KNOWLEDGE INCUBATION FOR TEQIP, IIT KANPUR

TEQIP Workshop on Teaching Methodologies in Chemical and Material Sciences

February 22-23, 2014

Knowledge incubation for TEQIP, IIT Kanpur organized a workshop on Teaching Methodologies in Chemical and Material Sciences in February 2013. This workshop was meant to address the Chemical and Materials Engineering programs at several Universities and Institutes in India. It aimed at discussing and suggesting curricula and directions for Chemical and Materials Engineering Programs.

TOPICS DISCUSSED

- Philosophy behind teaching of Chemical and Materials Engineering Programs and what must be its objective, how it should evolve with changing times.
- Discussion on existing courses and lab component.
- How to balance theoretical concepts and hands-on skills of the students.
- Balancing of core and elective courses.
- Relevance to industry as well as higher education and/or research.
- Thematic discussions to evolve model curricula which should be able to motivate the students with the framework of existing strengths of the participating institutions.

LIST OF SPEAKERS

- Gautam Deo, IIT Kanpur
- Ashish Garg, IIT Kanpur
- Manoj Harbola,IIT Kanpur
- Raj Chhabra, IIT Kanpur
- Y.N. Mohapatra, IIT Kanpur
- G.D. Yadav, ICT Mumbai
- Vikram Jayaram, IISc Bangalore
- Deepak Gupta, IIT Kanpur
- N.B. Ballal, IIT Bombay
- Gandham Phanikumar, IIT Madras
- TA Abinandanan, IISc Bangalore
- Shashank Shekhar, IIT Kanpur
- Sandeep Sangal, IIT Kanpur
- Anandh Subramaniam, IIT Kanpur
- Deepak Kunzru, IIT Kanpur
- Y.M. Joshi, IIT Kanpur
- Anish Upadhyaya, IIT Kanpur
- Kallol Mandal, IIT Kanpur
- Krishanu Biswas, IIT Kanpur
- Monica Katiyar, IIT Kanpur
- Anshu Gaur, IIT Kanpur
- Siddhartha Panda, IIT Kanpur
- Rajeev Gupta, IIT Kanpur
- Animangsu Ghatak, IIT Kanpur
- Sri Sivakumar, IIT Kanpur

- Kantesh Balani, IIT Kanpur
- V. Shankar, IIT Kanpur
- S.K Gupta, IIT Kanpur
- Kesava Rao, IISc. Bangalore

PARTICIPATING INSTITUTES

Institute	Number of Participants
Dr. SSB Univ. Institute of Chemical engineering and Technology	1
NIT, Kurukshtra	1
PEC, University of technology	4
HBTI, Kanpur	4
IFTM	3
MNIT, Allahabad	2
Jadavpur University	1
MJP, Rohilkhand	6
UIET, CJSM, Kanpur	6
IET, Lucknow	3
BIET, Jhansi	2

SCHEDULE OF THE WORKSHOP

February 22, 2014

Time	Event
9:00 AM – 9:30 AM	**Registration**
9:30 AM – 9:45 AM	**General Introduction of TEQIP** Prof. Goutam Deo
9:45 AM – 10:00 AM	**Outline of the workshop** Prof. Ashish Garg
10:00 AM – 10:30 AM	**Discussion on UG Curriculum at IIT Kanpur** Prof. Manoj Harbola

10:30 AM – 11:00 AM	**TEA BREAK**
11:30 PM – 12:15 PM	**Relevance of Physical, Chemical and Materials Science in engineering** Moderator: Raj Chhabra a. **Expert talk on Physical Sciences:** YN Mohapatra b. **Expert talk on Chemical Sciences:** GD Yadav
12:15 PM – 1:00 PM	**Discussion of UG Curriculum of CHE at IITK and other IITs** Prof. Goutam Deo **a. General Philosophy** **b. Department specifics on Core, Electives, Lab, Research and hands-on instruction and areas of improvement**
1:00 PM – 2:15 PM	**LUNCH BREAK**
2:15 PM – 2:45 PM	**Expert Talk on Materials Sciences** Prof. Vikram Jayaram
2:45 PM – 4:15 PM	**Discussion of UG Curriculum of MSE at IITK, other IITs and IISc** **a. General Philosophy** **b. Department specifics on Core, Electives, Lab, Research and hands-on instruction and areas of improvement** **Session chair: Sandeep Sanghal** **Order:** **(i) UG Curriculum at IIT Kanpur (Deepak Gupta)** **(ii) UG Curriculum at IIT Bombay (NB Ballal)** **(iii) UG Curriculum at IIT Madras (Gandham Phanikumar)** **(iv) UG Curriculum at IISc Bangalore (TA Abinandanan)**
4:15 PM – 4:30PM	**TEA BREAK**
4:30 PM – 5:15 PM	**Inputs from participants on their curricula, and discussion** (Moderators: Prof. Gautam Deo/Ashish Garg)

5:15 PM – 5:30 PM	**Summary** Shashank Shekhar

February 23, 2013

Time	Event
9:30 AM – 10:45 AM	**Thematic Discussions to evolve the Chemical and Materials Engineering curriculum** **Session 1: Fundamentals** **a. Structure and Characterization** (Sandeep Sangal, Vikram Jayaram, Gouthama and Anandh Subramaniam) **b. Thermodynamics and Rate Processes** (Deepak Kunzru, TA Abinandan, Y.M. Joshi)
10:45 AM – 11:15 AM	**TEA BREAK**
11:15 – 1:00 PM	**Session 2: Processes** **a. Manufacturing Processes** Anish Upadhyaya, Kallol Mandal, Shashank Shekhar, Nilesh Gurao, N.B. Ballal **b. Design, Control and Modeling** S.K. Gupta, Gandham Phanikumar, N.B. Ballal
1:00 PM – 2:30 PM	**LUNCH BREAK**
2:30 PM – 4:00 PM	**Session 3: Properties and Applications** **a. Mechanical Properties** (Kallol Mandal, Shashank Shekhar, Krishanu Biswas) **b. Electrical, Optical and Magnetic Properties** (Monica Katiyar, Anshu Gaur, Siddhartha Panda, Rajeev Gupta) **c. Nano and Biotechnology** (Animangsu Ghatak, Sri Sivakumar and Kantesh Balani) **d. Any other ideas** (Kesava Rao, V. Shankar)
4:00 PM – 4:30 PM	**HIGH TEA**
4:30 PM – 5:00 PM	**Action Points and Recommendations** Prof. C S Upadhyay, Prof. Gautam Deo, Prof. Ashish Garg

5:00 PM – 5:15 PM	**Concluding Remarks** Director, Prof. C S Upadhyay, Prof. Gautam Deo, Prof. Ashish Garg

Summary of Faculty Feedback

Workshop

Questions	Excellent	Good	Ordinary
Clarity of communication about workshop	11	15	00
Organization of the sessions	12	14	00
Quality of lectures	09	17	00
Quality of posters	02	10	03
Effectiveness of discussions	12	14	00
Effectiveness of learning experience	12	14	00
	Appropriate	**Short**	**long**
Duration of workshop	22	04	00
	Definitely	**Maybe**	**No**
Would you like to have more such sessions?	21	04	02
Would you like e-lectures by experts on special topics?	21	03	00
Suggest specific topic that you would like additional expert lectures on	• Chemical Reaction Engg., Chemical Technology • Thermodynamics, • Characterization, nanomaterials, colloid properties. •Designing of mass transfer equipments contacting devices. •Reactor design, Design using Aspen-Hysis		
Additional Suggestions	•Brief description of defects on M.S and Thermo. •Discussion in Chemical Engg. courses should have been more elaborative. •Discussion of content of 20% basic sciences (physics & chemistry) in the curriculum of UG courses in chemical & material engg. elective courses which can be offered by applied sciences faculty including lab components. •This kind of workshop should also be offered by		

Teaching

Which subjects do you teach?	•Chemical reaction engg. •Thermodynamics mechanics of materials. •Statistical methods •Mass transfer, equipment design. •Reaction engg. design, Process calculations, Heat Transfer. •Material and energy balance, Mass Transfer, Process plant design. •Applied Chemistry. •Applied Physics. •MSE , Bio-materials. •TOM, CT,MEMS •Fluid Mechanics, Thermodynamics. •Machine design, Material Science. •CRE. •Fluid Flow Operations, Chemical Process Industries. •Process Modelling and Simulation. •Chemical Reactions Engg. , Bio Process Principles. •Transport Phenomena. •APDC, EPMC, CT. •Polymers.
What is average student to teacher ratio in your institute?	•20:1 •20:1 •20:2 •22:1 •16:1 •26:1 •50:1 •50:1 •15:1 •25:1 •20:1 •15:1 •15:1 •25:1 •25:1 •20:1 •20:1 •20:1 •20:1 •05:1

Questions	YES	NO
Do you have additional support for teaching (tutors, graders, teaching Assistants, etc)?	8	14
Do you give class projects for UG classes?	21	04
Do you give class projects for PG classes?	14	6
Do you have sufficient resources for laboratory courses?	13	10
	Sufficient	**Inadequate**
Is the library/journal/e-connection support adequate?	14	12

	Definitely	May be	No
Would you like to have common (TEQIP) repository of course material?	17	06	00
Would you like to visit IITK to participate in and develop course material (existing or new)	21	04	00
Would you like to participate in creation of the repository material (course files/lab. Manuals/question bank/etc)	18	04	01

	e-courses	Workshops	Content	none
How can IITK effectively help you prepare for teaching?	14	13	12	00

How can TEQIP help improve your teaching?	•Interact by student more. •Exposure to different teaching techniques. •By providing funding to attend the conference. •By conducting this type of workshop again in future. •By Institute-Institute interaction and by Institute-Industry Interaction. •Through adoption of standard curriculum which matches the needs of the Industry and R&D centres. •By conducting workshops on specific topics of IITs. •Facilitating frequent interaction & discussing. •Workshop on core subjects. •More workshops on teaching methodologies. •A workshop on teaching methodologies for a week is necessary in every academic year. Also TEQIP can provide more funds to state engg. colleges to improve their infrastructure & labs. •It can support resources development. •It can provide wide range of course and expertise on the subjects materials. •Study material and videos. •Don't know can co-ordinate with NPTEL. •If TEQIP can arrange workshop on courses which are tough at UG and PG level by faculty from IITs. •Preparing written material for the lectures.

Research

Questions	Definitely	Maybe	No
Would you like to visit an IIT for a visiting-faculty/post-doctoral fellow ,if offered(via TEQIP)?	16	06	02
Would you like to share/use research infra-structure at IITK, if made available?	21	03	01
Would you like to conduct collaborative research with IITK?	19	04	01
Would you like lectures by experts (Indian and international) on niche research areas/topics?	18	04	01
Do you want special-topic conferences?	16	08	01
How can TEQIP help improve your research?	•To conduct workshop, e-learning programme. •Interaction. •By providing funds for the purchase of research equipments. •Providing infrastructure for research, having interaction with researchers of other institutes. •Providing the option of using research facilities in all institutes, visit by experts in both student/exchange mode. •By providing the option of using research facilities using research facilities available at IITs. •Travel grants & Procurement. •By providing opportunity to work together with faculty members at IITK during summer & winter vacations. •By making available the laboratory facilities where possible. •TEQIP can improve research by providing research opportunities to the teachers of all institutions by including them in Phd programs, projects and others areas according to their qualification. •More funds can be raised to the state govt. Engineering college for developing new research facilities at their premises. •TEQIP can provide more facilities at institute premises. •TEQIP can give financial support for research. •It can help by giving additional thoughts on research area. •By extending lab facilities. •By sharing library and other resources with us.		

Summary of Student Feedback

Workshop

Questions	Excellent	Good	Ordinary
Clarity of communication about workshop	02	01	00
Organization of the sessions	01	02	00
Quality of lectures	03	00	00
Quality of posters	00	01	01
Effectiveness of discussions	02	00	00
Effectiveness of learning experience	01	01	00
	Appropriate	**Short**	**long**
Duration of workshop	01	02	00
	Definitely	**Maybe**	**No**
Would you like to have more such sessions?	03	00	00
Would you like e-lectures by experts on special topics?	02	00	01
Suggest specific topic that you would like additional expert lectures on	•Material science & Fluid & Particle Mech. •Pollution control methods. •Matlab, Green Economy , Cleaner Technologies.		
Additional Suggestions	• You should provide one week course for fourth year chemical engg. students related to fluid & particle mech. • The course material should be more so that we understand it clearly.		

Learning

Questions	Yes	No
Do you get enough class projects?	02	01
Is the learning adequate?	01	01
Do you have sufficient resources for laboratory courses?	00	02
What is your area of specialization	•Chemical Engineering.	
	Sufficient	**inadequate**
Is the library/journal support/e-connection adequate?	01	01

	Definitely	Maybe	No
Would you like to have common (TEQIP) repository of course material?	01	00	00
Would you like to visit IITK to attend specialized courses?	03	00	00
Would you like MOOCS/e-resources based courses?	01	01	00
How can TEQIP help improve your learning?	• By conducting more long term workshops.		

Research

Questions	Definitely	Maybe	No
Would you like to visit an IIT for a short visit /internship/post-doctoral stint ,if offered(via TEQIP)?	03	00	00
Would you like to share/use research infra-structure at IITK, if made available?	02	01	00
Would you like to conduct collaborative research with IITK faculty?	02	01	00
Would you like lectures by experts (Indian and international) on niche research areas/topics?	01	02	00
Do you want special-topic conferences?	03	0	00
How can TEQIP help improve your research?	• TEQIP should organize two week summer internship for chemical		

OUTCOME

Participants were introduced to the teaching methods at IIT Kanpur in the department of Chemical and Materials Engineering programs. The workshop emphasized that the teaching methods must evolve with ever changing field requirements. The participants discussed how to fill the current gap between the theory and hands-on skills of the students and how to design motivational curricula for them.