional Manufacturing	**Yao, 2024, Comparison between Traditional Machining and CNC Machining**	4,5
5.	Energy Efficiency & Digital Manufacturing in CNC	**Kummetz, 2024, Innovative CNC Technology for Sustainable and Highly Efficient Manufacturing.**	4,5
6.	Introduction to Additive Manufacturing (AM) & Sustainability	**Peng, Kellens, Tang, Chen, Chen, 2018, Sustainability of additive manufacturing: An overview on its energy demand and environmental impact**	4,5
7.	Advanced AM Techniques & Applications in Green Manufacturing	**Javaid, Haleem, Singh, Suman, Rab, (2021 Role of additive manufacturing applications towards environmental sustainability**	5
8.	Midterm Exam	**N/A**	
9.	LCA & Sustainability Metrics in Additive Manufacturing	**Ribeiro, Matos, Jacinto, Salman, Cardeal, Carvalho, „, Peças, 2020, Framework for life cycle sustainability assessment of additive manufacturing.**	5
10.	Biomass Energy & Biofuels	**Mignogna, Szabó, Ceci, Avino, 2024, Biomass energy and biofuels: Perspective, potentials, and challenges in the energy transition**	1,2,3
11.	Biomass in Manufacturing & Circular Economy	**Hsiao, Hu, 2024, Biomass and circular economy: Now and the future**	3
12.	Industrial Waste & Recycling in Biomass Energy	**Xu, Chen, 2018, Examining the efficiency of biomass energy: Evidence from the Chinese recycling industry**	3
13.	Introduction to Robotics in Energy & Manufacturing	**Iqbal, Al-Zahrani, Alharbi, Hashmi, 2019, Robotics inspired renewable energy developments: prospective opportunities and challenges**	4,5
14.	AI, Automation & Smart Manufacturing	**Sahoo, Lo, 2022, Smart manufacturing powered by recent technological advancements: A review**	4,5
15.	Future of Robotics & AI in Sustainable Energy	**Kamisetty, 2022, AI-Driven Robotics in Solar and Wind Energy Maintenance: A Path toward Sustainability.**	4,5
16.	Project Presentations	N/A	

RECOMENDED OR REQUIRED READINGS

ASSESSMENT

	Quantity	Percentage (%)
Attendance		70
Practice		1
Field Research		
Practicum		
Quizzes		
Assignments		
Presentation/Jury		
Projects	1	50
Seminar		
Mid-terms / Oral examination	1	50
Final examination/ Oral examination		
Total	2	100

ECTS CALCULATION

Activities	Quantity	Duration (Hour)	Total Work Load
Course Duration	14	3	42
Practice			
Practicum			
Field Research	12	10	120
Hours for off the class study			
Presentation/Jury			
Seminar			
Projects	1	24	24
Assignments			

Quizzes			
Mid-terms / Oral examination	1	24	24
Final examination/ Oral examination			
Total Work Load	27	61	210
Total Work Load / 30 hours			7
Number of ECTS Credits			7

CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME OUTCOMES

Express the strength of the relationship between learning outcomes and program qualifications in numbers as follows:

- **1: Does not meet at all**
- **2: Slightly meets**
- **3: Meets**
- **4: Adequately meets**
- **5: Completely meets**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
LO1	4	4	5	5	5	4	5	4	5	5
LO2	4	4	5	4	4	4	4	5	5	5
LO3	5	4	4	4	5	4	5	5	5	5
LO4	5	5	5	5	5	5	4	4	5	5
LO5	5	5	5	5	4	4	5	5	4	4
LO6	4	5	4	4	5	4	5	5	5	5

LO: Learning Outcome