FACULTY OF
ENGINEERING &
THE BUILT ENVIRONMENT

CPD
CONTINUING PROFESSIONAL DEVELOPMENT

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Dept. of Mechanical Engineering| CPD Course

Overview of the Power Plant Industry

Presented in person at UCT, 25-29 March 2024

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

Introduction

Access to reliable and affordable energy is crucial for fulfilling basic needs, fostering development, and addressing global challenges such as poverty, health, and environmental sustainability. It is a direct contributor to increased GDP per capita and improved quality of life especially in the developing world. Energy can therefore be regarded as a fundamental human resource essential for work and progress, driving innovation, economic growth, and societal advancement.

Electricity is a versatile and efficient energy carrier that plays a crucial role in modern society. It is generated from various sources such as fossil fuels, nuclear energy, renewable sources like solar and wind, and hydroelectric power. Once generated, electricity can be transmitted over long distances through power grids, making it accessible to homes, businesses, and industries.

In this course, we will perform high-level, quantitative analysis of various electricity generation technologies, each with their respective primary fuel source(s). We will introduce the importance of the electrical distribution network (or grid). A high level techno-economic analysis will also be introduced in order to evaluate and compare these technologies on an economic basis.

Course Content

The course covers the following:

- Introduction to the energy sector:

This section will introduce the concepts which need to be understood in the context of this course. Students are given a global, regional and local understanding of the energy sector. A fundamental refresher is presented, including the concepts of power, energy, work and their basic units.

- Electricity generation technology:

In this section a high-level technical analysis is conducted on the available technologies that can be used to generate electricity. The energy content of primary fuel sources is calculated. The power conversion technology is presented along with computational methodology to perform quantitative analysis of the energy conversion process from primary energy to electricity. This includes high level thermodynamic analysis to determine the power conversion efficiency, waste products and emissions.

- An introduction to the electrical system and national transmission grid:

The role of electrical transmission grid is introduced in this section, along with how a system operator constantly balances supply and demand. Recent increases in variability of electrical energy sources puts unique demands on the system which is explained in this section.

- Calculating the costs:

In this section the student will be exposed to the methods employed for calculating the cost of building elements of a power system, the financing options and how to perform cost comparison using the Levelised Cost of Electricity (LCOE) approach.

Course Presenters

Leon Malan is a mechanical engineer and Senior Lecturer in the Department of Mechanical Engineering at UCT, where he is the programme convenor for the postgraduate diploma in power plant engineering. He has been interested in and involved in the power generation industry from early in his career and holds an M.Eng in Nuclear Engineering along with a Ph.D with a focus on numerical methods for two-phase flow. He has worked in industry as a steam turbine engineer, leading large project teams on outage and refurbishment projects in the coal-fired power stations of Mpumalanga.

Priyesh Gosai is a researcher and consultant in the Energy industry. He specialises in numerical modelling of thermofluid systems with a particular focus on power plant flexible operation. In his work he is developing dynamic numerical models of boilers. These models will inform engineers to understand the implications of flexible operation of power plant performance. At a systems level these models will provide key inputs to identify constraints when modelling power systems.

David Oyedokun graduated from the University of Cape Town (UCT) with a Ph.D. in electrical engineering in 2015. He has 15 years of experience in academic and applied research. His research interests are in renewable energy, power system stability, and geomagnetically induced currents (GICs). He is an active supervisor of postgraduate students and has published widely in the national and international literature. Before joining UCT, he completed a postdoctoral research term with the South African National Space Agency (SANSA). He is a recipient of the IEEE MGA Gold Award and the EBE Faculty Special Award for social responsiveness at UCT, and he is the past chairman of the IEEE South Africa Section. Over the years, he has served on many IEEE regional and global committees and organisational units. David has a track record of engaging in socially responsive engineering projects in surrounding communities

Course Overview

Name	Overview of the Power Plant Industry
Duration	5 days, 25-29 March 2024
Venue	Albert Wessels Room, E&M Building, Upper Campus
Course Fee	R14 500
Participants	Suitable for anyone with a background in the technological aspects related to the energy sector or with a keen interest in the electricity generation industry.
Format	The course will be delivered in person over 5 days at the University of Cape Town.

Certificates and CPD points

- Participants who attend 80% of the sessions will receive a Certificate of Attendance.
- This course forms part of the Power System Planning and Operations Training programme offered by Stellenbosch University.
- CPD certificates carry a weight of 4 CPD points.

Registration

Registration and Cancellation

- Register online
- Registration covers attendance of all sessions of the course and course material.
- Registrations close one week before the start of the course. Confirmation of acceptance will be sent on receipt of a registration form.
- Cancellations must be received one week before the start of a course, or the full course fee will be charged.
- For more information on application and registration procedures, please visit our website: https://ebe.uct.ac.za/cpd/registration-procedures

Contact details

For more information or details on CPD courses, visit our website or contact us.

Web: http://www.cpd.uct.ac.za
E-mail: ebe-cpd@uct.ac.za

Physical address
CPD Programme
Room 6.10, 6th Floor
New Engineering Building
Upper Campus
University of Cape Town
South Africa

Postal address
CPD Programme
EBE Faculty
University of Cape Town
Private Bag X3
Rondebosch 7701
South Africa

Programme administrators
Gillian Williams: +27 (0)21 650 7239
Sandra Jemaar: +27 (0)21 650 5793
Heidi Tait: +27 (0)21 650 4922
