

A Report of
One Day Workshop
on
Virtual Laboratories

February 04, 2012



Venue

**Lecture Hall – 16, Gate No. 3, Academic Area
Indian Institute of Technology Kanpur
Kanpur-208016**

Under the Aegis of

*Ministry of Human Resource and Development, Government of India
National Mission on Education through Information and
Communication Technology (NMEICT)*



VIRTUAL LABS

An Initiative of Ministry of Human Resource Development (MHRD)
Under the National Mission on Education through ICT

February 2012

Banner of Virtual Laboratories Workshop

The banners of the virtual lab were posted both at the IITK entrance gate and at the venue site.

**ONE DAY WORKSHOP
ON
Virtual Laboratories**

February 4, 2012

Venue
Lecture Hall – 16, Gate No. 3, Academic Area
Indian Institute of Technology Kanpur
Kanpur-208016

Under the Aegis of
Ministry of Human Resource and Development, Government of India
National Mission on Education through Information and Communication Technology (NMEICT)

VIRTUAL LABS
An Initiative of Ministry of Human Resource Development (MHRD)
Under the National Mission on Education through ICT

MHRD
Govt. of India

**ONE DAY WORKSHOP
ON
Virtual Laboratories**

February 4, 2012

Under the Aegis of
Ministry of Human Resource and Development, Government of India
National Mission on Education through Information and Communication Technology (NMEICT)

Hosted By
Indian Institute of Technology Kanpur

MHRD
Govt. of India

1. Background

Physical distances and the lack of resources make us unable to perform experiments, especially when they involve sophisticated instruments. Also, good teachers are always a scarce resource. Web-based and video-based courses address the issue of teaching to some extent. Conducting joint experiments by two participating institutions and also sharing costly resources has always been a challenge. With the present day internet and computer technologies the above limitations can no more hamper students and researchers in enhancing their skills and knowledge. Also, in a country such as ours, costly instruments and equipment need to be shared with fellow researchers to the extent possible. Web enabled experiments can be designed for remote operation and viewing so as to enthuse the curiosity and innovation into students. This would help in learning basic and advanced concepts through remote experimentation. Today most equipment has a computer interface for control and data storage. It is possible to design good experiments around some of this equipment which would enhance the learning of a student. Internet-based experimentation further permits use of resources – knowledge, software, and data available on the web, apart from encouraging skillful experiments being simultaneously performed at points separated in space (and possibly, time).

The aim of the one-day workshop was to expose the concept of virtual laboratories, being developed under the 11th Planned Project Initiative of MHRD, Government of India, to the faculty members of various engineering colleges and institutes. This was the first step for implementation of this model in regular engineering education in the coming years.

Objectives of the Virtual Labs

- To provide remote-access to Labs in various disciplines of Science and Engineering. These Virtual Labs would cater to undergraduate students, and post graduates and research scholars as well.
- To enthuse students to conduct experiments by the arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.
- To provide a Learning Management System around the Virtual Labs where the students can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self evaluation.
- To share costly equipment and resources, which are otherwise available to limited number of users due to constraints on time and geographical distances.

Demo of Virtual Laboratories (in parallel sessions based on branches of study) on:

- Virtual combustion and atomization
- Aerospace Virtual Laboratory
- Ultrafast Laser Spectroscopy
- Transducers and Instrumentation
- RF and Microwave Characterization
- Networks Monitoring Laboratory
- Production Shop Simulation Laboratory
- Optical Visualization of Heat Transfer and Fluid Flow Phenomena
- Nano-composite fabrication and bio-materials laboratory
- Material response to micro-structural, mechanical and thermal stimuli
- Waves and phenomena
- Virtual astrophysics laboratory
- Laboratory on Mechatronics
- Manufacturing Laboratory

**One Day Workshop
on
Virtual Laboratories**

February 04, 2012

Organized by
Indian Institute of Technology Kanpur

Program Schedule

0900-0930	Registration
0930-1000	Inauguration
1000-1015	High Tea
1015-1100	Introduction to Virtual Laboratory Initiative
1115-1300	Session #1 Parallel sessions of lab demonstration
1300-1400	Lunch Collection of signed TA forms and TA Payment
1400-1430	Networking
1430-1600	Session #2 Parallel sessions of lab demonstration
1600-1630	Tea/ Networking
1630	Program Ends



Virtual Laboratories Presentations Workshop Schedule

February 4, 2012



Time ↓	Lab-1	Lab-2	Lab 3
Specialization →	Agricultural/ Biotechnology/ Manufacturing/ Materials/ Mechanical (L-16)	Chemistry/ Computer Science / Electrical/ Electronics and Communication/ Information Technology/ Physics (L-17)	Aerospace/ Civil/ Mechanical (L-15)
1015-1100	Introduction to Virtual Laboratory Initiative (Prof. Sameer Khandekar) L-16		
1115-1155	Virtual Laboratory on Mechatronics (Tanuja Sheroy)	Transducers and Instrumentation (Nishchal Verma)	Material Response to Micro-structural, Mechanical and Thermal Stimuli (Kantesh Balani)
1155-1235	Manufacturing Laboratory (Vijay Gupta)	Ultrafast Laser Spectroscopy (D. Goswami)	Optical Visualization of Heat Transfer and Fluid Flow Phenomena (K. Muralidhar)
1235-1305	Production Shop Simulation Laboratory (Deepu Philip)	Waves and Phenomena (S. Banerjee)	Aerospace Virtual Laboratory (S. Kamle)
LUNCH BREAK/ NETWORKING			
1430-1515	Virtual Laboratory for Biomaterials: Processing and Characterisation (Bikramjit Basu)	RF and Microwave Characterization Laboratory (M.J. Akhtar)	Virtual Combustion and Atomization (D.P. Mishra)
1515-1600	Material Response to Micro- structural, Mechanical and Thermal Stimuli (Kantesh Balani)	Virtual Astrophysics Laboratory (Pankaj Jain)	Acoustics Lab (Nachiketa Tiwari)



Details of Website Links of Virtual Laboratories

PI	Email	Lab name and website link
DP Mishra	mishra@iitk.ac.in	Virtual combustion and atomization http://home.iitk.ac.in/~mishra/virtual_lab/List_of_experiments.php
S. Kamle	kamle@iitk.ac.in	Aerospace Virtual Laboratory www.iitk.ac.in/aero/Vlab/vlab.html
D. Goswami	dgoswami@iitk.ac.in	Ultrafast Laser Spectroscopy home.iitk.ac.in/~dgoswami/vlab/
Nishchal K Verma	nishchal@iitk.ac.in	Transducers and Instrumentation http://202.3.77.143/virtuallab/
M J Akhtar / K Vaibhav Srivastava	mjakhtar@iitk.ac.in kvs@iitk.ac.in	RF and Microwave Characterization Laboratory http://www.iitk.ac.in/mimt_lab/vlab/index.php
Deepu Philip	dphilip@iitk.ac.in	Production Shop Simulation Laboratory http://gssl.iitk.ac.in/pssl/
P.K. Panigrahi K. Muralidhar	panig@iitk.ac.in kmurli@iitk.ac.in	Optical Visualization of Heat Transfer and Fluid Flow Phenomena http://202.3.77.50/~opticalv/interferometry/
Bikramjit Basu	bikram@iitk.ac.in	Nano-composite fabrication and bio-materials laboratory http://www.iitk.ac.in/biomaterialslab/virtuallab.html
Kantesh Balani	kbalani@iitk.ac.in	Material response to micro-structural, mechanical and thermal stimuli http://home.iitk.ac.in/~kbalani/vl-kb/Home%20page.html
Satyajit Banerjee	satyajit@iitk.ac.in	Waves and phenomena http://202.3.77.158/
Pankaj Jain	pkjain@iitk.ac.in	Virtual astrophysics laboratory http://202.3.77.17/AstroWebPages/exp9.html
Nachiketa Tiwari	ntiwari@iitk.ac.in	Acoustics Lab vlabs.iitkgp.ernet.in/RedirectFiles/NoInfo.html
Dr. Tanuja Sheorey	tanush@iiitdmj.ac.in	Virtual Laboratory on Mechatronics http://vlabs.iiitdmj.ac.in/
Dr. Vijay Kumar Gupta	vk Gupta@iiitdmj.ac.in	Manufacturing Laboratory http://vlabs.iiitdmj.ac.in/

2. Registration and Inauguration Ceremony:

The one-day workshop on Virtual Laboratories was attended by 138 faculty from AICTE approved colleges in and around Kanpur region. After the NPTEL, the aim of this workshop was to create an awareness on the utilization of web-based experiments, virtualization and simulations towards enhanced learning. The target audience of faculties was chosen as the baton to pass on the knowledge of existence of web-based experiments to students. The purpose was to facilitate the understanding and concepts in the colleges where the state-of-the-art experimentations facilities and infrastructure is not present.

An overwhelming participation of over 250 faculty members was requested, but owing to logistics issue, a priority list is created to allow the other interested faculty members who could not participate in this workshop, can be called to experience the Virtual lab experiments. This overwhelming response has mandated that that the next virtual lab be organized soon enough to let the developed zeal continue igniting young minds.

Inauguration ceremony witnessed Prof. Kripa Shanker, Vice Chancellor, Gautam Buddha Technical University Lucknow as the chief guest. He had been instrumental in advertising the workshop and ensuring such an inundating experience. Prof. S.C. Srivastava, Deputy Director, IIT Kanpur welcomed the participants and encouraged them to avail this opportunity in enhancing their experience and serving as ambassadors of Virtual Labs back to their institute.



Inauguration Ceremony for Virtual Laboratories, Feb. 4, 2012. (Photo: From left to right: Prof. Sameer Khandekar, Prof. S.C. Srivastava, Prof. Kripa Shanker (chief guest), and Prof. S. Sangal)



Lighting of the lamp during inauguration ceremony of Virtual Laboratories, Feb. 4, 2012.
(Photo: From left to right: Prof. Kripa Shanker (chief guest), Prof. Kantesh Balani (workshop coordinator), Prof. S.C. Srivastava, Prof. S. Sangal, and Prof. Sameer Khandekar (seen at back))

The inauguration ceremony witnessed the zeal of participants, many of who had also attended the NPTEL workshops earlier. Encouragement by Prof. Kripa Shanker, and Prof. S.C. Srivastava were well received by the participants. The participation by 138 faculty members from in and around Kanpur area to participate in Virtual Lab workshop organized on Feb. 4, 2012, was a treat in itself. Prof. Kantesh Balani, coordinator of Virtual Laboratories workshop, served as the master of ceremony for conducting the event.

The inauguration ceremony followed with the introductory lecture by **Prof. Sameer Khandekar** on the “*Introduction to Virtual Laboratory Initiative*”. This lecture clarified the concept of Virtual Laboratories, and how real or virtual the experiments can be. The flavor of remote triggered experiments, and the animations/ visualization of virtual laboratories was also demonstrated. The link of utilizing the facility and not duplicating it everywhere was also stressed so that the same infrastructure can be shared by many institutions that would prepare the students for ‘getting a first-hand’ experience’ of the laboratories and being ready for doing the actual experiment. The transition from data to information to knowledge to wisdom was very well conveyed by Prof. Sameer Khandekar.



Prof. Sameer Khandekar delivering a lecture on *“Introduction to Virtual Laboratory Initiative”* on Feb. 4, 2012.



Audience attending to Prof. Sameer Khanedkar on his introductory lecture.

The session followed with a small tea break, and that session sensitized the participants about the benefits of attending the workshop. This session witnessed sharing of ideas and various expectations from the participants on this workshop. Many of the participants had also experienced NPTEL workshops and many are avid users of those lectures. Moreover, many appreciated the language and quality of speakers from IIT Kanpur that demonstrate the virtual laboratories.



Prof. Sandeep Sangal demonstrating a 'remote triggered live experiment' to the audience during Virtual Laboratories workshop on Feb. 4, 2012, at IIT Kanpur.

The tea and networking session involved the sharing of feedbacks and interaction of participants with the instructors/Pis.

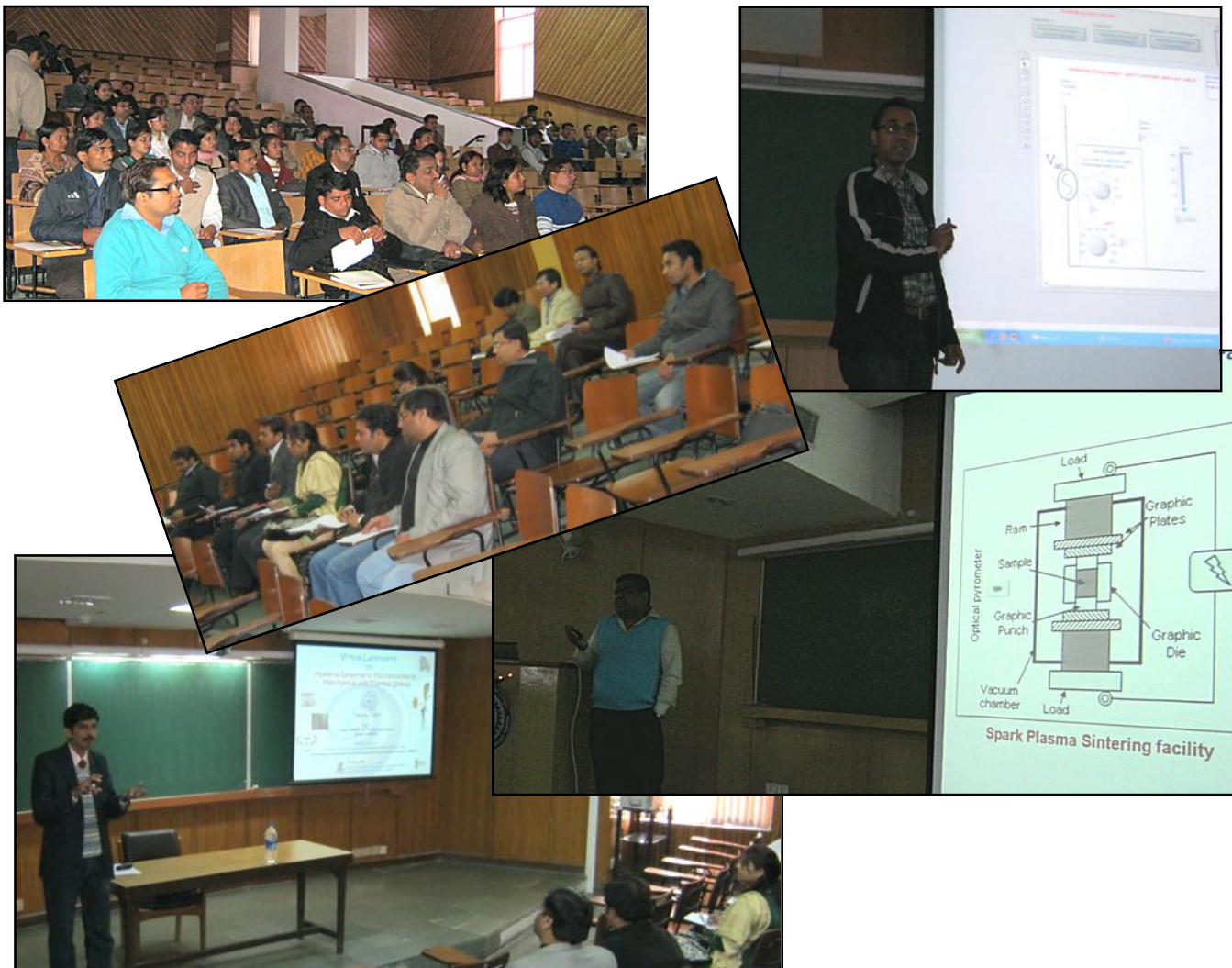


Participants interacting with the speakers/ instructors on Feb. 4, 2012, during a break session.

Then the sessions were parallelly split to cater to the interest of the participants. The sections were made on the following disciplines:

- (i) Agricultural/ Biotechnology/ Manufacturing/ Materials/ Mechanical
- (ii) Chemistry/ Computer Science/ Electrical/ Electronics and Communication/ Information Technology/ Physics
- (iii) Aerospace/ Civil/ Mechanical

The presentations included the outlining of the ‘conceptual’ inception, and the content of experiments that can be utilized for demonstration, and the actually developed virtual lab experiments were demonstrated to the audience. The deployable virtual laboratory experiments were well received by the participants. Participants had the luxury of attending the lectures to their interests. After each presentation a feedback survey was held in order to enhance the attractiveness of the website for dissemination to the eventual users...students.



A collage of various presentations during the Virtual Laboratories workshop on Feb. 4, 2012.

3. Feedback of Participants

The overall feedback from the participants was highly encouraging, and sure it was directed towards the better utilization and dissemination finally to students. The visualization and user-interface was highly interactive, and this exposure of virtual lab through this workshop witnessed delighted faces. Certain constructive comments were also received such as: to increase the number of demonstrations, providing more animations, etc, which is attributed to the limited time given for presentations. All, in all the reciprocation from the end of participants was very positive and participants were highly enthusiastic in serving as ambassadors back to their college/universities and publicizing the availability of Virtual Labs for enhancing the learning and knowledge through simulation based virtual experiments.

Typical Feedback Forms (The laboratories names are excluded)

Name of the Faculty Ashutosh Mishra

Department of the Faculty Chemical Engg.

Email of the Faculty ashutosh.m22@gmail.com

Name of the Institute Dr. Ambedkar Instt. of Technology for Handicapped, Kanpur

How many virtual lab experiments/ simulations were demonstrated? 02

1. Please tell your agreement with the following statements

	Excellent	V. Good	Good	Average	Poor
a) The simulations were informative.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) The descriptions/manuals were found to be helpful.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) The results of virtual simulations were easily interpretable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. How helpful do you feel the virtual lab is?
If this virtual lab technique implements in near future, then it may become just as a revolution in the field of experiments. The knowledge of students will increase comprehensively due to virtual real labs, but virtual virtual are quite sufficient.

3. Please answer the following questions

a) Did you get the feel of simulations/ problems?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Were step-by-step procedure described for virtual lab?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Could you measure and change the parameters?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Could you compare your results with expected results?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Was the virtual lab useful in learning the concepts?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Do you think virtual lab gives scope for more innovative and creative research work?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Specify problems/difficulties you faced while learning from virtual lab.
NO

5. Provide few interesting things about the virtual lab.
Really interesting & knowledge increasing.

Date: Feb. 4, 2012 Place: Kanpur Signature (Signature) 04.02.2012

--- Use the back of the sheet if required ---

Typical Feedback Forms (The laboratories names are excluded)

Name of the Faculty Dr. Ashutosh Tiwari
 Department of the Faculty Physics
 Email of the Faculty ashutoshtiwari@psid.in, ashutosh0885@gmail.com
 Name of the Institute Ranveer Singh Institute of Technology, Kanpur
 How many virtual lab experiments/ simulations were demonstrated? 10

- | 1. Please tell your agreement with the following statements | Excellent | V. Good | Good | Average | Poor |
|--|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|--------------------------|
| a) The simulations were informative. | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) The descriptions/manuals were found to be helpful. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) The results of virtual simulations were easily interpretable. | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

2. How helpful do you feel the virtual lab is?

Very much helpful

3. Please answer the following questions

- | | | | | | |
|---|-------------------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|
| a) Did you get the feel of simulations/ problems? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Were step-by-step procedure described for virtual lab? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Could you measure and change the parameters? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Could you compare your results with expected results? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Was the virtual lab useful in learning the concepts? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Do you think virtual lab gives scope for more innovative and creative research work? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

4. Specify problems/difficulties you faced while learning from virtual lab.

No problem

5. Provide few interesting things about the virtual lab.

Very much interactive and will help to increase the understanding

Date: Feb. 4, 2012

Place: Kanpur

Ashutosh Tiwari
Signature

--- Use the back of the sheet if required ---

Other comments

2. How helpful do you feel the virtual lab is?

It is one step forward in the field of Technical education

2. How helpful do you feel the virtual lab is?

Students will be benefited as it will be easy to understand & saves time

2. How helpful do you feel the virtual lab is?

It is very good tool for distance education

2. How helpful do you feel the virtual lab is?

The concept is no doubt a effective procedure of learning.

2. How helpful do you feel the virtual lab is?

Since the equipments are expensive & controlled environment is to be maintained simulators will help visualize in mass scale by student/faculty of state college.

2. How helpful do you feel the virtual lab is?

It is very must useful and create the innovative knowledge at that time

4. Specify problems/difficulties you faced while learning from virtual lab.

Time is an issue hence more time should be spend to show videos.

4. Specify problems/difficulties you faced while learning from virtual lab.

Time problem due to limited no. of equipments. Experiments can not be done any time.

4. Specify problems/difficulties you faced while learning from virtual lab.

The some problems create at time in availability of the instrument & maintenance of working time

5. Provide few interesting things about the virtual lab.

..... It is interesting to see live exp.
.....

5. Give most interesting thing about the virtual lab.

All the virtual lab was interesting and informative

5. Give most interesting thing about the virtual lab.

The live demonstration was very well conducted.

5. Give most interesting thing about the virtual lab.

Understand the intricate mechanism without being exposed to risky environment.

5. Give most interesting thing about the virtual lab.

This types of lab is very excellent for create the knowledge and maxi. out put knowledge

4. Summary

Virtual Laboratories workshop organized on February 4, 2012, witnessed the participation of 138 faculty members from AICTE approved colleges in and around Kanpur region. A total of fourteen virtual laboratories were demonstrated by the Principal Investigators. This initiative by the *Ministry of Human Resource and Development, Government of India, National Mission on Education through Information and Communication Technology (NMEICT)* is highly benefitting to the local colleges nationwide. A very positive feedback from the participants confirm that the module of enhanced learning via utilization of web-based experiments is certainly a boon to the upliftment of the quality of undergraduate and postgraduate education as required for country's progress.

With fourteen virtual laboratories that were demonstrated, the zeal of learning and participation from all 138 faculty was an effort well rewarded. Based on such a positive feedback of participants, another workshop is being planned for those who could not attend this workshop. Moreover, a dedicated workshop by each virtual laboratory will also be conducted for students, at various colleges upon mutual availability of PIs and the organizers.

All in all, the conduct of workshop on Virtual Laboratories on February 4, 2012 at IIT Kanpur was a grand success.

More of such dedicated workshops are being planned for dissemination to end-users.

Report Prepared By:

Dr. Kantesh Balani

Coordinator, Virtual Laboratories Workshop

Dept. of Materials Science and Engineering

Indian Institute of Technology Kanpur

Kanpur-208016

Email: kbalani@iitk.ac.in

Ph: +91-512-259-6194

Feb. 10, 2012