



SHELL NAWAFIDH 2022/2023

Shell
Nawafidh


OUTWARD BOUND OMAN™
unlocking human potential


RWTH AACHEN
الجامعة الألمانية للتكنولوجيا في عمان
German University of Technology in Oman



SHELL NAWAFIDH is designed to provide Omani youth with the opportunity to explore the future energy market through a structured and integrated technical and life skill curriculum. The objective of the program is to expose participants to the latest technology and applications related to emerging new sources of energy and to participate in discussion groups hosting professionals and leaders in the energy market in Oman. The program is conducted in partnership with German University of Technology in Oman (GUTech) and Outward Bound Oman (OBO).





OUR VISION

To provide a window into how the future of the energy market is shaping up and develop the skills critical to facilitate the energy transition. Our vision is inspired by local and global incentives to move towards clean and renewable energies.



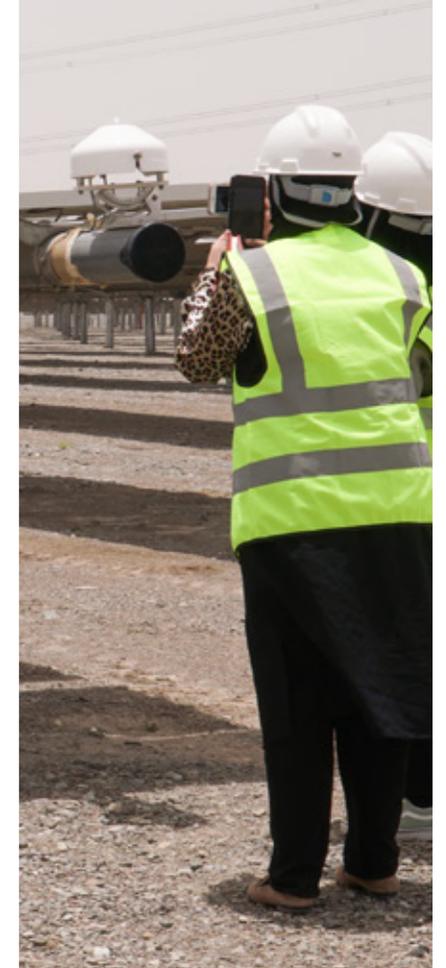
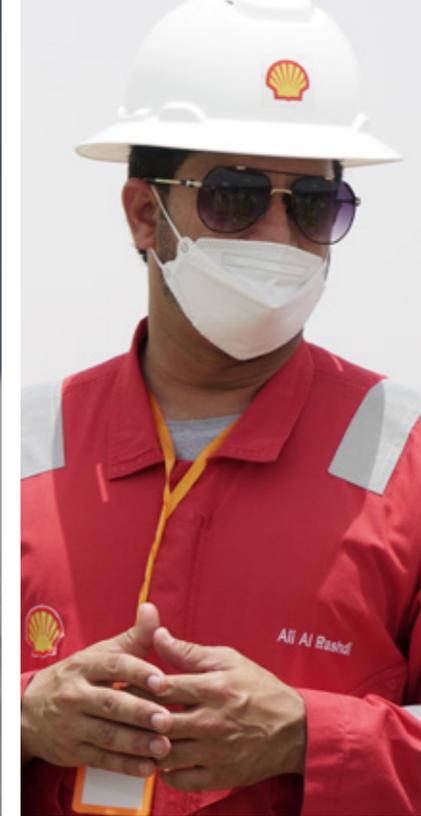
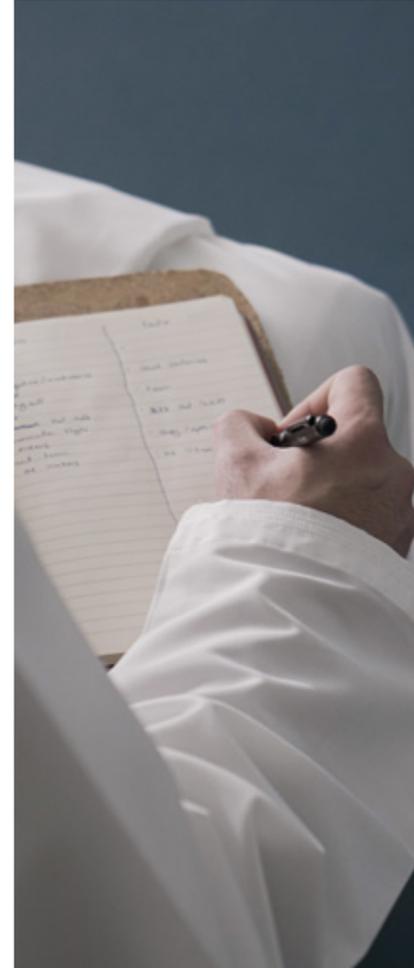
OUR OBJECTIVES

- To provide participants with the right platform to learn the latest on emerging energies and their application in Oman through live projects.
- To collaborate with key academic and training partners and provide participants with a solid foundation on technical and soft skills, which are essential for transitioning to new and emerging energies.
- To bridge the gap between academia and industry through the right discussions and workshops.
- To enable networking, peer assistance, staying connected, and motivating and empowering participants to lead the transition into the new energy market.



OUR MISSION

To equip our participants with the essential skills to compete in the future energy market in Oman.



TARGET AUDIENCE



Participants who are keen to develop new skills and lead the transition into the emerging energy markets



Omani youth with degrees in science and engineering



Omani youth residing in the country

PROGRAMME COMMITMENT



30

Technical sessions
(2 hours per session)



3

Non-technical Sessions
(Conducted over the weekend)



Industry Exposure
(Exclusive lectures by energy leaders on the future of the energy market in Oman)

OMAN SHELL Q&A SESSIONS

The Q&A sessions are team-based discussions on topics related to the future of the energy market. The sessions will be in a lecture format, and will offer participants the opportunity to engage and interact with industry leaders.

Shell Nawafidh

PROGRAMME DURATION

STARTS: 5th October 2022 **ENDS:** mid March 2023

EXPECTATIONS

Full attendance and punctuality in all the lectures, events and visits related to Shell Nawafidh. Adherence to all HSE procedures in venues used to conduct Shell Nawafidh events. Displaying respect, teamwork and collaboration with all other members in the program.

CONTACTS

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The Technical part of the program is organized in 4 blocks (Table 1). Each block focuses on a relevant aspect of energy resources. It starts with block 1 “Global Energy and Its Environmental Impact”. In this block participants are introduced to the global and local energy challenges, explore the different types of oil and gas reservoirs, and reflect on the impacts of burning fossil fuels on the climate. From block 2 onwards the focus is shifted toward renewable energy sources. The most common types of renewables are approached, i.e., solar panels, wind turbines, and biomass, as well as their implementation challenges, either technological or economical. The current search for more efficient renewable technologies associated with the reduction of the costs of building and installing facilities like solar power plants is explored and discussed. Panel discussions at the end of each block seek to dynamically and interactively integrate academic and industrial perspectives on the topics, allowing an active contribution from the participants.



Table 1: Overview of the structure for the technical content during the program.

Block One: 'Global Energy and Its Environmental Impact'		Block Two: 'Solar Energy and Its Applications'		Block Three: 'Green Energy'		Block Four: 'Energy Efficiency'	
Module 1	Global Energy	Module 4	Solar Photovoltaic Energy	Module 7	Green Hydrogen	Module 9	Technical Systems
Module 2	Fossil Energy	Module 5	Solar Thermal Energy	Module 8	Bioenergy	Module 10	Energy Efficiency in buildings and cities
Module 3	Climate Change	Module 6	Application of Solar Energy				
Panel discussion I		Panel discussion II		Panel discussion III		Panel discussion IV	

In the next sessions you will be briefly introduced to each course taught in the program. You will be able to explore their content, what you are expected to have learned by the end and how you would be assessed.



BLOCK ONE:

“GLOBAL ENERGY AND ITS ENVIRONMENTAL IMPACT”

MODULE 1: GLOBAL ENERGY

COURSE INSTRUCTOR: MARK GEILENKIRCHEN

The course aims at:

- Widening students' awareness of the available non-renewable and renewable energy resources and the challenges to reduce non-renewable energy consumption and its environmental impact.
- Introducing the global and local energy challenges.
- Exploring fossil energy resources and heat recovery systems using combustion waste flue gases.
- Discussing renewable energy resources and their applications such as solar thermal energy, photovoltaic panels, wind, and green hydrogen.
- Introducing production of biofuels from biomass.
- Exploring the environmental impacts of the usage of fossil fuels and renewable energies.

LEARNING GOALS:

Upon completion of this unit the participants will be able to:

1. understand the definition of energy and the different sources of energy used
2. understand the consumption, growth, and diversification of energy globally
3. understand the negative impact of the current energy mix on the environment
4. understand the mechanism of the energy market, especially the electricity market
5. to produce solutions for the current environmental energy crisis
6. illustrate how Oman and its inhabitants could change their policies and behavior to reach CO₂ targets

For each goal, participants will receive a short assignment. These assignments will be combined and worked out at a later stage into a final assignment as written down in the last goal. These assignments will be conducted in groups.

MODEL 2: FOSSIL ENERGY

COURSE INSTRUCTOR: WILFRIED BAUER

The course aims at:

- introduces the global carbon cycle.
- discusses the development of material from land plants during burying, subsidence, and thermal maturation.
- differentiates the different coal types using industrial and scientific methods. Introduces a range of marine organisms as a source of kerogene, oil, and gas.
- explains the concept of source rocks and the "oil window." And it explores several types of oil and gas reservoirs.

LEARNING GOALS:

1. Understand the evolution of organic material in sediments with increasing temperature and pressure.
2. Recognize different types of coal and lignite.
3. Distinguish source rocks for hydrocarbons, based on their chemical properties.
4. Know the fundamental environmental settings in which solid, liquid, and gaseous fossil energies can be found.

An in-class assessment will be conducted, where participants will discuss some of the concepts introduced by the instructor during class. Every student need, therefore, a computer/smartphone with internet access. The results can be used for the final assessment. The final assessment will consist of a group report about oil, gas, and coal in the Middle East.

MODULE 3: CLIMATE CHANGES

COURSE INSTRUCTOR: MICHAEL TSANG

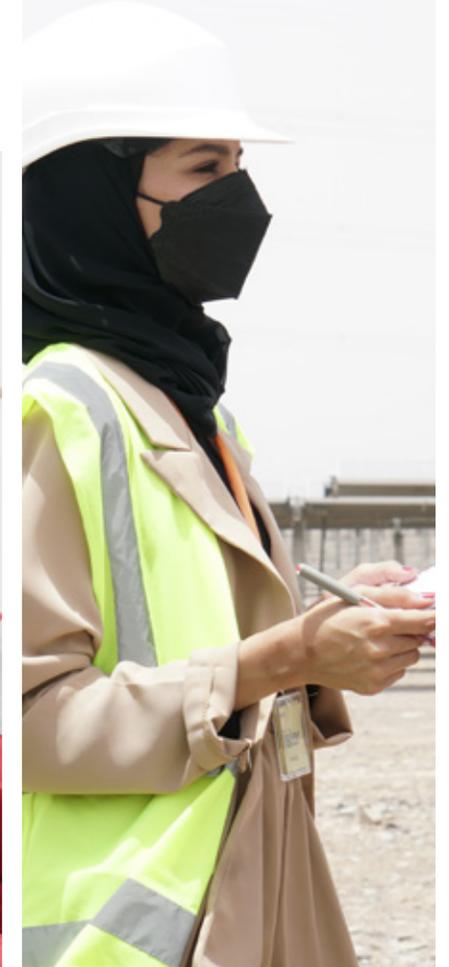
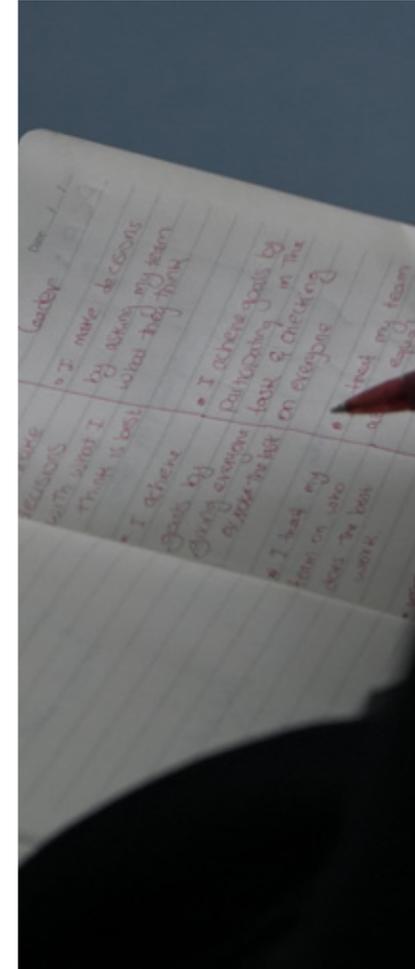
The course intends to discuss the basics of climate change, starting with an introduction to climate sciences, the history of research into climate change, and how we got to the present situation. The course will cover additional content such as topics about greenhouse gas accounting, regulations and policies related to climate change, decarbonization, and others.

LEARNING GOALS:

Understand the basics of:

1. Climate Science,
2. Greenhouse Gases,
3. Anthropogenic GHG Emissions,
4. Carbon Accounting,
5. Carbon Policies,
6. Decarbonization Opportunities

An in-class discussion based on the course content will be held and evaluated during lectures with some basic research exercises and examples in Excel. A Quiz will be used as a final assessment.





**BLOCK TWO:
“SOLAR ENERGY AND ITS
APPLICATIONS”**

INTRODUCTION FOR RENEWABLE ENERGY

COURSE INSTRUCTOR: SAUSAN AL-RIYAMI

- This course is based on the teaching provided in the “Global Energy” module featured in Block I. It focuses on the importance and the need for Renewable Energies.
- It summarizes the current situation, initiatives, and plans of the Sultanate regarding RE.
- It covers a brief introduction to Module 4 as fundamentals of Solar PV.

LEARNING GOALS:

1. To define the need for Renewable energies based on their resources and their storage capacity.
2. To understand the advantages and disadvantages or limitations of Renewable Energies.
3. To understand the current situation of Renewable Energies in the Sultanate of Oman.
4. To understand the regulations, frameworks, and policies of Renewable Energies in the Sultanate of Oman.
5. To understand the fundamentals of PV as pre-preparation for Module 4.

Each group will have a discussion about a suggested topic which will form the basis of a report. They also will receive an individual Quiz at end of the lecture.

MODULE 4: PV

COURSE INSTRUCTOR: ALI AL HUMAIRI

This course teaches the underlying introduction of renewable energy focusing on the solar PV system. It also covers the theory needed to understand the fundamentals of the Solar PV system. It is ideal for students interested in learning more about the Solar PV system. A combination of theory and practical activities will be adopted.

LEARNING GOALS:

1. Understand PV Modules and PV Technologies
2. Recognize and describe PV system
3. Know the Configuration of different PV systems
4. Understand Electrical basics of PV systems
5. Measure the PV panels parameters

Participants are encouraged to actively participate in each session.

The course involves presentations, lab experiments, and site visits. Active participation during the activities will also be evaluated. As a final assessment, a group report on relevant topics associated with PV systems should be delivered by the participants.

MODULE 5: SOLAR THERMAL

COURSE INSTRUCTOR: NAJAH AL MHANNA

This course introduces the principles of thermal energy and its applications. Topics such as Solar thermal collectors, thermal power plants, alternative vapor power plant configurations, and the concentrating solar power plant (CSP) are discussed. Basics of the thermodynamics cycle analysis are also covered.

LEARNING GOALS:

1. Demonstrate an understanding of the basic principles of solar thermal power plants.
2. Develop and perform analyses of thermal power plants and their modifications based on thermodynamic models, including:
 - a) Sketching schematic diagrams.
 - b) Evaluating property data at principal states in the cycle.
3. Applying mass and energy balances for the basic processes.
4. Determining cycle performance, thermal efficiency, net power output, and mass flow rates.

The course chooses a dynamic approach to in-course evaluation including exercises, applications, discussion, and gaming (Kahoot). A Quiz has been chosen as the final assessment of the course.

MODULE 6: SOLAR ENERGY

MODULE 6.1: SOLAR ENERGY ECONOMICS

COURSE INSTRUCTOR: T.B.D

This course will provide an overview of the challenges that are currently faced in the implementation of solar energy as an alternative to the traditional burning of fossil fuels. It covers both economic and environmental aspects.

LEARNING GOALS:

- To understand the economic concept of a PV system.
2. To understand the economic concept of the Solar system.
 3. To understand the economic concept of the hybrid system.
 4. To compare different Solar Energy applications from an economic perspective
 5. To analyze the cost-effectiveness of incremental increases in solar capacity.

The final assessment consists of elaborating a group report on the socio-economic challenges and benefits of adopting solar energy as a main energy source.

MODULE 6.2: SOLAR ENERGY SIMULATION

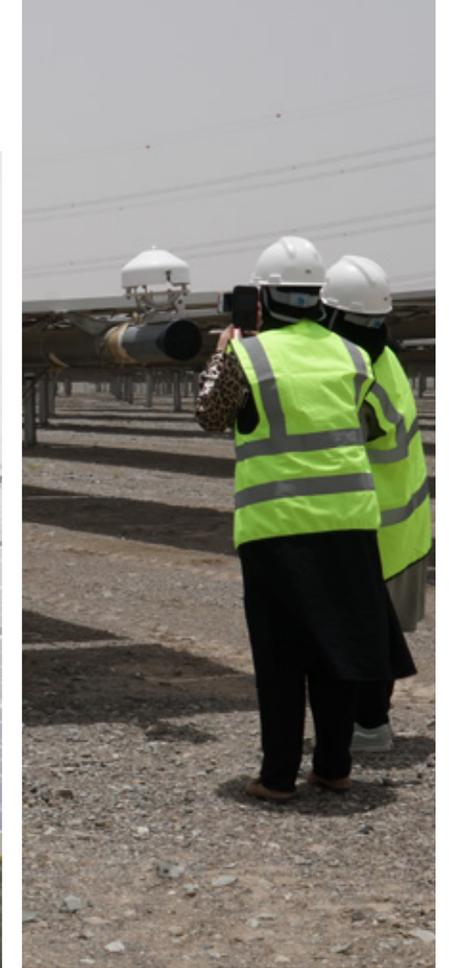
COURSE INSTRUCTOR: NAJAH AL MHANNA & ALI AL HUMAIRI

This course introduces the simulation of solar energy systems by using commercial software. Thus, it covers the basics of solar energy design concepts. In the end, a site visit is planned to the BP in-house site at the GUTech Campus.

LEARNING GOALS:

1. Understand the principles of solar energy simulation.
2. Demonstrate the ability to use software in designing solar energy system
3. Perform analysis of the simulation results

During this module, participants will have their hands-on activity by using commercial software to simulate the design of a solar energy system. Attendance and in-class participation will be evaluated with a pass/fail result.





BLOCK THREE: "GREEN ENERGY"

MODULE 7: GREEN HYDROGEN

COURSE INSTRUCTOR: SAUSAN AL RIYAMI

This module covers fundamental knowledge about hydrogen and its different types. It will focus on the need and the use of green hydrogen (GH) as an alternative source of energy. It highlights the importance of hydrogen in the Sultanate's strategy of economic diversification.

LEARNING GOALS:

1. To understand the importance of Hydrogen in the Energy Sector and its economic impact.
2. To distinguish between Hydrogen types, its future production technologies, and storage systems.
3. To learn about Hydrogen utilization and its safety.
4. To understand business model analysis of Hydrogen Energy.
5. To learn the various initiatives of the Sultanate of Oman to enable the Green Hydrogen Economy.

Each group will have an- discussion about a suggested topic which will form the basis of a report. They also will receive an individual Quiz at end of the lecture.

MODULE 8: BIOENERGY

INSTRUCTOR: ROGHAEIH PARVIZSEDGHY

The course aims at understanding the principles of bioenergy and learning how to harness this form of renewable energy to achieve sustainability. Participants will explore topics such as different types of Biomasses and the application of Biochemical and Thermochemical Processes to obtain bioenergy and how sustainable energy solutions can be developed in a wide range of communities.

LEARNING GOALS:

1. Understand the distinct types of biomasses, biofuels, and conversion processes
2. Analyze the required process for converting a specific biomass
3. Understand how we are currently using biomass as renewable energy.

This course dynamic combines theoretical lectures with a site visit to the WAKUD plant giving the participants full coverage of the topic. During the theoretical classes, active participation together with an Online quiz will assess the participant's performance. The Site Visit to the WAKUD plant will be evaluated with a short report on the topics discussed during the visit.

MODULE 9: TECHNICAL SYSTEMS

INSTRUCTOR: SEYED SEDRAMELI

This module includes topics related to the importance of energy efficiency in industry and sources of industrial waste heat. It covers the necessity of Energy Audit (Procedure, Outcome, Assessment, and Recommendations for Energy Efficiency). Industrial Heat Recovery Systems (Recuperators, Regenerators, Heat Pipes, Waste Heat Boilers, Incinerators Energy Management, and Energy Storage Systems Using Phase Change Materials (Case Studies.

LEARNING GOALS:

1. Distinguish different sources of wasted energy in the industry at different levels
2. Understand how to do an industrial energy audit and recommend some energy efficiency improvements for the process
3. Understand the selection, mechanisms, and basic design of the heat recovery systems such as Recuperators, Regenerators, Heat Pipes,
4. Waste heat boilers, incinerators
5. Recognize the properties and applications of phase change materials in energy management and energy storage systems

The course includes in-class participation in the discussions, attendance, and engagement as assessment criteria. A game-based learning platform (Kahoot) will be used to assess the above criteria. An online Quiz will be used as a final assessment of the course.

MODULE 10: ENERGY EFFICIENCY IN BUILDINGS AND CITIES

INSTRUCTOR: T.B.D

This module covers the relationship between architecture and urban planning with the maximization of energy efficiency. It explores ways to improve the energy efficiency of new development and the existing urban landscape. It approaches the relationship between cities and energy consumption to identify the factors having the most impact in planning for energy efficiency.

LEARNING GOALS:

1. Understand the climatic conditions of Oman
2. Understand the impact of climatic conditions on design decisions and selection of construction materials and methods to minimize heat gains in buildings
3. Understand different technological solutions to optimize cooling systems in buildings
4. Understand the principles of circular economy and their implementation in constructing and operating buildings
5. Understand the wider implications of the above-mentioned topics on urbanization in Oman

In-classes discussions about the relevant topics will take place. A game-based learning platform (Kahoot) will be used to assess the participants at the end of theoretical sessions. A final group report will be the method chosen for evaluating the participants' performance. Participants will also have the chance to visit the GUTech-Eco-house and learn about its concept and benefits.

OUTWARD BOUND OMAN (OBO) COURSES

TEAM BUILDING & RESILIENCE EXERCISE – INDOOR

OBJECTIVES:

- Elements of effective teamwork
- Individual's personal strengths, weaknesses, and contributions to the team
- Developing a sense of motivation and professional priorities
- Encouraging ambition amongst team members and emphasizing the importance of learning from others

SOFT SKILLS COURSE 1: COMPETENCIES FOR SUCCESS - INDOOR

OBJECTIVES:

- To develop participants' sense of responsibility and leadership
- To expose participants to different leadership styles
- To build participants' resilience and positive leadership
- To increase awareness of essential skills needed to be successful in life
- To promote self-improvement

SOFT SKILLS COURSE 2: BUILDING CHARACTERS OF THE NEXT GENERATION - INDOOR

OBJECTIVES:

- To increase awareness of employability skills needed for career growth
- To experience the link between effort and result, actions, and consequences
- To emphasize the importance of work ethics and the benefits of having it in the workplace through practical exercises
- To increase awareness about Oman Vision 2040 and youth's role in making it a reality

CLIMATE SHAPER FIELD TRIP - OUTDOOR

OBJECTIVES:

- Developing a greater factual knowledge of climate change and its potential consequences Oman
- Understanding the importance of reducing waste and making sustainable choices
- Creating awareness on green career pathways in Oman
- Understanding the importance of collaboration and compromise when addressing global issues
- Understanding the impact of climate change on V2040 and Oman's economic diversification
- Understanding the value of biodiversity

Activities	Location	Date	Time
Block 1			
Opening Ceremony	Novotel Muscat	Wed 5 Oct	10:30 - 13:00
Global Energy 1	GUtech Campus	Mon 10 Oct	16:00 - 18:00
Global Energy 2	GUtech Campus	Tue 11 Oct	16:00 - 18:00
Global Energy 3	ONLINE	Wed 12 Oct	16:00 - 18:00
Fossil Energy 1	ONLINE	Sun 16 Oct	16:00 - 18:00
Fossil Energy 2	ONLINE	Mon 17 Oct	16:00 - 18:00
Fossil Energy 3	GUtech Campus	Wed 19 Oct	16:00 - 18:00
Climate Change 1	ONLINE	Sun 23 Oct	16:00 - 18:00
Climate Change 2	ONLINE	Mon 24 Oct	16:00 - 18:00
Climate Change 3	GUtech Campus	Wed 26 Oct	16:00 - 18:00
Panel Discussion 1	GUtech Campus/Online	Sun 30 Oct	16:00 - 18:00
Block 2			
Renewable Energy	ONLINE	Wed 2 Nov	16:00 - 18:00
PV 1	ONLINE	Sun 6 Nov	16:00 - 18:00
PV 2	ONLINE	Mon 7 Nov	16:00 - 18:00
PV 3	GUtech Campus	Wed 9 Nov	15:00 - 17:00
Solar Thermal 1	ONLINE	Sun 13 Nov	16:00 - 18:00
Solar Thermal 2	ONLINE	Mon 14 Nov	16:00 - 18:00
Solar Thermal 3	GUtech Campus	Wed 16 Nov	16:00 - 18:00
Solar Energy Economics	ONLINE	Sun 20 Nov	16:00 - 18:00
Solar Simulation 1	ONLINE	Mon 21 Nov	16:00 - 18:00
Solar Energy- Site Visit	GUtech Campus	Tue 22 Nov	15:00 - 17:00
Panel Discussion 2	GUtech Campus/Online	Wed 30 Nov	16:00 - 18:00

Activities	Location	Date	Time
Outward Bound Oman Training (OBO)			
Team Building & Resilience Exercise	Outward Bound Oman (OBO) Training Center	WKND 2-3 Dec	9:00 - 16:00
Soft Skills Course 1: Competencies for Success	Outward Bound Oman (OBO) Training Center	WKND 9-10 Dec	9:00 - 16:00
Soft Skills Course 2: Building Characters of the Next Generation	Outward Bound Oman (OBO) Training Center	WKND 16-17 Dec	9:00 - 16:00
Year 2023			
Climate Shapers Field Trip	Jebel Akhdar	Jan 16-19	4 days/3 nights
Block 3			
Green Hydrogen 1	ONLINE	Mon 23 Jan	16:00 - 18:00
Green Hydrogen 2	GUtech Campus	Wed 25 Jan	16:00 - 18:00
Bio Energy 1	ONLINE	Sun 29 Jan	16:00 - 18:00
Bio Energy 2	ONLINE	Mon 30 Jan	16:00 - 18:00
Site Visit – WAKUD	WAKUD	Wed 1 Feb	9:00 - 18:00
Panel Discussion 3	GUtech Campus/Online	Thu 2 Feb	16:00 - 18:00
Block 4			
Technical Systems 1	ONLINE	Sun 12 Feb	16:00 - 18:00
Technical Systems 2	ONLINE	Mon 13 Feb	16:00 - 18:00
Technical Systems 3	GUtech Campus	Wed 15 Feb	16:00 - 18:00
Energy Efficiency 1	ONLINE	Sun 19 Feb	16:00 - 18:00
Energy Efficiency 2	ONLINE	Mon 20 Feb	16:00 - 18:00
Ecohouse visit - Panel discussion 4	Ecohouse & GUtech Campus/Online	Wed 22 Feb	16:00 - 18:00
Team Project – Start	GUtech Campus	Sun 26 Feb	16:00 - 18:00
Team Project- poster presentation	GUtech Campus	Wed 15 Mar	16:00 - 18:00

