

Five-day ISTE Workshop for Coordinators

On

Thermodynamics in Mechanical Engineering

Under the

National Mission on Education through ICT (MHRD, Govt. of India)

21st -25th February, 2011

Introduction

An important initiative has been taken by IIT Bombay to work with Engineering Colleges in the country to enhance the teaching skills of our faculty colleagues in core Engineering and Science Subjects. Under this project called "**Empowerment of Students & Teachers through Synchronous & Asynchronous Instruction**," IIT Bombay conducts two-week ISTE workshops during the vacation period in summer and winter. Participating teachers attend live lectures given by IIT faculty at a remote center close to their own college, and also attend tutorial and lab sessions conducted in the same centers. The lecture transmission and live interaction takes place through distance mode using the EDUSAT network of ISRO and/or the AVIEW technology, at selected remote centers across the country. This initiative is part of the National Mission on Education through ICT supported by MHRD. Faculty coordinators are appointed at each remote centre to handle the technology infrastructure and other operational logistics. Additionally, for each workshop, there will be a workshop faculty coordinator for that subject who will help in the conduct of labs and tutorials at each center.

We invite expert faculty from various remote centers to a five-day Coordinators' training workshop which is held in IIT, at least two months before the main workshop. These Coordinators then act as Workshop Coordinators during the main workshop, liaising between the participants at their Remote Centers and IIT Bombay, from where the workshop is transmitted live. During the main workshop, the Workshop Coordinator at every center supervises the conduct of tutorials and Labs. All the lectures and tutorial sessions are recorded. The final edited audio-visual contents, along with other course material will be released under open source. These contents can be freely used later by all teachers and students.

In the past, we conducted two-week ISTE workshops twice on "Effective teaching/ learning of Computer Programming in December 2009 and in June-July 2010. These workshops were conducted for over 1300 participating teachers across the country, at 36 remote centers. We also conducted a two-week ISTE workshop on Database Management Systems from 13th to 23rd Dec. 2010, for over 1000 teacher participants at 32 remote centers.

The success of these earlier workshops has now led us to announce another two-week ISTE workshop, this time in **Thermodynamics in Mechanical Engineering**, to be held in **June 2011**.

Five-Day Coordinators' Workshop (21st to 25th February, 2011)

The proposed Coordinators' Workshop, to support the above, is being conducted from **21st to 25th February, 2011** to provide a complete orientation to the prospective Workshop Coordinators on the methodology to be followed in this project. This will include the delivery of live lectures through AVIEW/EDUSAT mechanism of interaction with participants and the local conduct of tutorials and labs. Since the final contents are meant to be adopted by most colleges across the country, this workshop will finalize the following for the subject of Thermodynamics in Mechanical Engineering:

(a) Definition of common syllabus to be covered.

- (b) Graded coverage from simple to difficult levels for each topic and subtopic.
- (c) Nature of tutorials, keeping the above gradation and the typical examination pattern in mind, but leading to the typical advanced levels reached in such subject teaching at the top institutions of the world.
- (d) Discussion of laboratory environment and the experiments to be conducted, if any.
- (e) Use of the learning management system, audio-visual equipment, editing tools.
- (f) Other logistic details for conducting the main workshop.

Teaching Faculty

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Course Content

- Introduction to thermodynamics.
- System, surroundings, boundaries, classification of systems.
- Units and dimensions. Conversion factors.
- Properties of systems. Equilibrium, processes, interactions.
- The work interaction. Thermodynamic definition of work. Characteristics of the work interaction. Evaluation of work.
- Adiabatic boundary. Adiabatic systems and processes. Adiabatic work.
- The First Law. Basic form. Energy of a system. The heat interaction. Sign convention.
- Diathermic boundary. Zeroth law. Isothermal states. Empirical temperature.
- Principles of thermometry. Scales of temperature.
- Gas thermometer. The ideal gas. Ideal gas temperature scale.
- The state principle. Equations of state. Properties of gases.
- Properties of steam. Introduction to steam tables.
- Other equations of state. Van-der-Waals gas. Critical state.
- Reduced equation of state.
- The Second Law. Kelvin-Planck and Clausius statements. Equivalence of statements. Carnot theorem. Thermodynamic temperature. Kelvin scale. Carnot engine. Equivalence of thermodynamic Kelvin scale and ideal gas Kelvin scale.

- Clausius inequality. Definition of entropy. Evaluation of entropy.
- Principle of increase of entropy. Formulation of second law for closed systems.
- Auxiliary functions. Property relations. Maxwell's equations.
- Applications to equations of state.
- First law for open systems. Derivation of the general form. Special cases. Steady-flow energy equation. Second law for open systems.
- Combined first and second laws. Availability and exergy. Lost work.
- **Introduction to cycles. Classifications of cycles. Implementation of cycles. Gas power cycles - Otto, Diesel, Brayton. Vapour power cycles -Rankine cycle and its modifications. Refrigeration (reversed) cycles -Joule, vapour-compression.**

Duration and Venue

The duration of the workshop is **five** days. It will start at 9 am on Monday 21st February 2011 and end at 5.30 pm on Friday 25th February 2011.

Venue: Seminar Hall, Van Vihar Guest House, IIT Bombay.

Who may benefit

The workshop is likely to benefit faculty colleagues who are willing to be prospective Workshop coordinators for the larger workshop to be held in June 2011. They should have taught a course on Thermodynamics in Mechanical Engineering and should be familiar with the syllabi and examination pattern of their own college or university. It is preferable that they have some experience in conduct of ISTE, QIP workshops.

It is mandatory that the participant's Institute is either an established ISRO EDUSAT/National Knowledge Network center, or is well equipped to conduct the workshop through the NKN/ internet for a minimum of 30 participants.

It is also mandatory that the participants bring a document from the Heads of their institutes to the effect that the institute is willing to be part of this project.

Note

Please note that this workshop is conducted under the eOutreach project of IIT Bombay. Live recording of the course and other created contents would be released under Open Source through a portal. The recorded CD/DVD of the course lectures would be available for distribution at cost, to any individual/ institution. All participants are required to sign a certificate for such release of contents contributed by them during and after the workshop. The recognition and citation will naturally be made for all contributors.

Accommodation & other support

Shared Guest House accommodation with standard boarding will be provided free to the participants depending on availability, from the evening of Sunday 20th February 2011 (arrival) to the morning of Saturday 26th February 2011 (departure.)

* Accommodation is not guaranteed.

Course Fee

Since the workshop is funded by the National Mission on Education through ICT (MHRD, Government of India), there is no course fee for participation*.

* Travel fare reimbursement will be made for up to A/C 2-tier or lowest return airfare, as per GOI entitlement.

How to Apply

Those wishing to attend this course should register online at <http://ekalavya.it.iitb.ac.in/>

Due to limited seats, registration will be on a first-come-first-served basis. Confirmation of registration will be sent by email. **Enrollment will be strictly online.**

LAST DATE FOR ONLINE ENROLLMENT: 10th February, 2011

Enroll here: <http://ekalavya.it.iitb.ac.in/>

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