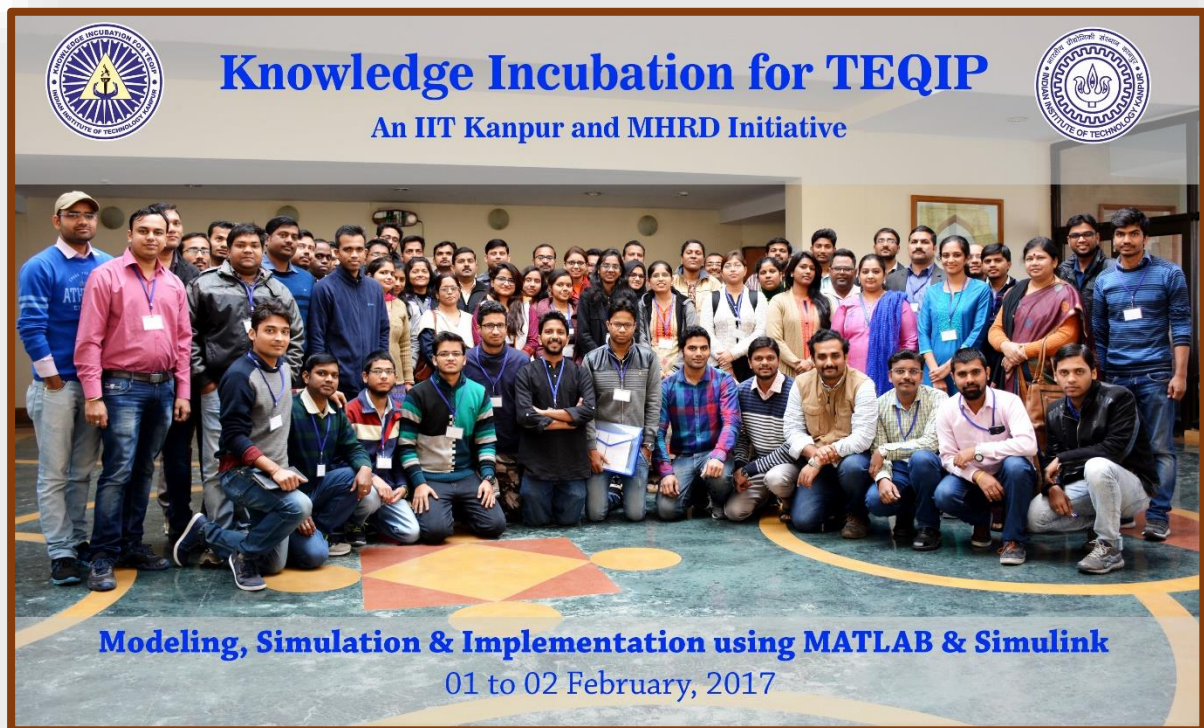




KNOWLEDGE INCUBATION FOR TEQIP, IIT KANPUR

TEQIP Workshop on Modeling, Simulation and Implementation using MATLAB and Simulink

February 1-2, 2017



This workshop aimed at providing practical methods for incorporating Simulink in the classroom to enhance teaching of technical concepts. Engineering education involves a fine balance between teaching theory and imparting practical problem-solving skills. Educators are also challenged to provide real-world examples that enable students to appreciate how the theory being taught in class can be applied in industry. The use of Simulink models in class and throughout a course exposes students to a tool that is widely used in industry to design and model complex systems. At the same time, large-scale models can be used to illustrate how theoretical concepts relate to the bigger picture and how they can be applied to solve real-world problems.

In this workshop, it was demonstrated how Data analytics, signal processing and control systems models can help to bridge the gap between theory and application, thus providing extra motivation for students. The speaker demonstrated how using interactive models in class can help to address the different learning styles of students, allowing them to learn more actively. A session was planned at the end to review resources that can help teachers incorporate MATLAB & Simulink throughout a course.

TOPICS DISCUSSED

- MATLAB and Simulink in Engineering Education
 - MATLAB Basics for the Budding Engineer
 - Experimentation and Modeling in MATLAB
 - Design and Implementation
 - Project-Based Learning (Arduino, RaspberryPi)
 - Machine Learning & Data Analytics
- Accessing, exploring, analyzing, and visualizing data in MATLAB
- Using the Classification Learner app and functions in the Statistics and Machine Learning Toolbox to perform
- Common machine learning tasks such as Feature selection and feature transformation
- Demo: ADAS using live camera stream
- Electrical engineering concepts Using MATLAB and Simulink
- System Identification & Neural Network Based System Modeling Techniques
- Electrical engineering using Simscape (Physical Modeling)
- Electrical engineering using SimPowersystems
- Control system design and analysis
- What is IoT?
 - Market Drivers and Challenges
 - Introduction to ThingSpeak
 - Examples
 - Other IoT examples using MW tools
 - MATLAB and Simulink Capabilities for IoT
- Mechanical engineering and Control System Concepts Using MATLAB and Simulink.
 - Mechanical engineering concepts using Simscape (Physical Modeling)
 - Multi-Body Dynamics Simulation using SimMechanics
- Import CAD Models using GetMechanics App
- Implement Control on Low cost hardware - Arduino
- Demo of Magnetic Levitation System

SPEAKER

- Mr. Dharendra Singh, Application Engineer, MathWorks India

PARTICIPATING INSTITUTES

Institute	Number of Participants
ZHCET, Aligarh Muslim University	7
HBTU Kanpur	17
Government Engineering College, Ajmer	3
MNNIT Allahabad	5
University Institute of Engineering & Technology, CSJM University Kanpur	1
PES University, Bangalore	2
MNIT Jaipur	1
B. V. Bhoomaraddi College of Engineering & Technology,Hubballi, Karnataka	2
Integral University, Lucknow	1
KNIT Sultanpur	4
IIT(ISM), Dhanbad	2
Nitte Meenakshi institute of technology, Bangalore.	4
Dr. Virendra Swarup Group of Institutions	1
MMMUT Gorakhpur	5
NIT Patna	1
PSIT, Bhauti,Kanpur	5
College of Engineering, Cherthala, Kerala	2
NIT Jamshedpur	5
Jadavpur University	1
Dr. B.R. Ambedkar National Institute of Technology, Jalandhar	4
College of Engineering & Technology, Bhubaneswar	3
WCE Sangli	6
Total	82

WORKSHOP SCHEDULE

Day -1

9:00 am – 9:30 am	Registration
9:30 am - 9:45 am	Welcome Address
9:45 am -11:00 am	<p>MATLAB and Simulink in Engineering Education</p> <ul style="list-style-type: none">• MATLAB Basics for the Budding Engineer• Experimentation and Modeling in MATLAB• Design and Implementation• Project-Based Learning (Arduino, RaspberryPi)• Machine Learning & Data Analytics
11:00 am – 11:30 am	Tea Break
11:30 – 12:30 pm	<ul style="list-style-type: none">• Accessing, exploring, analyzing, and visualizing data in MATLAB• Using the Classification Learner app and functions in the Statistics and Machine Learning Toolbox to perform• Common machine learning tasks such as Feature selection and feature transformation• Demo: ADAS using live camera stream
12:30 pm - 2:30 pm	Lunch Break

2:30 pm - 4:30 pm	<ul style="list-style-type: none"> • Electrical engineering concepts Using MATLAB and Simulink • System Identification & Neural Network Based System Modeling Techniques • Electrical engineering using Simscape (Physical Modeling) • Electrical engineering using SimPowersystems • Control system design and analysis • What is IoT? <ul style="list-style-type: none"> - Market Drivers and Challenges - Introduction to ThingSpeak - Examples - Other IoT examples using MW tools - MATLAB and Simulink Capabilities for IoT
4:30 – 5:00	Tea Break

Day 2

10:00 am -11:00 pm	<p>Mechanical engineering and Control System Concepts Using MATLAB and Simulink.</p> <ul style="list-style-type: none"> • Mechanical engineering concepts using Simscape (Physical Modeling) • Multi-Body Dynamics Simulation using SimMechanics
11:00 – 11:30	Tea Break
11:30 – 1:00	<ul style="list-style-type: none"> • Import CAD Models using GetMechanics App • Implement Control on Low cost hardware - Arduino • Demo of Magnetic Levitation System
	Closure
1:00 pm - 2:00 pm	Lunch Break

SUMMARY of FACULTY FEEDBACK

Workshop

Questions	Excellent	Good	Ordinary
Clarity of communication about workshop	10	10	3
Organization of the sessions	6	9	5
Quality of lectures	6	14	
Quality of posters	3	11	4
Effectiveness of discussions	4	13	3
Effectiveness of learning experience	3	13	3
	Appropriate	Short	long
Duration of workshop	6	13	
	Definitely	Maybe	No
Would you like to have more such sessions?	13	5	2
Would you like e-lectures by experts on special topics?	19	1	
Suggest specific topic that you would like additional expert lectures on	<ul style="list-style-type: none"> • Hands on project execution from scratch using ardnins, raspberry pi etc. • SMART GRID &IOT • Only hands on workshop is more effective for workshops on softwares. • Working on arduino, raspberry pi. • Neural networks, fuzzy logic & (artificial intelligence) • Give some ideas to relate beomathematics to programmes & how to draw graphs. • Energy efficiency and management IOT based small grids. Hybrid energy sources. • Computational fluid dynamics. • IOT , hardware target, simspace, simmechanics, simwise 4D, contact modelling. • Thermal hydraulic modelling. • Power electronics converters, THD analysis etc. MLI. • Some basic about MATLAB because many have attended this to get some basic knowledge. As we are new to MATLAB, LATEX. 		
Additional Suggestions	<ul style="list-style-type: none"> • Better accommodation should be provided. Transport facility, better food(lunch, dinner) should be provided • If fooding and accommodation of participants leaves a lot to be desired. This fault need to be improved a lot. • Hands on experience is not there, but you aked to bring us laptops. • Conduct handson workshop on MATLAB. • Hands on workshop to be conducted. • Some useful topics related to mathematics. • It has to be hands on exercise. • Some hands-on practice session has to be there. 		

Teaching

Which subjects do you teach?	<ul style="list-style-type: none"> • Thermal Engg • Manufacturing subjects. • Thermal Engg subjects. • Physics • Advanced control system, MPMC. • Control systems, soft computing. • MATLAB, electric, hybrid vehicles. • Control System • Mechatronics, microprocessors theory of machines. • Mathematics I II II • Electrical machines, control systems. • Basic mechanical Engg. • Basic electrical and control systems • Mobile computing • Mining • Control system. • Engineering Physics, Nuclear Engg. • Power electronics, electric drives power quality. • Mathematics. 		
What is average student to teacher ratio in your institute?	<ul style="list-style-type: none"> • 22:01 • 22:01 • 15:01 • 17:01 • 18:01 • 20:01 • 60:01 • 10:01 • I handle around 80 students • 18:01 • 60:01 • 30:01 		
Questions	YES	NO	
Do you have additional support for teaching (tutors, graders, teaching Assistants, etc)?	14	6	
Do you give class projects for UG classes?	16	4	
Do you give class projects for PG classes?	11	7	
Do you have sufficient resources for laboratory courses?	17	3	
	Sufficient	Inadequate	
Is the library/journal/e-connection support adequate?	16	4	
	Definitely	May be	No
Would you like to have common (TEQIP) repository of course material?	19		
Would you like to visit IITK to participate in and develop course material (existing or	18	2	

Would you like to participate in creation of the repository material (course files/lab. Manuals/question bank/etc)	16	3	1
	e-courses	Workshops	Content
How can IITK effectively help you prepare for teaching?	13	17	4
How can TEQIP help improve your teaching?	<ul style="list-style-type: none"> • Attending workshops, seminars • By providing all of the above. • For attending workshops. • By conducting workshop. • By participating in both inhouse & outstation . • FDP's and pedagogical as well as MEPS. • Participating in several inhouse and outstation faculty development programme. • By lectures & other material. • By organisation workshops for new topics. • Add-on workshops would help. • Enhanced understanding. • By providing funds to attend and organize workshop FDP etc. 		

Research

Questions	Definitely	Maybe	No
Would you like to visit an IIT for a visiting-faculty/post-doctoral fellow ,if offered(via TEQIP)?	18	2	
Would you like to share/use research infrastructure at IITK, if made available?	19	1	
Would you like to conduct collaborative research with IITK?	20		
Would you like lectures by experts (Indian and international) on niche research areas/topics?	18	2	
Do you want special-topic conferences?	16	1	1

How can TEQIP help improve your research?

- By organizing different workshops, seminars, conferences.
- Better hospitality.
- By providing hands on workshops on software or practical things.
- By conducting research work & support us facility in NIT & IITs.
- By providing funding support for equipments and for conferences workshops.
- I am getting TEQIP fellowship which is supporting me financially to do my research work betterly.
- Opportunity to attend both national & international conferences & workshops. Funding for research and paper publishing, patent registration etc.
- Got as opportunity to visit different IIT's.
- Conducting needful workshops.
- It allow me to purchase OPAL-RT at HBTU Kanpur which can help my research project etc.

SUMMARY of STUDENT FEEDBACK

Workshop

Questions	Excellent	Good	Ordinary
Clarity of communication about workshop	20	17	3
Organization of the sessions	23	18	
Quality of lectures	25	14	1
Quality of posters	21	16	2
Effectiveness of discussions	14	24	2
Effectiveness of learning experience	17	22	
	Appropriate	Short	long
Duration of workshop	16	23	1
	Definitely	Maybe	No
Would you like to have more such sessions?	34	5	
Would you like e-lectures by experts on special topics?	37	3	
Suggest specific topic that you would like additional expert lectures on	<ul style="list-style-type: none"> • Matlab with real time simulators. • Matlab function • Power system applications of MATLAB in this field to simulate fault. • Applications of MATLAB in food technology. Analysis of food component using MATLAB. • Applications of MATLAB in the field of process engineering with the explanations and tools which are relevant to the some field are need to be taught. • Power quality issue in power system and electronic applications with the real time simulation • Non-linear system control using adaptive control like MPC, Kalman Rittex using MATLAB toolbox. • Renewable energy resources. • PV applications. • Statistics, algebra, numerical analysis, differential equations, number theory. • Differential equation, Matrix, Algebra. • Research for masters students. • Artificial intelligence, Biometrics, Robotics, Image Processing. • New technology, industrial visit, problem on actual work site or machines. • PD tool 		

- Advanced plotting
- Solving coupled non-linear ODE/PDE
- Heat transfer in MATLAB
- IoT
- Image Processing, Networking, Neural Network
- Artificial Intelligent.
- Machine Learning.
- FEM, CFD
- Design for manufacturing, design for experiments.
- Areas of research in CFD
- CFD analysis of HVAC system design (with basics)
- CFD analysis of combustion in IC engines
- CFD theory.
- Power electronic, application with real time simulation.
- MATLAB coding, so that we can simultaneously run the codes in our laptop.
- Power electronics, control system, power system, neural networks, machine design, MATLAB etc.
- Smart grid, energy efficiency management.
- More MATLAB working on power system.
- CFD analysis of medical devices using MATLAB.
- More mechanical engineering approvals with MATLAB is required.
- Sinscape, thingscape
- Global optimisation tool like MOGA, Genetic algorithm.
- LABVIEW, SPSS,
- Statistical tools and techniques, data analysis softwares like R, Minitab, SPSS, SAS etc.
- On network security issues (how we can use matlab efficiently for networking purpose)
- LATEX software

Additional Suggestions

- Long duration workshops
- Please arrange some long duration course, least of 7-8 days.
- It will be better if we are given a certain piece of task to perform at our own at the end of session/day. It will let us know the difficulty we can face & how to overcome from it.
- Workshop should be long duration.
- Handsome session for workshop
- More practical approach for learning.
- Visit in power plants, like gas and hydro and also automobile industries.
- Course like MATLAB should be categorized under short term courses ranging from 7-11 days course and not as 1 day workshops.
- Which would be beneficial for those candidates working in VLSI design under dept. Of Electrical Engg.
- It may be possible that if the speakers try to more elaborate then the listeners understand more.
- Interesting topics and a little boring topics should be discussed alternatively so, seminar cannot become boring.
- Duration of workshop may be increased, otherwise its good and beneficial.
- Fooding & lodging should be upgraded.
- Workshop duration should be of adequate duration.
- Duration of workshop should be more. (7-10 days)
- I am working with MATLAB & LABVIEW, so if TEQIP can also arrange workshop on LABVIEW it will beneficial.
- Please increase the number of intakes in these kinds of workshops as one rarely gets selected. My friends could not make for this workshop even though they really wanted to.
- Stay true to the topic of the workshop and proceed through a proper roadmap.
- Try to arrange lectures by most experienced faculty instead of less experienced faculty.
- Please arrange some lab based session, which one more reliable to understand it properly.
- Organize another workshop.

Learning

Questions	Yes	No	
Do you get enough class projects?	22	13	
Is the learning adequate?	31	9	
Do you have sufficient resources for laboratory	20	13	
What is your area of specialization	<ul style="list-style-type: none"> • Power system (electrical) • Electrical power system • Electrical engineering • Electrical control system • Power Systems (Electrical) • Numerical methods & analysis statistics & probability. • Algebra, Differential equation • Mathematics • VANET, Information security. • Production and manufacturing • Advance Micro-process Mechanical Engg. • Heat transfer & CFD • Networking, vanet, IOT, Machine Learning. • OIP • VLSI Design • Computer Aided Design • Mechanical engineering thermal sciences. • Image processing • Electrical Engg. • Power System • Biomedical engineering. • CAD/CAM. FEM • Mechanical (Thermal Engg.) • Production Engg. • Bio medical engg., Ergonomics. • Order statistics. • EMG • Composite structures. • Non-linear modelling of smart composite structures. • Network (Mobile Adhoc network secure gateway discovery) • Mathematics. 		
	Sufficient	Inadequate	
Is the library/journal support/e-connection	26	5	
	Definitely	Maybe	No
Would you like to have common (TEQIP) repository of	30	6	
Would you like to visit IITK to attend specialized courses?	36		
Would you like MOOCS/e-resources based	26	5	

How can TEQIP help improve your learning?

- More workshops, trainings.
- Video interfacing at all TEQIP receiving institutes so that more students can attend lectures at their local institutes.
- By arranging more such informative lectures and improve our skills.
- If possible arrange the video lectures online.
- Arranging workshops related control system.
- By organizing more workshops, internships.
- TEQIP can provide some online lectures on MATLAB, MATHEMATICA.
- Organizing workshops about recent trends in science & technology.
- Industry Academic Collaboration
- Visit the solar powers planer and different manufacturing
- By conducting no of workshop on different topics.
- By arranging hands on courses.
- Arrange video lectures/e-classes for specialised area.
- Provide expert videos & ppt.
- Provide expert video & ppt by email
- Lab facility to do experiments.
- Please organize short term courses in Mechanical engineering thermal/CFD.
- By workshops seminars etc.
- This is my first experience I feel, it may be enhance our learning in future.
- By providing PPTs or materials related to the topic discussed.
- By providing valuable interesting knowledge.
- It helps to explore the required field of courses.
- TEQIP is a good initiative for technical education learning.
- Arrange more workshops like this.
- By giving us opportunity to visit in these types workshops.
- By organizing such short term courses as well as workshop on new and useful topics.
- More content based workshops.
- Please arrange some session on networking research area.
- TEQIP provides a platform to attend such workshops and create a change to get effective learning.

Research

Questions	Definitely	Maybe	No
Would you like to visit an IIT for a short visit /internship/post-doctoral stint ,if offered(via TEQIP)?	34	3	
Would you like to share/use research infrastructure at IITK, if made available?	33	3	
Would you like to conduct collaborative research with IITK faculty?	32	2	1
Would you like lectures by experts (Indian and international) on niche research areas/topics?	28	7	
Do you want special-topic conferences?	29	6	
How can TEQIP help improve your research?	<ul style="list-style-type: none"> • I am not interested to go to research • By arranging the workshop. • By organizing more such workshops & paid internship programme. • Conducting more no. Of workshops, seminars and short term courses. • It help to short course on new topic and technologies in different areas. • By organize lots of workshops. • By availing us with topic courses. • Arrange short term courses and workshop in summer. • Allowing me to meet faculty for internship. • TEQIP will help to research scholars through expert training provide to student under respective faculty. • One month internship. • By providing membership of IEEE, Springer etc. So that research scholar can easily get research papers for literature review etc. • It may more better learning if resources are available. • By conducting seminar on the topics which can help us in project. • Knowledge is key to success it provides us knowledge. • It helps with all experimental and theoretical requirement. • TEQIP is an excellent platform to let familiar with latest in the chosen field. • It make us aware about latest trend in the field. • If workshop deal with the practical application, connect with these research tool. • By giving such workshop for a week at least. • As stated above. • By organizing workshops in other institutes as well so that we can attend the workshop closer to our institutes. • By conducting more workshops related to our research field. • TEQIP gives a good platform and information. 		

OUTCOME

After attending this workshop, participants got an idea on how to use Matlab tools to enhance their teaching/research and make learning more effective. The participants learnt about different features of Matlab and how to combine them with their theoretical knowledge to analyze and visualize data for their teaching and research. Participants learned how to use Matlab for

- Technical Computing (programming, plotting etc.)
- Modeling physical systems
- How to do different simulations using Matlab
- How to do signal processing and image processing and its applications