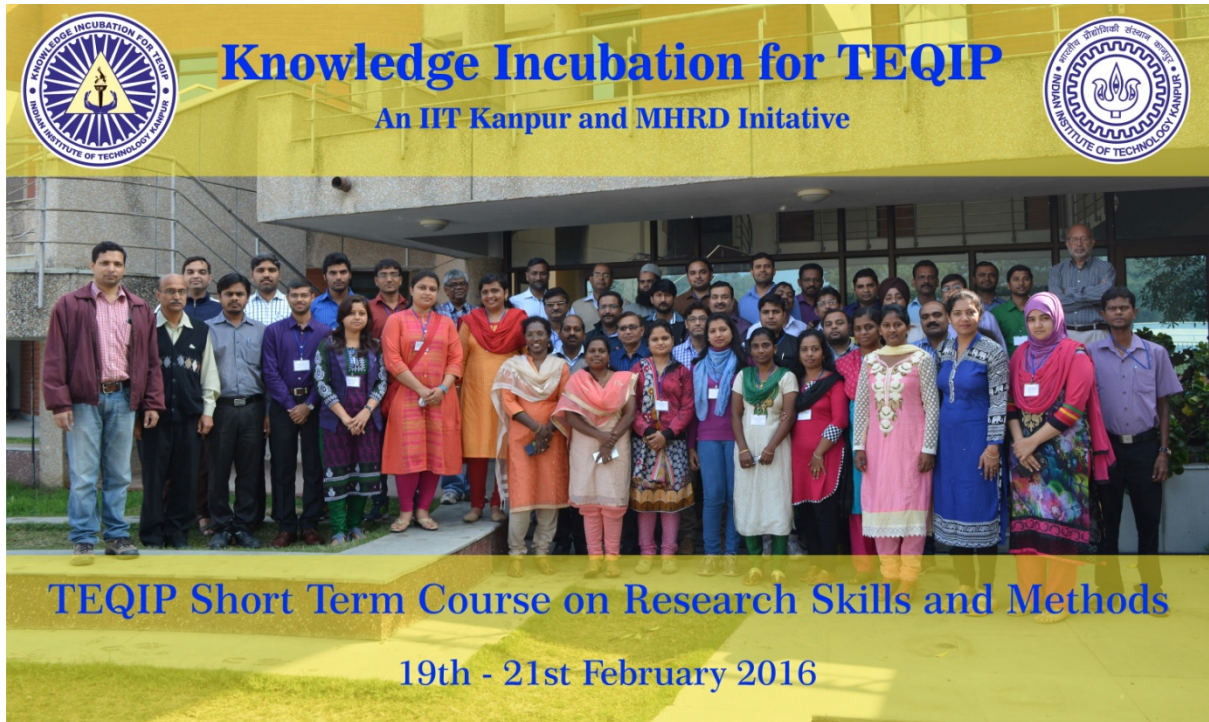




KNOWLEDGE INCUBATION FOR TEQIP, IIT KANPUR

Short term course on Research Skills & Methods

February 19 – 21, 2016



Knowledge Incubation for TEQIP, IIT Kanpur organized a 3 day short term course on *Research Skills & Methods*. The broad objective of this course was to make individuals who are launching their research careers understand the philosophy of research and introduce them to various tools that can help improve their research and problem solving skills. This short course was divided into five modules.

- Notion of research, various tools for thinking with creativity and innovation which are critical for undertaking research.
- Data presentation.
- Statistical analysis of data.
- Concepts of regression, curve fitting and error estimation.
- Technical reading and writing.

The course concluded with a shortmodule on “*Ethics in Research*”, scientific method, types of misconduct in academic settings, etc.

Topics Discussed

- Definition and Nature of Research - Tools for thinking
- Creativity and Innovation- Roles of simple models in thinking
- Data Presentation
- Technical Reading
- Technical Writing
- Ethics in Research
- ❖ Lab Work-
 - Design of experiments
 - Statistical Analysis Part I
 - Statistical Analysis Part II
 - Data Processing Part I
 - Data Processing Part II

List of Speakers

- Prof. Raj P Chhabra, IIT Kanpur
- Prof. ShashankShekhar, IIT Kanpur
- Prof. Rajeev Gupta, IIT Kanpur
- Prof. Sandeep Sangal, IIT Kanpur
- Prof. Ashish Garg, IIT Kanpur

Participating Institutes

Institute	Number of Participants
Kamla Nehru Institute of Technology ,Sultanpur UP	1
LBS Institute of Technology for Women ,Trivandrum. Kerala	1
College of Engineering Karunagappalli	5
Cochin University of Science of Technology	3
Sreenidhi Institute of Science and Technology	2
College Of Engineering Karunagappally	2
Rajarambapu Institute Of Technology	1
IFTM University, Moradabad	3
Aligarh Muslim University	2
MNNIT Allahabad, U.P	6
MMMUT Gorkhpur	1
Kurukshetra University	2
HBTI, Kanpur I	7
NIT, Rourkela	1

IET Lucknow	5
NIT Calicut	1
BTKIT Dwarahat	1
DCRUST, Murthal	1
NCCE, MED	1
Total	46

Workshop Schedule

Day 1st February 19, 2016

Time	Event
08:00 - 08:45 AM	Registration
08:45 - 09:00 AM	Opening Remarks
09:00 - 10:30 AM	Definition and Nature of Research - Tools for thinking <i>Prof. Raj P Chhabra, IIT Kanpur</i>
10:30 - 10:55 AM	Tea Break
11:00 - 12:30 PM	Creativity and innovation - Role of simple models in thinking <i>Prof. Raj P Chhabra, IIT Kanpur</i>
12:30 - 02:15 PM	Lunch Break
02:15 - 03:45 PM	Data presentation <i>Prof. ShashankShekhar, IIT Kanpur</i>
03:45 - 04:30 PM	Tea Break
04:30 - 06:00 PM	Design of Experiments <i>Prof. ShashankShekhar, IIT Kanpur</i>

Day 2nd February 20, 2016

Time	Event
09:30 - 11:00 AM	Statistical Analysis Part I <i>Prof Rajeev Gupta/Prof. Raj P Chhabra, IIT Kanpur</i>
11:00 - 11:25 AM	Tea Break
11:30 - 01:00 PM	Statistical Analysis Part II <i>Prof Rajeev Gupta/ Prof. ShashankShekhar, IIT Kanpur</i>
01:00 - 02:30 PM	Lunch Break
02:30 - 04:00 PM	Data Processing Part I <i>Prof. Sandeep Sangal, IIT Kanpur</i>
04:00 - 04:25 PM	Tea Break
04:30 - 06:00 PM	Data Processing Part II <i>Prof. Sandeep Sangal, , IIT Kanpur</i>

Day 3rd February 21, 2016

Time	Event
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08:30 - 10:00 AM	Technical Reading <i>Prof. Ashish Garg, IIT Kanpur</i>
10:00 - 10:25 AM	Tea Break
10:30 - 12:00 PM	Technical Writing, <i>Prof. Ashish Garg, IIT Kanpur</i>
12:00 - 01:00 PM	Ethics in Research <i>Prof. Raj P Chhabra, IIT Kanpur</i>
01:00 -01:30 PM	Closing Remarks

Faculty Feedback

Workshop

Question	<i>Excellent</i>	<i>Good</i>	<i>Ordinary</i>
Clarity of communication about workshop	16	06	01
Organization of the sessions	19	04	02
Quality of lectures	16	08	01
Effectiveness of discussions	11	13	01
Effectiveness of learning experience	12	11	01
	<i>Appropriate</i>	<i>Short</i>	<i>Long</i>
Duration of workshop	18	06	00
	<i>Definitely</i>	<i>May be</i>	<i>No</i>
Would you like to have more such sessions?	17	07	00
Would you like e-lectures by experts on special topics?	22	02	00
Suggest specific topic that you would like additional expert lectures on	<ul style="list-style-type: none"> ➤ Literature survey technique. ➤ Physical interpretation of mathematical equation ➤ Paper writing techniques. ➤ Advances in analog& Digital electronics ➤ Digital image processing ➤ Application based explanation of stasified measures (ex. Image processing based.). ➤ Digital image processing, Linear Algebra. ➤ Technical writing. ➤ Number Theory. ➤ Optimization. ➤ Mathematical foundations for any research. ➤ Data visualization of optimisation. ➤ Analog signal processing/microelectronics. ➤ Data Visualisations. ➤ More focussed statistic techniques on approximation, probability distribution & else with image processing applications. ➤ Formal method, Pi-calculus on CCS, CSP in computer science. ➤ Process modelling formulation optimization (CFD) ➤ Optimization techniques. 		
Additional Suggestions	<ul style="list-style-type: none"> ➤ How to conclude the observation is effective way. ➤ Presentations of Tables, Figures etc. property is papers for refried journals. ➤ More hands on practice required ➤ Medical image processing. 		

	<ul style="list-style-type: none"> ➤ Course not (hard copy) should be given before/end of session if topic covered in next session are inter-related. ➤ Basic mathematical concepts. ➤ More time to be given to participants to have hands on experience on each subject topic covered. ➤ Give more scope to electronics section in current mode circuit. ➤ In was overall good. Some of basic titles could be chopped & advance & newer titles be added. ➤ Examples of real life problems & research methods in details.
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Teaching

Which subjects do you teach?	<ul style="list-style-type: none"> ➤ Manufacturing Science I&II ➤ Theory of machine ➤ Dbms, operating systems, compiler design, data mining soft computing (all cse) ➤ Programming in C, python ➤ Digital electronics, microprocessor, basic electronics ➤ Signals & system ➤ Web Technology, computer networks mobile computing data structure ➤ Analog& Digital electronics & related subjects. ➤ Medical Image programming ➤ Pattern Recognition ➤ Chemistry subject -inorganic chemistry. ➤ Distributed computers, Analysis & Design of Algorithm. ➤ Modelling & Simulation, optimization. ➤ DBMS ➤ Heat transfer ➤ Computer Science & Engineering. ➤ Micro process system design. ➤ Polymers ➤ Microprocessors, integrated circuit, network analysis & synthesis ➤ Formal language & automatic data structure. ➤ Embedded systems, computer vision & image processing ➤ Automata theory, mobile computing ➤ Mass transfer , thermodynamics ➤ Engg. mechanics, machine design robotic engg. ➤ Definition and nature of research
What is average student to teacher ratio in your institute?	<ul style="list-style-type: none"> ➤ 20:01

	<ul style="list-style-type: none"> ➤ 30:01 ➤ 15:1 ➤ 15:01 ➤ UG- 20:01 ➤ PG- 100:01 ➤ 15:01 ➤ 20:01 ➤ 50:01 ➤ 20:01 ➤ 18:01 ➤ 20:01 ➤ 15:01 ➤ 20:01 ➤ 20:01 ➤ 1:15 				
Questions		Yes		No	
Do you have additional support for teaching(tutors, graders, teaching Assistants, etc)?		08		15	
Do you give class projects for UG classes?		22		03	
Do you give class projects for PG classes?		15		06	
Do you have sufficient resources for laboratory courses?		17		08	
		Sufficient		Inadequate	
Is the library/journal/e-connection support adequate?		06		17	
		Definitely	May be	No	
Would you like to have common (TEQIP) repository of course material?		19	03	00	
Would you like to visit IITK to participate in and develop course material (existing or new)		16	08	00	
Would you like to participate in creation of the repository material (course files/lab. Manuals/question bank/etc)		16	08	01	
		e-courses	Workshops	Content	None
How can IITK effectively help you prepare for teaching?		10	19	02	01
How can TEQIP help improve your teaching?		<ul style="list-style-type: none"> ➤ By provide opportunity for attend such type courses in future. ➤ By attaching short terms course, workshops Etc. ➤ By providing workshops on different courses. ➤ Getting lot of chances for improvement ➤ By providing me opportunity to attend various 			

	<p>workshop across the country.</p> <ul style="list-style-type: none"> ➤ Image processing ➤ Chance to attend more workshops fdpsrelevant ➤ Promote R&D work funding for attending FSD work separate scholarship for Phd etc. ➤ Funding for attending FSD, scholarship for PhD Scholars. ➤ Providing e-courses, conducting workshops. ➤ By providing maximum teaching material which can be easily downloaded. ➤ Updating on recent trends in specific areas. ➤ Hands on experimental work/workshop ➤ FEPs & workshops ➤ Average to poor teachers be identified and after the required inputs improvements in their teacher quality be evaluated. ➤ In can by giving more lectures on analog field & electronics sections. ➤ International conference. ➤ Workshops ➤ TEQIP can help in providing e-resources of IITK like e-journals, e-book etc.
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Research

<i>Questions</i>	<i>Definitely</i>	<i>Maybe</i>	<i>No</i>
Would you like to visit an IIT for a visiting-faculty/ post-doctoral fellow, if offered (viaTEQIP)?	17	06	02
Would you like to share/use research infra-structure at IITK, if made available?	22	03	00
Would you like to conduct collaborative research with IITK?	22	03	00
Would you like lectures by experts (Indian and international) on niche research areas/topics?	24	01	00
Do you want special-topic conferences?	18	07	00
How can TEQIP help improve your research?	<ul style="list-style-type: none"> ➤ By giving opportunity for the faculties & student (PG) of our college to attend such programme ➤ By encouraging collaborative research project (Jointly held by our Inst.&IIT) ➤ TEQIP can grant me & can provide financial aid for attending the workshops & conferences around world. ➤ This type of intersection will give me a confidence and experience. ➤ Helped to attend various workshop & conference ➤ Funding for attending conference journal publications 		

	<ul style="list-style-type: none"> ➤ Various in house program organization in my infraction help me to complete my research. ➤ Helped to attend various workshop and conference. ➤ Funding for attending conference/journal publication. ➤ Various in-house program organized in my institution help me to complete my research. ➤ By attending tours related to my specific area. ➤ By attending courses related to my specific area. ➤ By providing proper interaction with experts. ➤ By motivating in specific area where sufficient work has been done. ➤ For private TEQIP funded institute, limitations are here that no physical object can be purchase under TEQIP grant. ➤ TEQIP helps to allocate/bear private institute faculty research support to NIT/IIT budget. ➤ It provide with lots of experts in terms of opportunity to take part in conference, publish paper. ➤ By attending through these trends of workshops. ➤ Instruments purchases should be able to run, maintain and operate by technical staff at all centers. ➤ Giving more information about analog VLSI design. ➤ Journals should be available licence for web of science. ➤ Relevant information & workshop about my research area “Formal method, Pi-calculus CCS” and Discrete Mathematics. ➤ By providing opportunity to work with people in IIT Who are best in the basics? ➤ TEQIP can help in providing access to all TEQIP institution, the e-resources through internet like course materials of professors available at internet, resources like e-journals e-books, magazines etc.
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Student Feedback

Workshop

<i>Questions</i>	<i>Excellent</i>	<i>Good</i>	<i>Ordinary</i>
Clarity of communication about workshop	06	08	00
Organization of the sessions	10	03	01
Quality of lectures	08	05	01

Quality of posters	03	06	05
Effectiveness of discussions	05	07	02
Effectiveness of learning experience	08	06	00
	<i>Appropriate</i>	<i>Short</i>	<i>Long</i>
Duration of workshop	08	06	00
	<i>Definitely</i>	<i>Maybe</i>	<i>No</i>
Would you like to have more such sessions?	12	02	00
Would you like e-lectures by experts on special topics?	11	02	00
Suggest specific topic that you would like additional expert lectures on	<ul style="list-style-type: none"> ➤ Recent research issues ➤ Design of experiments. ➤ How to check & deal with authenticity work. ➤ Methods to minimise errors. ➤ Additive manufacturing of biomedical implants. ➤ C.F.D analysis of mechanical & open form for circulatory system (Mechanical Pump for Heart) ➤ I would like to have expert lectures on format modelling in security ➤ Response surface methodology. ➤ Modelling related items ➤ Formal methods ➤ If you can arrange some expat lectures on image processing that can be benefited for us. 		
Additional Suggestions	<ul style="list-style-type: none"> ➤ There should be some test after completion of the workshop and the score also should be mentioned in the certificate. ➤ How to choose a approximate topic for our research ➤ More hands on experience session must be there. ➤ Much hands on session must be there. ➤ Faculty from all engg. department should involve ➤ Good sessions arrangement but i think the sessions should also be arranged for stream based such that people with in this can communicate. ➤ Please may be provide more hands on computer with applications. 		

Learning

<i>Questions</i>	<i>Yes</i>	<i>No</i>
Do you get enough class projects?	08	06
Is the learning adequate?	11	02
Do you have sufficient resources for laboratory courses?	09	03
What is your area of specialization	<ul style="list-style-type: none"> ➤ Material science & Nano technology ➤ Hydraulic Str.(Civil Enggg.) ➤ Mechanical Engg. ➤ AG wireless communication ➤ Biomedical Engg. (Applied Mechanics) 	

	<ul style="list-style-type: none"> ➤ Mechanical Engg. (Design) ➤ Civil Engg. ➤ Format modelling in security ➤ VLSI Design ➤ Formal methods & verification of large systems. ➤ Image processing in computer ➤ Image processing in computer science. 		
	<i>Sufficient</i>	<i>Inadequate</i>	
Is the library/journal support/e-connection adequate?	06	03	
	<i>Definitely</i>	<i>Maybe</i>	<i>No</i>
Would you like to have common (TEQIP) repository of course Material ?	12	02	00
Would you like to visit IITK to attend specialized courses?	12	01	00
Would you like MOOCS/e-resources based courses?	08	03	00
How can TEQIP help improve your learning?	<ul style="list-style-type: none"> ➤ By providing good expert talks. ➤ By organising more such events. ➤ Interaction with the renewal faculty really helped. ➤ By provide some special courses for the knowledge of some special software. ➤ By interactions with other workshop members and resource persons. ➤ By the interaction of other researchers and Faculty. ➤ By giving more time for workshop. ➤ I think TEQIP should increase no of participants as it helps more interaction of new researcher to conclude and may be arrange in stream wise. Provide free directories/resources to TEQIP researches. ➤ Provide hand copy notes. ➤ By knowledge the shortcut method. ➤ Through these TEQIP workshop we have with privilege to have the knowledge from experts . I appreciate to do such workshop in hear future. 		

Research

<i>Questions</i>	<i>Definitely</i>	<i>Maybe</i>	<i>No</i>
Would you like to visit an IIT for a short visit/internship/post-doctoral stint, if offered (via TEQIP)?	11	03	00
Would you like to share/use research infra-structure at IITK, if made available ?	13	00	00
Would you like to conduct collaborative research with IITK faculty?	11	03	00
Would you like lectures by experts	14	00	00

(Indian and international) on niche research areas/topics ?			
Do you want special-topic conferences?	14	04	00
How can TEQIP help improve your learning?	<ul style="list-style-type: none"> ➤ Expert talks delivered in the workshop was quite adequate which connect my research work & provide an efficient direction. ➤ By providing more and more economical support for projects and such events. ➤ By providing some special workshop based on research area ➤ Every research yields some results, conveying results to other is science as well as arts. To me it was greatest outcome of this workshop [How to present data and in experience. ➤ By learning of good data presentation ways and appropriate chosen simulation tool as per individual key objectives. ➤ By conducting more workshops and conference. ➤ With hand on practice & connect to professor from outsider students. ➤ By telling the exactly way for salary the problem but according to be stream. ➤ It spread my thinking & knowledge about persons ➤ Through TEQIP, this particular workshop doesn't help much against my research area but it indefinitely inferences my basis it is will be beneficial in near future. 		
Additional Questions for TEQIP 3rd Phase:			
1) Would you want in the 3 rd phase of TEQIP paid access to high end experimental facilities in specific institution?	14 out of 14 says yes		
2) Would you be interested in having end state art of activity TEM, SHRTM etc at specific institution (in the TEQIP fold so that all TEQIP institution can access) ?	12 out of 14 says yes and 2 says maybe.		

OUTCOME

This workshop was very successful in terms of participation and feedbacks from participants were very encouraging too. Almost all the **46 participants** who registered for the workshop showed up. The focus of this course was to understand the motivation of the participants for joining the workshop so that the contents can be tailored to fit their broad needs. Accordingly, some live experiments were designed. This short course was divided into five modules.

- In the first module of the course, Prof. Raj Chhabra introduced participants to the notion of research, various tools for thinking with creativity and innovation which are critical for undertaking research.
- Second module of the course was given by Prof. Shashank Shekhar who touched upon the idea of presenting data in a meaningful and comprehensive form. It also introduced the concept of “Design of Experiments” so as to optimize the number of real experiments.
- Third module of the course was delivered by Prof. Rajeev Gupta and it dealt with statistical analysis of data. The aim of this module was to convey the concepts of mean, standard deviation, precision, accuracy and their implication to experimental data.
- Fourth module of this short course was covered by Prof. Sandeep Sangal, whose objective was to enable researchers to process the data obtained from various experiments so that it can be analysed and interpreted in a cogent manner in order to draw logical inferences. He introduced the concepts of regression, curve fitting and error estimation.
- Fifth module of this course was taken by Prof. Ashish Garg, who made the participants familiar with the importance of technical reading and writing.