

INTRODUCTION

Achieving sustainable development by balancing the long-term economic, environmental and societal objectives is one of the most complex scientific problems of our times. Engineering designs need to increasingly incorporate these aspects in decision making. This task goes beyond the traditional areas of process development, process design, and industrial ecology. It becomes essential to take a holistic view and develop systems based solutions. It is also necessary to use new methods and tools to aid engineering design. The course will discuss basics of sustainability and the challenges in sustainable engineering. Different sustainability quantification methods along with their applications will be discussed. The course will then focus on assessment methods including life cycle assessment (LCA) and its variants. Different design approaches such as biomimicry and green engineering principles will also be discussed. The course will illustrate the application of these concepts using several case studies in the domain of energy, water, and municipal solid waste management.

COURSE OUTLINE

- 1. Sustainability: Introduction and quantification (6 hours)**
 - Sustainability definition, dimensions and trade-offs
 - Challenges in sustainable engineering design and practice
 - Sustainability indicators and indices
- 2. Life Cycle Assessment (LCA) (7.5 hours)**
 - LCA: Need and advantages
 - Goal and scope, life cycle inventory, and impact assessment
 - Software and databases with industrial problems/examples
 - Additional topics in LCA
- 3. Design approaches (4.5 hours)**
 - Biomimicry and industrial ecology
 - Principles of green engineering
 - Resiliency and uncertainty
- 4. Integrated assessment (3 hours)**
 - Systems dynamics: Modeling and assessment
 - Agent-based modeling
- 5. Case studies in sustainable engineering (7.5 hours)**
 - Energy, municipal solid waste management
 - Domestic and industrial water management
- 6. Sustainability education: Course development (1.5 hours)**
 - Overview of existing courses in sustainable engineering
 - Discussion of available books, online resources and libraries

COURSE FORMAT

The course will be highly interactive consisting of the following specific components:

- Introductory lectures on selected topics
- Case study and illustrative examples
- Software demonstration / practice sessions
- Tutorial / hands-on training sessions
- Short field visit; discussion and debate

A Certificate of participation will be awarded to all the participants of the course.

LEARNING OUTCOMES:

At the completion of the course, the participants would be able to:

- Understand and critique sustainability concept and trade-offs
- Understand, compare, and critique different quantification methods
- Formulate and set-up simple problems for performing LCA
- Use open source packages to develop LCA models
- Analyse LCA results to draw conclusions and provide recommendations
- Develop simple systems dynamics models using open source software
- Understand and evaluate different design approaches for sustainability
- Understand challenges, opportunities and solutions in teaching sustainability

LECTURE NOTES

Hard copies of the lecture notes or presentations will be made available at the time of registration.

ELIGIBILITY

Faculty members of degree level engineering colleges recognized by AICTE are eligible to attend the course.

WHO MAY BENEFIT

The course would benefit many across various disciplines of science and technology. It is of interest to serving teachers and researchers, PG and doctoral students, and laboratory scientists. Participants from various branches of engineering, including chemical, civil, environmental, mechanical, and industrial, as well as fields such as biotechnology and business administration will find this course useful.

VENUE FOR CLASSES

Course will be held at the Guest House Conference Room, IIT Bombay.

FACULTY

The teaching faculty constitutes Prof. Yogendra Shastri, Department of Chemical Engineering, IIT Bombay and Prof. Bhavik Bakshi, Department of Chemical and Biomolecular Engineering, The Ohio State University, USA. The course will also feature guest speakers on specific topics.

TRANSPORT, BOARDING AND LODGING

Participants are entitled for Second Class (Sleeper Class) or III AC railway fare to and fro by the shortest route from college to IIT Bombay. All participants will be given auto fare from Kanjurmarg/Andheri Railway Station to IIT Powai on the dates of arrival and departure. Local participants will be paid second class railway fare or BEST Bus fare. **Boarding and lodging will also be provided free of cost in the students Hostels only for participants.**

REGISTRATION

All short-listed candidates are required to confirm their participation by sending a **Demand Draft of Rs. 1,000/- in the name of "Registrar IIT Bombay"**. The above amount will be refunded to the participant if he/she attends the course. In case a participant does not attend the course, the above amount will be forfeited.

IMPORTANT DATES

Last date for receipt of registration form: **July 17, 2017**

Notification of acceptance: **July 19, 2017**

Note: Incomplete application forms will not be considered. For additional copies of the registration form, please use a photocopy or type in the format given.

Completed registration forms to be sent to the course coordinator at the following address (please send an e-mail to notify if sending a paper application):

Prof. Yogendra Shastri,
Course Coordinator,
Department of Chemical Engineering,
Indian Institute of Technology Bombay,
Powai, Mumbai – 400 076.
Phone : (022) – 2576 7203
Fax : (022) – 2572 6895
Email : yshastri@iitb.ac.in



QIP Short Term Course on

Sustainable Engineering: Theory and Practice

July 24-28, 2017

Coordinator

Prof. Yogendra Shastri
Department of Chemical Engineering

Office of
Continuing Education & Quality Improvement Programme

Indian Institute of Technology Bombay
Powai, Mumbai – 400 076

REGISTRATION FORM

Five-day QIP Course on

Sustainable Engineering: Theory and Practice

July 24-28, 2017

NAME (BLOCK LETTERS) : _____

_____ GENDER: M / F

DESIGNATION : _____

ORGANIZATION: _____

MAILING ADDRESS : _____

TELEPHONE : _____ (O) _____ (R)

FAX: _____ MOBILE: _____

EMAIL : _____

QUALIFICATIONS : _____

ACCOMMODATION REQUIRED: YES / NO

SIGNATURE OF APPLICANT:

Sponsorship and signature of Head of the College/Institute (with date and seal):

(IMPORTANT: BY SIGNING ABOVE HEAD OF THE COLLEGE/INSTITUTE CERTIFIES THAT APPLICANT IS A FACULTY MEMBER OF DEGREE LEVEL ENGINEERING COLLEGE RECOGNIZED BY AICTE)