

AAE-E3090 Renewable Energy Engineering

Course Schedule 2022, updated 2.1.2023, Mika Järvinen

Week	Date	Room	L/E	HW	Quiz	GW	Content
Introduction							
2	Tue 10.1.	Zoom	L/E1				Course introduction. The need for renewable energy and resources. MJ.
	Fri 13.1.	Zoom	L/E2				The need for renewable energy and resources. MJ.
Power from the Wind							
3	Tue 17.1.	Zoom	L/E3	1	1		Principles of wind turbines. One-dimensional momentum theory and the Betz limit. MJ.
	Fri 20.1.	Zoom	L/E4			GW1	Ideal horizontal axis turbine with wake rotation. Air foils and blade element theory. MJ.
4	Tue 24.1.	Zoom	L/E5				Control systems. Stall regulation of wind turbines. MJ
	Fri 27.1.	Zoom	L/E6		2		Pitch control of wind turbines. MJ
5	Tue 31.1.	Zoom	L/E7				Wind statistics and height variation. Introduction to Wind Atlas. MJ.
	Fri 3.2.	Zoom	L/E8				Introduction to RES-Electricity Economics & Windpower specifics. SC.
6	Tue 7.2.	Zoom	L/E9		3		Windpower project investment case study. SC.
Power from the Sun							
6	Fri 10.2.	Zoom	L/E10	R1, 2			Solar resource and Sun-Earth geometry. Solar Atlas. MJ
7	Tue 14.2.	Zoom	L/E11				Orientation of solar panels. Concept of Air Mass. MJ
	Fri 17.2.	Zoom	L/E12		4		Operation principles of a solar cell and the equivalent circuit. MJ.
8	Exam week 20.-24.2						
9	Tue 28.2.	Zoom	L/E13				Effect of irradiance and cell temperature on power generation. MJ.
	Fri 3.3.	Zoom	L/E14				Principles of grid connected solar PV systems. MJ.
10	Tue 7.3.	Zoom	L/E15				Economics of PV systems 1. SC
	Fri 10.3.	Zoom	L/E16		5		Economics of PV systems 2. SC
Renewable heat - heat pumps							
11	Tue 14.3.	Zoom	L/E17	R2, 3		GW2	Heating in de-carbonized energy systems. Need for heat pumps. MJ+LS.
	Fri 17.3.	Zoom	L/E18				Principles of a compression cycle based heat pump. Second law of thermodynamics. MJ+LS.
12	Tue 21.3.	Zoom	L/E19				Evaporators and condensers. MJ+LS.
	Fri 24.3.	Zoom	L/E20		6		Compressor types and operation. Efficiency contours. MJ+LS.
13	Tue 28.3	Zoom	L/E21			GW3	Economics of heat pumps 1. SC.
	Fri 31.3.	Zoom	L/E22				Economics of heat pumps 2. SC.
Group work presentations and summary of the course							
14	Tue 4.4.	Zoom	L/E23				Group work seminar
	Fri 7.4.	Zoom	L/E24	R3			Group work seminar
15	Exam week 9-14.4.						

X = home work X out, RX = return homework X. MJ = Mika Järvinen, SC = Sam Cross, LS = Shouzhuang Li, NN = Assistants

L/E is usually activating lectures, e.g. 45 min lecture + 45 min calculations/demonstrations.

GW1 = topics delivered, GW2 = midterm show, GW3 = return report.