MANIPAL UNIVERSITY
JAIPUR
(University under Section 2(f) of the UGC Act)

Integrating Sustainable Development Goals (SDGs) Across University Education

Universities worldwide are embracing a commitment to infuse the principles and values of the SDGs into their educational frameworks. This integration spans diverse academic disciplines, ensuring that students from all fields of study receive exposure to the SDGs and their relevance in today's world. By incorporating these goals into the curriculum, universities aim to nurture a generation of graduates with a deep understanding of the global challenges we face.

In the pursuit of a sustainable and equitable world, Manipal University Jaipur is stepping forward to instill a commitment to meaningful education around the Sustainable Development Goals (SDGs) across all disciplines, making it relevant and applicable to every student. This educational commitment transcends the conventional boundaries of learning, aiming to empower future leaders with a holistic understanding of global challenges and the tools to effect positive change. The integration of SDGs in education is not limited to specific courses but extends throughout various disciplines. From science and technology to social sciences, business, arts, and humanities, the principles of sustainable development and the interconnectedness of global issues are emphasized. This approach allows students to understand how their field of study contributes to and can be influenced by the pursuit of the SDGs. Manipal University Jaipur is fostering experiential learning and practical application of SDGs. Through projects, internships, and service learning, students engage in real-world problem-solving related to sustainable development. This hands-on experience provides a platform for students to apply theoretical knowledge to real-life scenarios, fostering a sense of responsibility and an understanding of their role in effecting change.

The emphasis on SDGs fosters interdisciplinary collaboration, encouraging students to work across diverse fields to address complex challenges. This collaborative approach nurtures critical thinking and problem-solving skills, preparing students to address multifaceted global issues that demand innovative solutions. Manipal University Jaipur emphasizes the development of global awareness and cultural competence through SDG-focused education. Understanding global challenges requires an appreciation of diverse perspectives and a recognition of the interconnectedness of issues on a global scale. Students are encouraged to appreciate cultural diversity and recognize the implications of their actions in a global context. SDG-centered education also aims to develop leadership qualities and a sense of ethical responsibility in students. Manipal University Jaipur seeks to empower future leaders well-versed in their fields and conscious of their ethical responsibilities towards society and the planet.

MANIPAL UNIVERSITY JAIPUR

(University under Section 2(f) of the UGC Act)

University of Colorado Boulder

"Renewable energy futures"

Organized by

Department of Chemical Engineering
Manipal University Jaipur

About the course

Renewable energy's future is bright, yet uncertain. Will it continue to grow rapidly? Is current growth sufficient to achieve climate stabilization? How do related technologies, like electric vehicles and heat pumps, fit in? This course will shed light on the many confusing and at-times inconsistent claims and predictions for renewable energy.

We'll review promising new renewable technologies and approaches, such as floating platforms for wind turbines and building-integrated photovoltaics (PV) and point out key opportunities and limitations. We'll take a close look at possible futures of enabling technologies such as electricity storage, electric vehicles and hydrogen, which can support and enhance renewables. We'll then unravel key trends and new approaches, such as distributed energy and electrification, and explain how they affect renewable energy's future.

Renewable energy, aided by enabling technologies such as electric vehicles and storage, will eventually dominate energy systems worldwide. From this course, you'll learn the current status and likely future paths of renewable energy. With this knowledge, you'll be able to pinpoint the opportunities in this vibrant industry and get in front of the change

Aim of the course

Aim: The aim of this course is to make students learn the status and likely future paths of renewable energy as well to explore the opportunity in this industry

Learning outcomes of the course

- Predicting the renewable energy growth in different sectors
- Understanding the enabling technologies of renewable energy
- Knowledge of current status and future paths of this sector
- Exploring opportunities in this vibrant industry
- Understanding the various remedial methods available to victims in cases involving business human rights violations.

Detailed Content of the course

1. Introduction, Energy Transitions, and Scenarios
2. Renewable Energy Technology Futures: Wind, Solar PV, and More
3. Enabling Technologies for Renewable Energy
4. Emerging Issues and Concepts in Renewable Energy
5. Summary and Review

Resource Person/s

The programme is conducted by Dr Paul Komor, research faculty at Energy Institute

Duration of the course

The course will be conducted for a total of 45 days (30 hrs.)
Week 1: 3 hours
Week 2: 3 hours
Week 3: 3 hours
Week 4: 5 hours
Week 5: 2 hours
The course shall begin from 17 August 2022 and Conclude by 20 November 2022.

Assessment

- Assessment will be based on completion of assignments and performance in the test conducted at the end of the course.
- Course completion certificate to be provided as a part of internal assessemnt of the program elective (CE4141: Conventional and Non conventional energy resources)

Contact

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Assiatnt Professor,
Department of Chemical Engineering, Manipal University jaipur
Nandana.chakinala@jaipur.manipal.edu

Renewable Energy Futures-Syllabus

Link: https://www.coursera.org/learn/renewable-energy-futures/home/week/1

Module 1: Introduction, Energy Transitions, and Scenarios
Renewable energy's future is bright, yet uncertain. Will it continue to grow rapidly? Is current growth sufficient to achieve climate stabilization? How do other technologies, like electric vehicles and heat pumps, fit in? In these lessons, we take a close look at several leading energy scenarios - models that describe possible futures for renewable energy. These scenarios show where we are headed, and where we need to be headed in order to stop climate change.

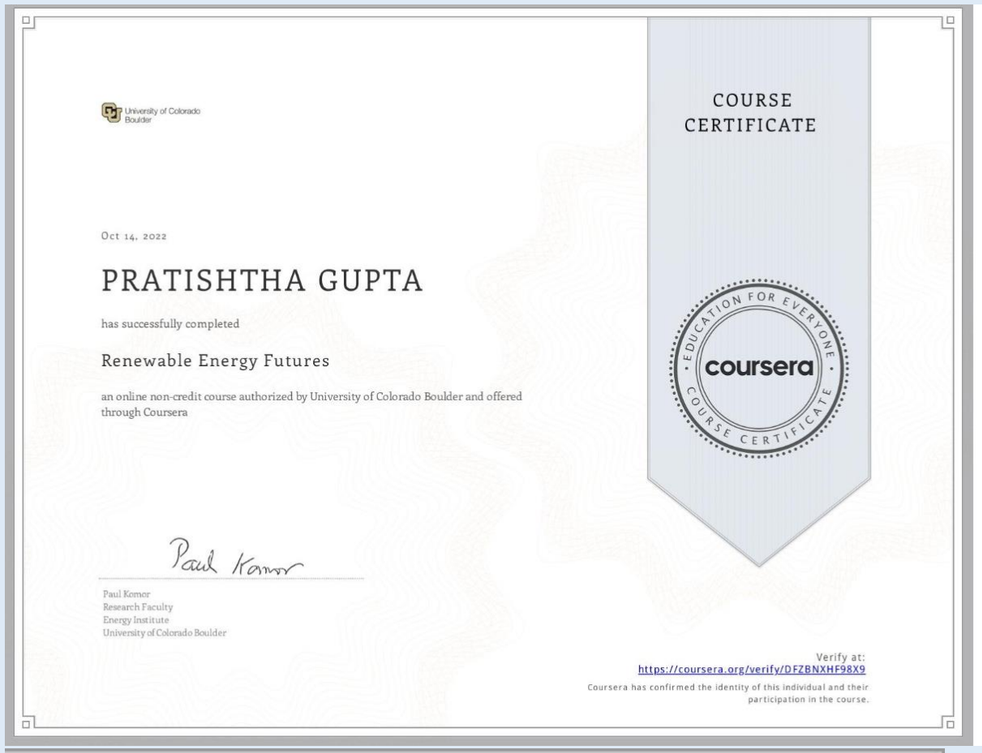
Module 2: Renewable Energy Technology Futures: Wind, Solar PV, and More
Wind turbines and solar photovoltaics (PV) are on a path of rapid growth. In these lessons, we review promising new technical approaches for wind and solar PV, such as offshore floating wind platforms and building-integrated PV. We'll also assess other renewable energy technologies that are on different paths: concentrating solar power (CSP), ocean energy, and biofuels.

Module 3: Enabling Technologies for Renewable Energy
For renewables to provide the bulk of global energy needs, 'enabling' technologies - those that support and enhance renewables - are needed as well. In these lessons, we describe the critical roles these enabling technologies play, and review their current status and future prospects. Enabling technologies covered include storage (notably batteries), electric vehicles, and hydrogen.

Module 4: Emerging Issues and Concepts in Renewable Energy
Renewables are driving rapid change in energy systems worldwide, and these systems will look very different in the future. These lessons examine key trends, issues, and concepts for future renewables-based energy systems. These included electrification, distributed energy, electricity market structures, and others.

Module 5: Summary and Review
Renewable energy, aided by enabling technologies such as electric vehicles and storage, will eventually dominate energy systems worldwide. In these lessons, we pull all the course material together and show how the pieces fit together.

Certificates of enrolled students



University of Colorado Boulder

COURSE CERTIFICATE

Nov 23, 2022

Shivam Kumar

has successfully completed

Renewable Energy Futures

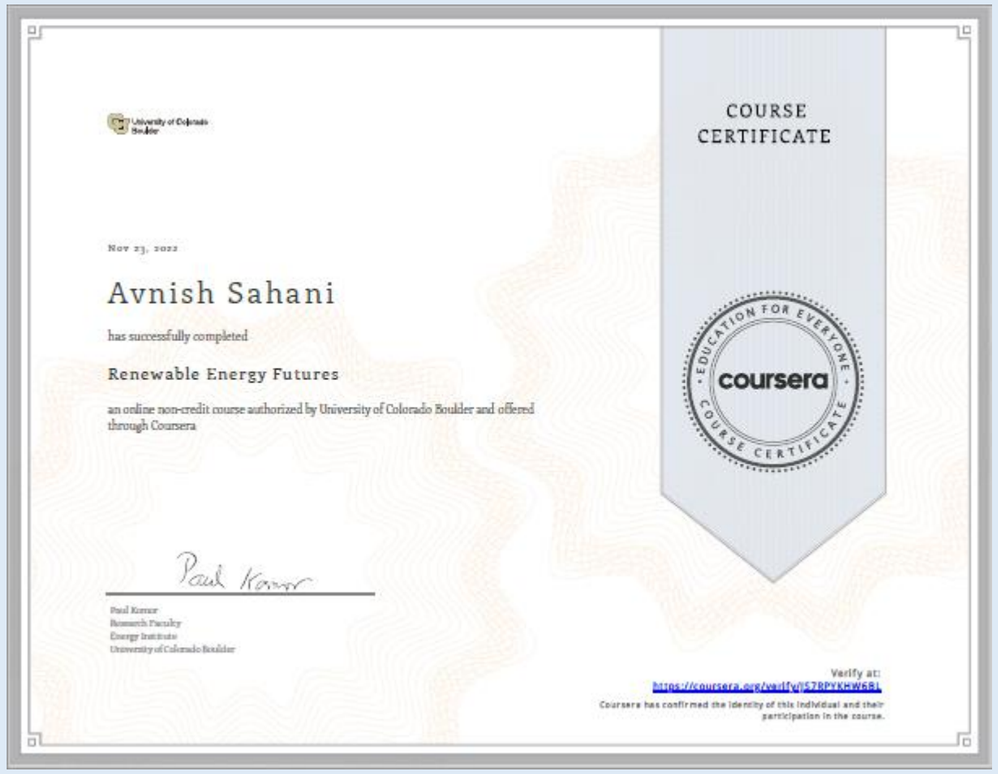
an online non-credit course authorized by University of Colorado Boulder and offered through Coursera

Paul Kumar

Paul Kumar
Research Faculty
Energy Institute
University of Colorado Boulder

EDUCATION FOR EVERYONE · COURSE CERTIFICATE · coursera

Verify at:
https://coursera.org/verify/VAVW9AW3DV878
Coursera has confirmed the identity of this individual and their participation in the course.



MANIPAL UNIVERSITY JAIPUR

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Faculty of Engineering | School of Electrical, Electronics and communication Engineering (SEEC)

Department of Electrical Engineering

Open Elective Course details

Session: Jan – May 2022 | Type: Regular

Fundamentals of Renewable Energy Sources | EE2082 | Credits: 3

Course Coordinators: Dr. Neeraj Kanwar/ Mr. Divya Rishi Shrivastava

Introduction: This course is offered by Dept. of Electrical Engineering as an Open Elective, targeting students who wish to pursue research & development in industries or higher studies in field of Integration of renewable energy sources, including solar, wind, biomass, geo-thermal, wave and hybrid systems. Most of the renewable energy comes either directly or indirectly from sun and wind and can never be exhausted, and therefore they are called renewable. Worldwide attention to environmental issues combined with the energy crisis force us to increase the use of renewable energy sources which are freely available in the nature and environment friendly. A renewable energy system converts the energy found in sunlight, wind, falling-water, sea waves, geothermal heat, or biomass into a form, we can use such as heat or electricity. To understand this course students are expected to have background knowledge about generation of electrical power and basic electrical engineering.

Course Outcomes: At the end of the course, students will be able to

[EE2082.1]. Know the need and advancements in the Renewable Energy Sources. **(Bloom's Level: Comprehension)**
[EE2082.2]. Understand the working principles of different types of Renewable energy sources as solar, wind, biomass, geo-thermal and ocean. (**Bloom's Level: Application, Synthesis)**
[EE2082.3]. Know the problems and their possible solutions in harnessing energy from different types of renewable sources. **(Bloom's Level: Comprehension, Analysis)**
[EE2082.4]. Develop skills to understand about the operation of renewable energy sources in grid connected and isolated modes. (**Bloom's Level: Application, Synthesis)**
[EE2082.5]. Know the environmental impact of various renewable sources and hybrid energy systems. (**Bloom's Level: Comprehension, Application)**

Prerequisites:

- To understand this course students are expected to have background knowledge about generation of electrical power and basic electrical engineering.

Syllabus:

Energy sources and their availability, Solar Energy - Solar radiation and measurements, solar energy storage, Solar Photo-Voltaic systems design- Wind Energy- Estimation, Maximum power and power coefficient, wind energy conversion systems, design considerations and applications. Energy from Bio-Mass- Sources of bio-mass, Biomass conversion technologies, Thermochemical conversion and Biochemical conversions, Anaerobic digestion and Fermentation, Bio-gas generation Pyrolysis and Liquefaction, Classification of Gasifiers, Geo-Thermal Energy, Energy plantation- Energy from the Oceans, Ocean Thermal Energy Conversion, Open and Closed Cycle plants, Site selection considerations, Origin of tides, Tidal energy conversion systems, Wave energy conversion systems, Hybrid Energy Systems.

References:

1. B. H. Khan, Non-conventional Energy Resources, TMH, 2009.
2. J. W. Twidell & A. D. Weir, Renewable Energy Resources, ELBS, 2005.
3. D. Mukherjee & S. Chakrabarti, Fundamentals of Renewable Energy Systems, New Age Intl., 2004.
4. G. D. Rai, Non-Conventional Energy Sources, Khanna Publishers, 2004.

Restrictions:

- The course is restricted for the students of SEEC.

Report generated from DMS Portal

JAN-MAY 2022 - B.Des - Fashion

S.N	Student Name	Reg. No.	Sem.	Course Type	Course Code	Description	Grade
1	SUHANI GUPTA	200601002	IV	OPEN ELECTIVE	AU2080	FUNDAMENTALS OF AUTOMOBILE ENGINEERING	S
2	VANSHIKA ARORA	200601003	IV	OPEN ELECTIVE	AT2085	ECOPHILOSOPHY	S
3	KHUSHI SHARMA	200601004	IV	OPEN ELECTIVE	EC2080	INTRODUCTION TO COMMUNICATION SYSTEMS	S
4	MANASVI ACHARYA	200601005	IV	OPEN ELECTIVE	ID0051	GRAPHIC DESIGN ELEMENTS FOR NON DESIGNERS	S
5	MYTHILI S. ITTAMAN	200601006	IV	OPEN ELECTIVE	AT0002	INTRODUCTION TO INDIAN PHILOSOPHY	S
6	ANISHA VERMA	200601007	IV	OPEN ELECTIVE	BT2080	ELEMENTS OF BIOSCIENCE AND BIOTECHNOLOGY	S
7	SACHIN JANGID	200601008	IV	OPEN ELECTIVE	AU2080	FUNDAMENTALS OF AUTOMOBILE ENGINEERING	U
8	SALONI RAVINDRA VERMA	200601009	IV	OPEN ELECTIVE	LA0052	AMERICAN CONTRACT LAW II	S
9	BRINDA GUPTA	200601011	IV	OPEN ELECTIVE	MC0002	FUNDAMENTALS OF INTERNET OF THINGS	S
10	AKSHITA	200601012	IV	OPEN ELECTIVE	ME3087	PRINCIPLES OF INDUSTRIAL ENGINEERING	S
11	AKSHIKA KUMAWAT	200601013	IV	OPEN ELECTIVE	CC0051	INTRODUCTION TO DATA STRUCTURE	S
12	SHORYA VARDHAN SINGH SHEKHAWAT	200601014	IV	OPEN ELECTIVE	BB0002	DESIGNING & PHOTOGRAPHY	S
13	priyal mathur	200601017	IV	OPEN ELECTIVE	AT2085	ECOPHILOSOPHY	S
14	JANHAVI BORSE	200601018	IV	OPEN ELECTIVE	BT2081	SCIENCE OF LIVING SYSTEMS	S
15	PRADHYUMAN SINGH	200601019	IV	OPEN ELECTIVE	BT2080	ELEMENTS OF BIOSCIENCE AND BIOTECHNOLOGY	S
16	AISHWARYA SHARMA	200601020	IV	OPEN ELECTIVE	AU3087	PRODUCT DEVELOPMENT	S
17	MANISHA KHAN	170601008	VI	OPEN ELECTIVE	AT2087	SOUTH ASIAN STUDIES	S
18	NICOLE MARIA GREEN	190601001	VI	OPEN ELECTIVE	HA0001	INTRODUCTION TO WINE AND SENSORY TECHNIQUES	S
19	PRIYAL GUPTA	190601004	VI	OPEN ELECTIVE	AR0053	DESIGN AND MAKE INFOGRAPHICS BY MICHIGAN STATE UNI	S
20	SUDITI BILALA	190601005	VI	OPEN ELECTIVE	HA0001	INTRODUCTION TO WINE AND SENSORY TECHNIQUES	S
21	ISHIKA AGARWAL	190601006	VI	OPEN ELECTIVE	HA0001	INTRODUCTION TO WINE AND SENSORY TECHNIQUES	S
22	SULEKHA CHOUDHARY	190601007	VI	OPEN ELECTIVE	AT2289	INTRODUCTION TO INDIAN MUSIC	S
23	SRISHTI SETH	190601008	VI	OPEN ELECTIVE	AT0002	INTRODUCTION TO INDIAN PHILOSOPHY	S
24	MADHU	190601010	VI	OPEN ELECTIVE	HA0001	INTRODUCTION TO WINE AND SENSORY TECHNIQUES	S
25	DEVANSHI BAYANWALA	190601011	VI	OPEN ELECTIVE	AR0053	DESIGN AND MAKE INFOGRAPHICS BY MICHIGAN STATE UNI	S
26	KAVITA SAINI	190601012	VI	OPEN ELECTIVE	BB0002	DESIGNING & PHOTOGRAPHY	S
27	PRATIKSHA JANGID	190601013	VI	OPEN ELECTIVE	ID2280	DESIGN THINKING AND CREATIVITY	S
28	RAGHAV JALALI	190601015	VI	OPEN ELECTIVE	LA2080	CONSUMER AFFAIRS	S
29	NISHA SAINI	190601016	VI	OPEN ELECTIVE	MC3081	QUALITY CONTROL AND MANAGEMENT	S
30	LAKSHITA CHOUHAN	190601017	VI	OPEN ELECTIVE	EE2082	FUNDAMENTALS OF RENEWABLE ENERGY SOURCES	S

ScienceDirect

Materials Today: Proceedings
Volume 63, 2022, Pages 778-785

Recent development in thermal performance of solar water heating (SWH) systems

Sudhir Kumar Pathak [a], V.V. Tyagi [a], K. Chopra [a, b], Ravi Kumar Sharma [c]

https://doi.org/10.1016/j.matpr.2022.05.502

Abstract

Solar energy is best suited substitute energy source owing to its cost-effectiveness and eco-friendly nature. But, the irregular nature of solar energy limits its usage and efficacy in domestic and industrial applications, particularly for water heating. Various research reports demonstrated that increasing convective heat transfer rate and energy storage capacity could increase the thermal output of solar water heating (SWH) systems. Active and passive types are two categories of SWH systems. The aim of the present study is to discuss a crisp review of recent developments made in the field of SWH systems, and focusing on ways used to enhance their thermal performance. The thermal performance improving methods that have received specific attention include geometrical changes to the absorber plate, solar selective coatings, collector tilt angle, fluid flow rates, phase change materials as a thermal energy storage unit, and twisted tape insertion. This study also helps to understand the physical science and mechanism behind the performance enhancement methods used in SWH systems for sustainable energy development.

Previous Next

Keywords

Solar energy; Solar water heating; Thermal performance; Phase change materials

Abbreviations

CNT, Carbo nanotubes; CPCs, Compound parabolic collectors; DTE, Daily thermal efficiency; ETCs, Evacuated tube collectors; FPCs, Flat plate collectors; PCMs, Phase change materials; LPH, Liter per hour; HTF, Heat transfer fluid; NE-PCMs, Nano-enhanced phase change materials; SWH, Solar water heater; TES, Thermal energy storage

Special issue articles Recommended articles

Cited by (0)

ENERGY ECONOMICS AND POLICY

PROF. SHYAMASREE DASGUPTA
Department of Humanities and Social Sciences
IIT Mandi

PRE-REQUISITES : Any foundational course in Economics

INTENDED AUDIENCE : Primarily the graduate students working in the area of energy economics and energy policy domain. This course will also be useful for general audience

INDUSTRIES APPLICABLE TO : Power Sector; Energy consulting firms; Renewable Energy production units, Policy makers

COURSE OUTLINE :

The course deals with understanding energy as a scarce resource, various aspects of energy demand and supply with a focus to policies that are in place to promote renewable energy supply and finally, a much needed discussion on interaction between energy, environment and climate change. The course aims at broadening the vision of students while making any energy related decision as a technology developer, energy manager, entrepreneur, policy maker, researcher in future or simply for personal energy use in day to day activities.

ABOUT INSTRUCTOR :

Prof. Shyamasree Dasgupta is an Assistant Professor at the School of Humanities and Social Sciences in Indian Institute of Technology Mandi. She is an economist by training. Her teaching and research interest remains in the area of energy, environment, climate change and sustainable development. She obtained Ph.D and M.Phil in Economics from Jadavpur University, Kolkata, India with SYLFF Fellowship. She is a member of several active academic/research networks including International Association of Energy Economics, Indian Society for Ecological Economics, The Indian Econometric Society etc. She is a contributing author in the Industry Chapter of IPCC AR 5.

COURSE PLAN :

Week 1**:** Energy as a Scarce Resource; Classification, Measurement and Accounting of energy resources

Week 2**:** Energy Demand-Part I- Analyzing past, present and future demand

Week 3**:** Energy Demand-Part II - Demand Side Management, policies and behavioural issues

Week 4**:** Energy Supply- Part I – Economics and policies of non-renewable energy supply

Week 5**:** Energy Supply- Part II – Economics of electricity supply and renewable energy and related policies

Week 6**:** Energy Market

Week 7**:** Special topics on energy, environment and climate change - Part I

Week 8**:** Special topics on energy, environment and climate change - Part II

Energy Economics and Policy

COURSE OUTCOMES

- This course covers the economic principles that guide the energy-related behavior of both the producers and the consumers of energy and the policy regime that has emerged to govern it.
- The course has four building blocks: understanding energy as a scarce resource, various aspects of energy demand and supply with a focus on policies that are in place to promote renewable energy supply, and finally, a much-needed discussion on the interaction between energy, environment, and climate change.
- The course aims at broadening students' vision while making any energy-related decision as a technology developer, energy manager, entrepreneur, policy maker, or researcher in the future, or simply for personal energy use in day-to-day activities.

NPTEL Online Certification

(Funded by the MoE, Govt. of India)

This certificate is awarded to

YASH WADHAWAN

for successfully completing the course

Energy Economics And Policy

with a consolidated score of **47** %

Online Assignments	16.13/25	Proctored Exam	31.06/75

Total number of candidates certified in this course: **53**

Prof. Tushar Jain
Centre for Continuing Education
IIT Mandi

Aug-Oct 2022

(8 week course)

Prof. Andrew Thangaraj
NPTEL, Coordinator
IIT Madras