Five-day ISTE Workshop for Coordinators

On

Heat Transfer

Under the

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

12th -16th September, 2011

Conducted by IIT Bombay

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 and Teachers through Synchronous and Asynchronous Instruction**," IIT Bombay conducts two-week ISTE workshops during the vacation periods 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 center. The lecture transmission and live interaction takes place through distance mode using the internet and AVIEW technology, at selected remote centers across the country. This initiative is part of the National Mission on Education through ICT, supported by MHRD. Remote Center and workshop coordinators are appointed at each remote centre to handle the technology infrastructure and other operational logistics, and to help in conduct of labs and tutorials. The Remote Centers are funded for the conduct of the workshop by IIT Bombay.

We invite expert faculty from various remote centers to a five-day 'Coordinators' training workshop' which is held in IIT, 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 video recorded at IIT Bombay. 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.

We are pleased to announce the next workshop in our series of ISTE-IITB workshops, sponsored by **MHRD, Govt. of India,** under the **National Mission on Education through ICT (NMEICT.)** This workshop is on **"Heat Transfer"** which is scheduled to be held in the winter vacation of December 2011.

Introduction to Heat Transfer:

Heat transfer is a basic course for mechanical, chemical, metallurgical and aerospace engineering students at undergraduate level. Heat transfer involves the physics related to transfer of energy in the form of heat by the three modes – conduction, convection and radiation. Heat transfer plays a significant role in most engineering applications. Concepts of heat transfer are applied at the design stage as well as for the evaluation of performance of various engineering equipments. Its applications include heat exchangers, electronic chip cooling, furnaces, casting and foundry, turbine blade cooling, automobile engine cooling and in process industries.

Objective of Workshop:

- Imparting knowledge of heat transfer on a larger scale and at a quicker rate.
- Helping maximum number of students, teachers and working professionals learn heat transfer concepts and implement them in real life.
- Empower students and teachers in engineering colleges on a large scale.
- Impart new teaching methods.
- Teach centres as per the common syllabus.
- Encourage teachers to contribute learning material.
- Publish the contents in Open Source on the portal.

Five Day Coordinators' Workshop

The proposed Coordinators' Workshop, to support the above, is being conducted from **12th to 16th September 2011, at IIT Bombay,** 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 the AVIEW software 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 Heat Transfer:

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.

Course Contents

Introduction to heat transfer
Introduction, Introduction to one dimensional conduction, conduction rate equation, thermal conductivity, thermal diffusivity, Heat diffusion equation, Initial and boundary conditions,

Conduction
One dimensional steady state conduction, Plane wall, composite wall, cylinder, sphere, Critical radius of insulation, summary of all cases, One dimensional steady state conduction in plane wall and radial systems with thermal energy generation, Fins - Fin efficiency, effectiveness, length of the fin, Transient conduction – Lumped capacitance, Heisler charts, semi-infinite medium.

Convection
Physical Mechanism of Convection, Basics of fluid mechanics, Differential Convection Equations – Navier stokes equation, Energy equation, boundary layer equations for both momentum and heat transfer, Solutions of convection equations for a flat plate, Normalised dimensionless equations and similarity, analogies of heat transfer, Convective heat transfer in external flows for general configurations, Internal forced convection – average velocity and bulk mean temperature, laminar and turbulent flow in tubes and Natural convection

Heat Exchangers

Types, overall heat transfer coefficient, fouling factor, Analysis of heat exchangers, Log mean temperature difference for parallel and counterflow heat exchangers, multipass and cross flow heat exchangers, use of correction factor, ε-NTU method – Effectiveness relations for all heat exchangers along with the charts, selection of heat exchangers

Thermal Radiation

Introduction, thermal radiation, black body radiation – Stefan Boltzman law,Planck's law, Wien's displacement law, Radiation intensity, solid angle, intensity of emitted radiation, incident radiation, radiosity, spectral quantities, Radiative properties, Kirchoff's law, Greenhouse effect, Radiation heat transfer – view factor, view factor relations, Black surfaces , diffuse and gray surfaces, Net radiation heat transfer between any two surfaces, methods of solving radiation problems, radiation heat transfer in two and three surface enclosure, radiation shields and radiation effects.

Teaching Faculty:

Prof. S. V. Prabhu, Department of Mechanical Engineering, IIT Bombay

http://www.me.iitb.ac.in/wiki/doku.php?id=svprabhu

Prof. Arunkumar Sridharan, Department of Mechanical Engineering, IIT Bombay

http://www.me.iitb.ac.in/wiki/doku.php?id=arunsri

Who Should Attend?

The workshop will benefit faculty colleagues who are willing to be prospective Workshop coordinators for the larger workshop to be held in December 2011. It is preferable that they have some experience in conduct of ISTE and QIP workshops.

It is mandatory that the participant's Institute is well equipped to conduct the workshop through the internet, for a minimum of 30 participants, and provide lab support for them.

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, and that the participant has been nominated by the institute to coordinate the main workshop. **The participants are required to send a scanned copy of this letter to eoutreach@it.iitb.ac.in by 28th August 2011, in order to be considered for selection.**

We have limited accommodation; therefore we will invite only one coordinator per center. If for any reason the nominated coordinator cannot attend the above said workshop, we will invite one more coordinator.

Note

Please note that this workshop is conducted under the ekalavya project of IIT Bombay. Live recording of the course and other created contents will be released under Open Source, through

a portal. The recorded CD/DVD of the course lectures will be available for distribution at cost, to any individual/ institution. All participants are required to sign an undertaking for such release of contents contributed by them during and after the workshop. Recognition and citation will naturally be made for all contributors.

Accommodation and other support
Shared Guest House accommodation with standard boarding will be provided free to the participants depending on availability, from the evening of **Sunday 11ᵗʰ September 2011 (arrival) to the morning of Saturday 17ᵗʰ September 2011 (departure.)**

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 railway return fare 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. **Enrolment will be strictly online.**

LAST DATE FOR ONLINE ENROLMENT:

28th August 2011

Enroll online at http://ekalavya.it.iitb.ac.in/

The list of confirmed participants will be put up at the same website 30ᵗʰ August 2011. The confirmed participants will also be intimated by email.

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