National Knowledge Network

Ministry of Electronics & Information Technology

Digital India
Power To Empower

सत्यमेव जयते

Government of India Initiative for Employability Enhancement

Mentoring Academicians & Professionals for Future Generation
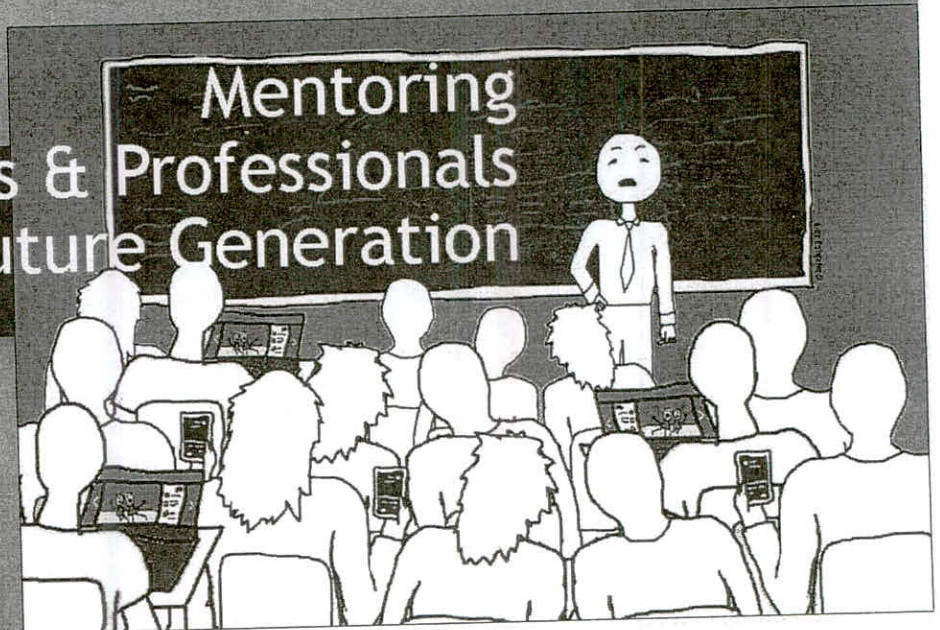
- Faculty Training
- Training and Consultancy
- Services for Industry
- Technical Incubation and Entrepreneurship
- Continuing Education for Students & Professionals

CONVERGENCE — BLOCKCHAIN · I.O.T. · A.I. · HOLOGRAPHIC COMPUTING

IIT Guwahati   IIITDM Jabalpur   MNIT Jaipur   IIT Kanpur   NIT Patna   IIT Roorkee   NIT Warangal

Programme brochure for 2021

India is fast emerging as a world power in Information, Communications Technology and Electronics (ICTE) sectors. To complement its growth and further development, there is an ever-increasing need for trained professionals with specialization in this space. This includes training of professionals not only in existing and changing technologies but also in the fields of R&D and electronics manufacturing. This will specifically be aimed at the ICTE sector to create a substantial resource pool of talent and generate ample opportunities for entrepreneurs. Ministry of Electronics & Information Technology (MeitY) has approved a scheme and setup Electronics and ICT Academies at 07 (seven) premier and leading institutions viz. IIT Guwahati, IIT Kanpur, NIT Warangal, NIT Patna and IIITDM Jabalpur (all five under Category-A); and IIT Roorkee, MNIT Jaipur (both under Category B). The Ministry had earlier setup two ICT Academies at Tamil Nadu and Kerala respectively. Subsequent to internal reviews in Ministry, revised cost and targets for the Electronics and ICT Academies in both the Categories for a period of seven years 4 months are as follows.

Category	Total Outlay	Internal Revenue	Grants-in-Aid from	Training Target Total
Category-A & B: 7- Academies	Rs. 87.7 crore	Rs. 10.4 crore	Rs. 77.3 crore	92,800

These Academies are aimed at faculty/mentor development and upgradation to improve the employability of the graduates, diploma holders in various streams, through collaboration of States/Union Territories. Each Academy would be provided funding support upto financial year 2021-22, and is expected to generate revenue by charging fee and taking up other activities to meet the recurring cost in a gradual manner and become self-sustainable by March 2022. All these Academies will cater to the requirements of identified neighboring States and UTs also. Brief information about all the Academies is available at:
https://meity.gov.in/esdm/scheme-financial-assistance-setting-electronics-and-ict-academies

Activities of the Academies
- Faculty development for
    - Specialized training with hands-on on basic and advanced level topics for Engineering streams and
    - Domain based training on use of ICT tools and techniques for non-engineering streams
- Training and consultancy services for industry
- Curriculum development for industry
- Continuing Education programme for students / working professionals
- Design, Develop and Deliver specialized modules for specific research areas
- Providing advice and support for technical incubation and entrepreneurial activities

About Spring/Summer Courses

Online Training Programmes in core areas of Electronics and Information & Communication Technology (ICT) streams have been planned by academies for delivery during Spring & Summers (i.e., Feb – Aug 2021). All these Spring & Summer- courses will be offered through online live web-conferencing, with instructor led talks delivered by eminent experts from IITs, NITs, IIITs and other premier institutes/industries, even from abroad. In addition, online proctoring coordinators designated by respective academies centres will take care of sessions on design orientation/activity linked problems/ assignments/ case studies and quiz test(s). Participants would be able to join online to web-conferencing platform using video/audio. For registration participants need to apply to any participating academy online through its website, as mentioned in details of respective programme,

How to apply:
* For a particular programme, a participant is encouraged to apply to Academy level coordinator ONLY, belonging to any participating academy in that programme.
* Government of India norms will be followed for SC/ST/EWS category participants.
* The application form is to be submitted in the online mode to the Academy level coordinator of the respective academy.
Note: Refer, programme offering Academies websites for complete contact address and other details of Summer courses.

Following programmes are being offered online, these Spring & Summer, Feb - Aug 2021, each of 10/12 days duration.

Names of courses in Spring 2021	Starting date	Completion date	Names of courses in Summers 2021	Starting date	Completion date
Machine Learning for Computer Vision	01 Feb 2021	12 Feb 2021	Deep Learning & Applications (Parallel Architectures)	10 May 2021	21 May 2021
Advanced Communication & Antennae	15 Feb 2021	26 Feb 2021	Digital Tools for Writing, Authoring and reviewing manuscripts	24 May 2021	4 Jun 2021
5G Design: Journey from Devices to Circuits	01 Mar 2021	12 Mar 2021	SuperX- Operating Systems- Linux	7 Jun 2021	18 Jun 2021
ICT Tools for Teaching, Learning process & Institutes	15 Mar 2021	26 Mar 2021	Social Robotics & AI	7 Jun 2021	18 Jun 2021
RISC-V VLSI Implementation Flow: RTL2GDS	27 Mar 2021	10 Apr 2021	Numerical Analysis & optimization for Scientists & Engineers (SCILAB)	21 Jun 2021	2 Jul 2021
Data Science for All	12 Apr 2021	23 Apr 2021	Programming in Python	5 Jul 2021	16 Jul 2021
Designing With FPGAs (Intel)	19 Apr 2021	30 Apr 2021	Blockchain Technology & Applications	19 Jul 2021	30 Jul 2021
			Advanced Optimization Techniques and Hands-on with MATLAB/SCILAB	2 Aug 2021	13 Aug 2021
			Quantum Computing	16 Aug 2021	27 Aug 2021

Following are the programmes being offered as Self-Paced in this Spring/Summer, Feb - Aug 2021, by IIT Kanpur Academy.

Python Programming – A Practical Approach	https://ict.iitk.ac.in	Smart Grid Technology	https://ict.iitk.ac.in
Computer System Security	https://ict.iitk.ac.in		

Target Beneficiaries:

Interested Faculty/students of engineering/other institutions & professionals from our country as well as from outside India, are eligible to attend these Spring/Summer courses. Additionally, faculty of non-engineering background are also invited to attend FDP on ICT Tools and techniques for Teaching Learning Process & Institutes. Industry persons and student participants are also invited to attend the aforesaid programmes to upgrade their skills.

Availability of seats at each offering Academy:

Participants will be selected based on first-cum-first-serve basis by organizing academy. Selected participants will be communicated through e-mail / notified in E&ICT Academy websites. There is no limit on number of participants, however, only first 1000 participants would enjoy duplex both way video/audio. Rest of the participants would enjoy receiving video/audio but may not raise queries in real-time.

Course duration:

Each course is designed as 3 credit equivalent for 35-40 hours (Theory Lectures, Hands-on/Design orientation/Activity linked problems/Assignments Problem Solving/Case Studies sessions/Quiz Tests). The contact hours are to be spread over 10 days, implying NOT more than 3½ hours per day.

Accommodation & Travel

There is no provision as well as scope for Boarding and Lodging, as all the programmes are being offered ONLINE.

Registration Fee for each Summer Course:

No Registration fee is charged for attending these programme. However, candidates from India/SAARC/African countries are required to pay a mandatory examination fee of Rs. 500/- (faculty/PhD-scholars/students) OR Rs. 1000/- (others), and US$ 60 from other countries, if they desire a certificate of completion of programme. This Certificate for participation as well as for Satisfactory performance will be given to the participants subject to fulfillment of attending all sessions, submission of assignments and clearing the test(s) by all the paying participants.

Mode of Payment: Preferred mode is ONLINE payment at respective Academy site.

Academy Name	Link for payment
IIT Guwahati	Online registration at web site of Academy, IIT Guwahati- http://www.iitg.ernet.in/eictacad/
IIITDM Jabalpur	Online registration at web site of Academy, IIITDM Jabalpur- http://ict.iiitdmj.ac.in/
MNIT Jaipur	Online registration at web site of Academy, MNIT Jaipur- http://www.mnit.ac.in/eict
NIT Patna	Online registration at web site of Academy of NIT Patna- http://www.nitp.ac.in/ict
IIT Roorkee	Online registration at web site of Academy of IIT Roorkee- http://eict.iitr.ac.in/
NIT Warangal	Online registration at web site of Academy NIT Warangal- http://nitw.ac.in/eict/

- Last Date for Submission of Applications is Monday of earlier week from the start date of respective programme.
- The intimation of Selection for participation will be posted on website on Wednesday of previous week.

The details of Online-Spring courses being offered during Feb - Apr 2021 is as follows.

1. Machine Learning for Computer Vision	1 Feb – 12 Feb 2021

EXPERTS/SPEAKERS-
Prof. Shantanu Chaudhury, Director IIT Jodhpur; Dr. Suresh Sundaram, IITG; Prof. H. Fujiyoshi, Chubu Univ. Japan; Prof. Barbara Zitova, Acad Sci. Czech Repulic; Dr. Amit Sethi, IITB; Prof. Sumantra Dutta Roy, IITD; Prof. P. Guha, , Prof. Aparajita Ojha, IIITDM Jabalpur, Dr. Santosh Viparthi, MNIT Jaipur

Principal Coordinator	Joint- Principal Coordinators	
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Joint- Principal Coordinators		
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MODULES TOPICS-

- Introduction to Image Processing and Computer Vision (CV)   Digital Image and Computer Vision, Main Goals and challenges of the CV, Structure of Human Eye and Vision, Color Models, Image Processing Goals and Tasks.
- Traditional approaches in CV   Feature Extraction using local patterns and their applications to Image Processing and CV: SIFT, HOG, LBP, Natural Image Classification, Image Enhancement, edge Detection, Segmentation. Image denoising
- Introduction to Artificial Intelligence (AI) and Machine Learning (ML)   AI and ML, Supervised and Unsupervised Learning, Traditional ML approaches,

- Neural Network as a learning machine, Machine learning. applications in computer vision. Image classification, Image segmentation etc
- Applications of ML in Medical Images   Challenges in Medical image processing, ML for Medical Image processing, Medical image segmentation, classification and survival prediction, Medical image denoising, Medical image retrieval
- Introduction to Deep Learning (DL)   Basic differences between Conventional ML and DL approaches, Feed forward Neural Networks (NN), Back propagation, Stochastics gradient method and variants, regularization,

- and optimization, Vanishing /exploding gradient problem.
- Introduction to Convolutional Neural Network   The Convolution Operation, Basic architecture of a Convolution Neural Network, Pooling and Batch Normalization layers, CNNs as feature extractors, Image classification using CNN, Image Enhancement and Segmentation.
- CNN architectures for CV   State of the Art CNN Architectures, CNN for Image Enhancement and Segmentation.
- Applications of CNN in face recognition   Face Detection and Recognition using CNN, Siamese Network and Triplet Loss.

EXPERTS/SPEAKERS- Prof. P. K. Jain, NITP; Prof. Ratnajit Bhattacharjee, IITG; Dr. Ravi Gangwar, IIT(ISM) Dhanbad; Dr. Veer Singh Gangwar, LRDE Bangalore; Dr. Ribhu, IITG; Dr. Kalpana Dhaka, IITG; Dr. Mahima Arrawatia, IITG; Dr. Sudarshan Mukherjee, IITG; Dr. Salil Kashyap, IITG; Dr. Gaurav Varshney, NIT Patna; Dr. Rakesh Ranjan, NITP

Principal Coordinator	Joint- Principal Coordinators	
Prof. Ratnajit Bhattacharjee IIT Guwahati ratnajit@iitg.ac.in M: 954 965 8131	Dr. Rakesh Ranjan, NIT Patna rr@nitp.ac.in M: 9334385016	Dr. Sarthak Singhal sarthak.ece@mnit.ac.in 7376157421(M) Dr. R. Mitharwal, rajendra.ece@mnit.ac.in 8239633089(M)

Academy Level Coordinator		
Dr. Richa Agrawal, NIT Patna richa.ec@nitp.ac.in M: 9559090527	Dr. Gaurav Varshney, NIT Patna, gaurav.ec@nitp.ac.in M:8076114006	

MODULES TOPICS-

- 1: Digital Communication System
- 2: Channel coding: block and convolutional codes
- 3: Multicarrier modulation and OFDM
- 4: Spread spectrum and DSSS
- 5: Diversity techniques for wireless communication
- 6: MIMO and Massive MIMO for wireless communication
- 7: 5G and Emerging millimetre wave communication systems
- 8: Optical communication
- 9: Antenna Basics
- 10. Antennas for WiFi, cellular communication, portable devices and 5G
- communication systems
- 11. Antenna Array

3 5G Design: Journey from Devices to Circuits   1 Mar – 12 Mar 2021

EXPERTS/SPEAKERS- Shri Surinder Singh (Director, SCL Chandigarh); (ii) Other Speakers- Shri H. S Jatana (Senior Head, SCL Chandigarh), Prof. Anand Bulusu (IIT Roorkee), Dr. Salil Kashyap, Dr. Ribhu Dr. Sudarshan Mukherjee, Dr. Gaurav Trivedi, IITG (iii) Industry- Dr. Aditya Dalakoti, Mr. Ashish Jindal (DRDO), Puneet Mittal

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MODULES TOPICS-

- **Introduction and Tools Overview**: Introduction: Basics of RF Communication; Setup of Scikit-RF,
- **RF ASIC Concepts** 1: Two port Networks, Stability, Equivalent Device Models, Impedance Matching, Biasing
- **Device**: Semiconductor general basics and requirements, Exploration in Si MOSFET, GaN HEMT

- **Modelling**: Basic of Device Modelling, Passive and Active Model, Hands on Modelling of passive component using Scikit-RF
- **RF Simulations**: Hands of tutorial for Doing Impedance Matching using Scikit-RF
- **RF ASIC Concepts** 2: PDK Development, Layout Issues, Packaging Issues and package selection, Testing

- **Power Amplifier Design**: Basics of PA, different classes, performance matrix, design of one topology for 5G , Flow of MMIC design using ADS
- **Measurement**: Loadpull measurement, DC-IV, S parameter and power measurement

EXPERTS/SPEAKERS- CONSENT Awaiated (i) Prof. D. B. Phatak, IITB (ii) Prof. Prabhakar, IITK, (iii) Prof. K. Mangala Sundar, IITM (iv) Prof. Binod Kumar, IITR (v) Prof. S. Sancheti, VC, SRMIST (consent awaited) & speakers from IIT Kharagpur (consent awaited); Dr. Reema Sahni, FiTT, IITD; Active Learning Group

Experts from host institutes- (i) Prof. Aparajita Ojha, IIITDMJ (ii) Prof. L. Bhargava, MNITJ (iii) Dr. Pilli Emmanuel Shubhakar, MNITJ, (iv) Dr. Arka Prokash Mazumdar, MNITJ (v) Dr. A. M. Joshi, (vi) Dr. R. K. Maddila, MNITJ, (vii) Dr. Santosh Vipparthi, MNITJ & Prof. V. Sahula, MNITJ (viii) Dr. Prabhat Kumar & Dr.Bharat Gupta, NIT Patna

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Academy Level Coordinator

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MODULES TOPICS-

- **Use of ICT-** Effective use of ICT for transforming pedagogy and empowering students; Empowerment through Communication skills
- **Online/blended Learning-** Adopting online/blended-learning in teaching learning process
- **MooC-** Use of MooC for contents management, class organization, assessment; MooC's deployment and use; Building Course Website and Google Suite
- **Teaching Learning Tools & e-content generation-** Using tools for teaching learning-interactive whiteboards/smart-screens, video-conferencing, digital content creation, design of instructional material & presentation;
- **Content Dissemination-** Management, Version Control; ICT tool for English language teaching and learning; Illustration tools and author aids- Visio
- **Computer Based Training (CBT) =-** CBT for letters generation, certificate preparation, report writing, Presentation and posters preparation, Spreadsheets & evaluation, Research Resources & Bibliography Management etc.

EXPERTS/SPEAKERS-

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Dr. Gaurav Trivedi, IIT Guwahati ratnajit@iitg.ernet.in M: 99544 98116	Dr. Bal Chand Nagar, NITP balchandnagar@nitp.ac.in M:9993102487 Dr. Meena Pachori, NITP meenap.ec@nitp.ac.in M:8989186900	Prof. D. Boolchandani, MNITJ dboolchandani.ece@mnit.ac.in Mobile:93314 06964 Dr. Deepak Bharti, MNITJ dbharti.ece@mnit.ac.in M:

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MODULES TOPICS- TO be Announced (IIT Guwahati)

- Simulations and Characterization for Libraries
- Design Basics: Circuit, Architecture and System Level
- Constraints and Synthesis : Input Output Constraints, Complex SoC Constraints

- Input Output Files : Lib Files, General files needed in complete flow
- Layer and Power Planning
- Floorplanning
- Delay Calculations and System Implications
- Setup and Hold Discussion

- Placement Basics and Settings
- DRC LVS and Extraction
- Low Power Flow Basics
- Sign Off

- All Modules will be covered using hands on tutorials of RISC-V implementation in open source tool flow.

EXPERTS/SPEAKERS- Prof Amey Karkare IITK, Prof DVLN Somayajulu-IIITDMK, Prof RBV Subramnayam NIT-W, Dr Atul Gupta IIITDMJ, Dr T Ramakrishnudu NIT-W, Dr Nagesh Bhattu – NIT AP, Dr Anand Kumar- NIT K Surathkal, Industry speakers.

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MODULES TOPICS-

- **Mathematical Foundations of Data Sciences**: Matrices, Vectors, Vector Spaces, Matrix Decomposition, Singular Value Decomposition, Statistical Measures, Probability basics, density function, variance, conditional probability, Markov Chains

- **Data Processing**: Dimensionality Reduction, Principal Component Analysis.
- **Machine Learning basics**: Regression, Classification – Decision Trees, Naïve Bayesian Classifier, Clustering, Handling Large Datasets: MapReduce

- **R for Data Science**: Data Wrangling, Data Visualization, Programming
- **Python for Data Science**: Normal Python, NumPy, Pandas, Matplotlib
- Deep Learning
- **Scikit, Keras and TensorFlow**: Practice on ML topics

EXPERTS/SPEAKERS-

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MODULES TOPICS- To be Announced (IIT Guwahati)

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Various courses from IIT Kanpur in Intelligent Self Paced Education (iSPED) mode are being offered in this pandemic period till September 2021. The courses are made available to faculty for free for a limited duration under FDP. Participants may please ignore the price mentioned on the URL for the courses, and join the courses of their choice.

EXPERTS/SPEAKERS-

Prof. Sandeep Shukla   (https://www.cse.iitk.ac.in/users/sandeeps/)

Principal Coordinator

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MODULES TOPICS-

- Introduction, Interview with Prof.Sandeep Shukla; Learning objectives, Sample Attacks, The Marketplace for vulnerabilities, Error 404 Hacking digital India part 1 chase
- Control Hijacking, More Control Hijacking attacks integer overflow, More Control Hijacking attacks format string vulnerabilities, Defense against Control Hijacking
- Confidentiality Policies, Confinement Principle, Detour Unix user IDs process IDs and privileges

- VM based isolation, Confinement principle, Software fault isolation, Rootkits, Intrusion Detection Systems
- Secure architecture principles isolation and leas, Access Control Concepts
- Web security landscape, Web security definitions goals and threat models, HTTP content rendering, Browser isolation, Security interface, Cookies frames and frame busting

- Major web server threats, Cross site request forgery & scripting, Finding vulnerabilities, Secure development
- Basic cryptography, Public key cryptography, RSA public key crypto, Digital signature Hash functions; Email security certificates, Transport Layer security TLS, IP security, DNS security
- Internet infrastructure, Summary of weaknesses of internet security, Link layer connectivity and TCP IP connectivity

9 Python Programming – A Practical Approach
(https://ict.iitk.ac.in/product/python-programming-a-practical-approach/)

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MODULES TOPICS-

- Introduction
- The Programming Cycle for Python
- Interacting with Python Programs
- Elements of Python
- Type Conversion
- Expressions
- Assignment Statement
- Arithmetic Operators
- Operator Precedence
- Boolean Expression
- Conditionals
- Expression Evaluation
- Float Representation
- Loops
- For Loop
- Nested Loops
- Break and Continue
- Function

- Parts of A Function
- Execution of A Function
- Keyword and Default Arguments
- Scope Rules
- Strings
- Indexing and Slicing of Strings
- More Slicing
- Tuples
- Unpacking Sequences
- Lists
- Mutable Sequences
- List Comprehension
- Sets
- Dictionaries
- Higher Order Functions
- Sieve of Eratosthenes
- File I/O
- Exceptions
- Assertions
- Modules

- Abstract Data Types
- Classes
- Special Methods
- Class Example
- Inheritance
- Inheritance and OOP
- Iterators
- Recursion
- Simple Search
- Estimating Search Time
- Binary Search
- Estimating Binary Search Time
- Recursive Fibonacci
- Tower Of Hanoi
- Sorting
- Selection Sort
- Merge List
- Merge Sort
- Higher Order Sort

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MODULES TOPICS-

Smart Grid Overview	Smart Grid Measurement	Smart Grid Standards and Protocols
• History of Smart Grid	• Synchrophasor Technology	• IEC 61850
• Conventional Grid Vs. Smart Grid	• Smart Meters and Advanced Metering Infrastructure	• IEC 60870
• Features of Smart Grid		• IEEE C37.118
• Key Characteristics of Smart Grid	• Wireless Sensor Network (WSN)	• IEEE 1588
• Smart Grid Elements	• GIS/Google mapping	• IEC 62351; IEC 61970/ 61968
• Forces behind Smart Grid Evolution	•	• IEC 62056; DNP 3.0
• Smart Grid Stake Holders	**Smart Grid Communication**	**Interoperability & Associated Standard**
• Smart Grid Building Blocks	• Wired Communication (e.g. PLCC, Ethernet, Optical Fibre)	• Interoperability issues in Smart Grid and its solutions
• Smart Grid Resources		
Smart Grid Architecture & Design	• Wireless Communication (e.g. WiFi, Zigbee, GSM/GPRS, WAN)	• Common Information Model
• Conventional Power System Architecture	• Machine to Machine Communication	• Multispeak
• IT Layer		• Green Button
• Communication Layer		• SunSpec
• Distributed Architecture Design		• SEP 2.0

IIT Roorkee

IIT Guwahati

NIT WARANGAL
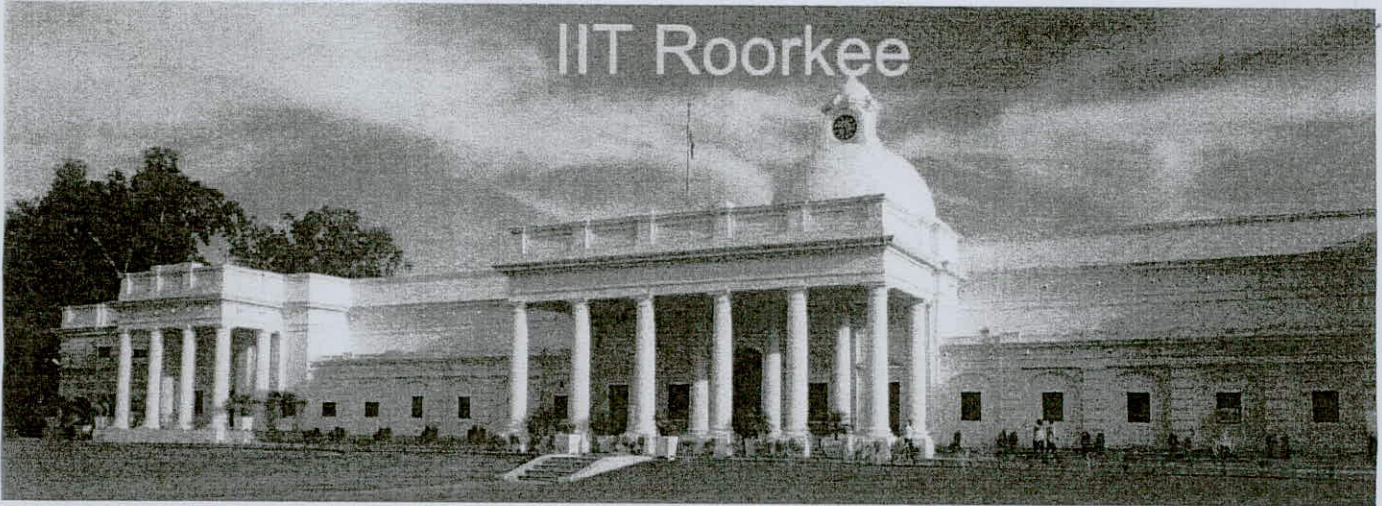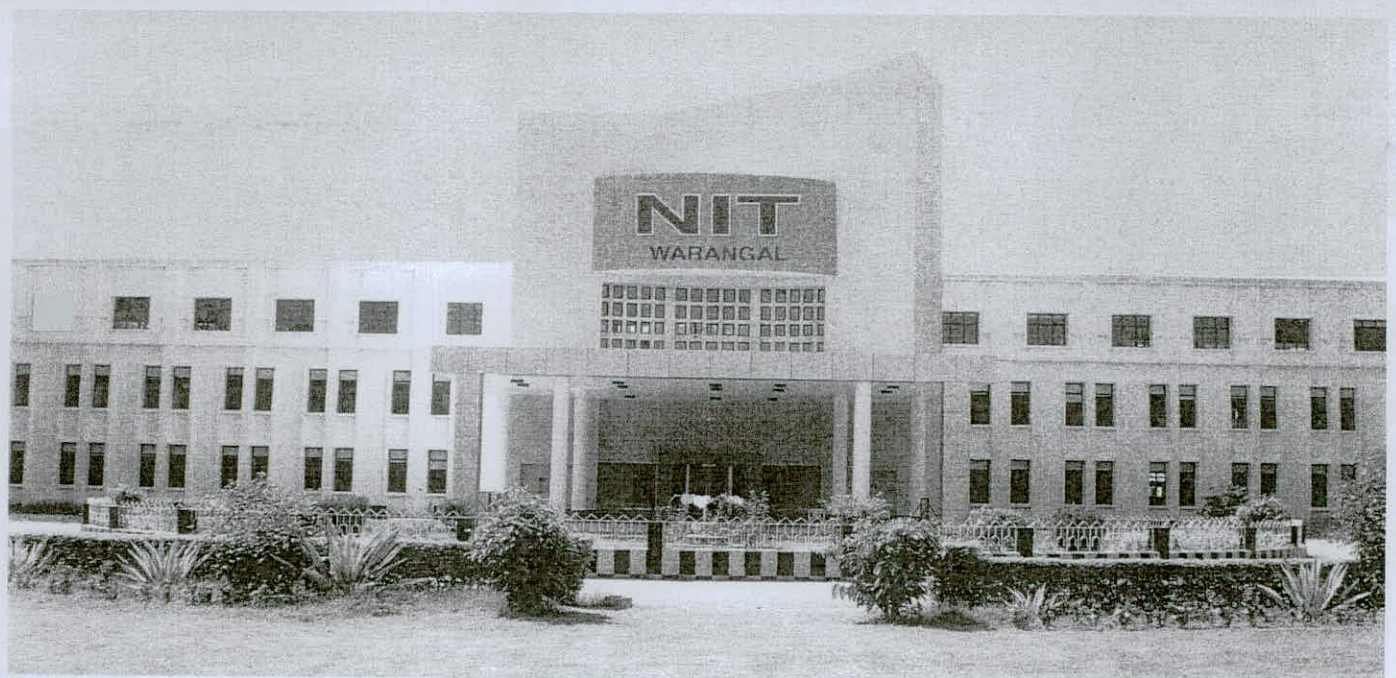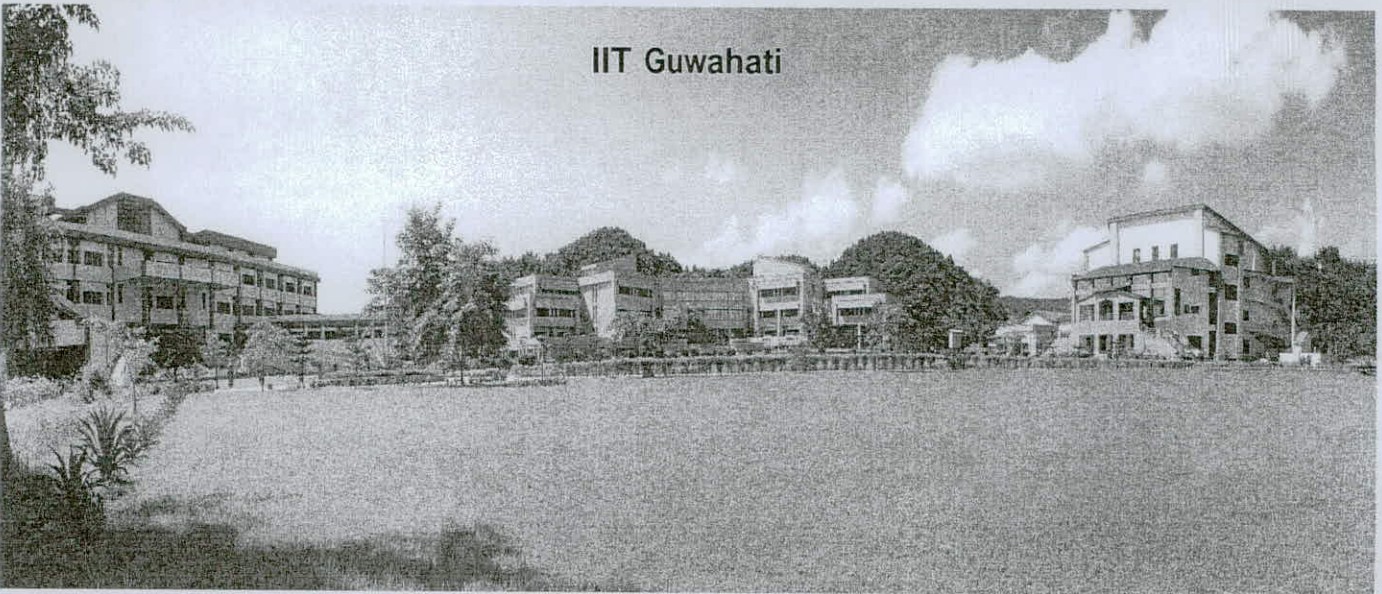
MNIT Jaipur

NIT Patna

PDPM IIITDM Jabalpur

IIT Kanpur

CONNECTED LIVESTOCK
Sensors monitor animal health and food intake send alerts on health anomalies or reduction in food/water intake

SMART DRONES
Survey fields, map weeds, yield and soil variations, enable application of inputs and map productivity. Drones are also used for applying pesticide and herbicide
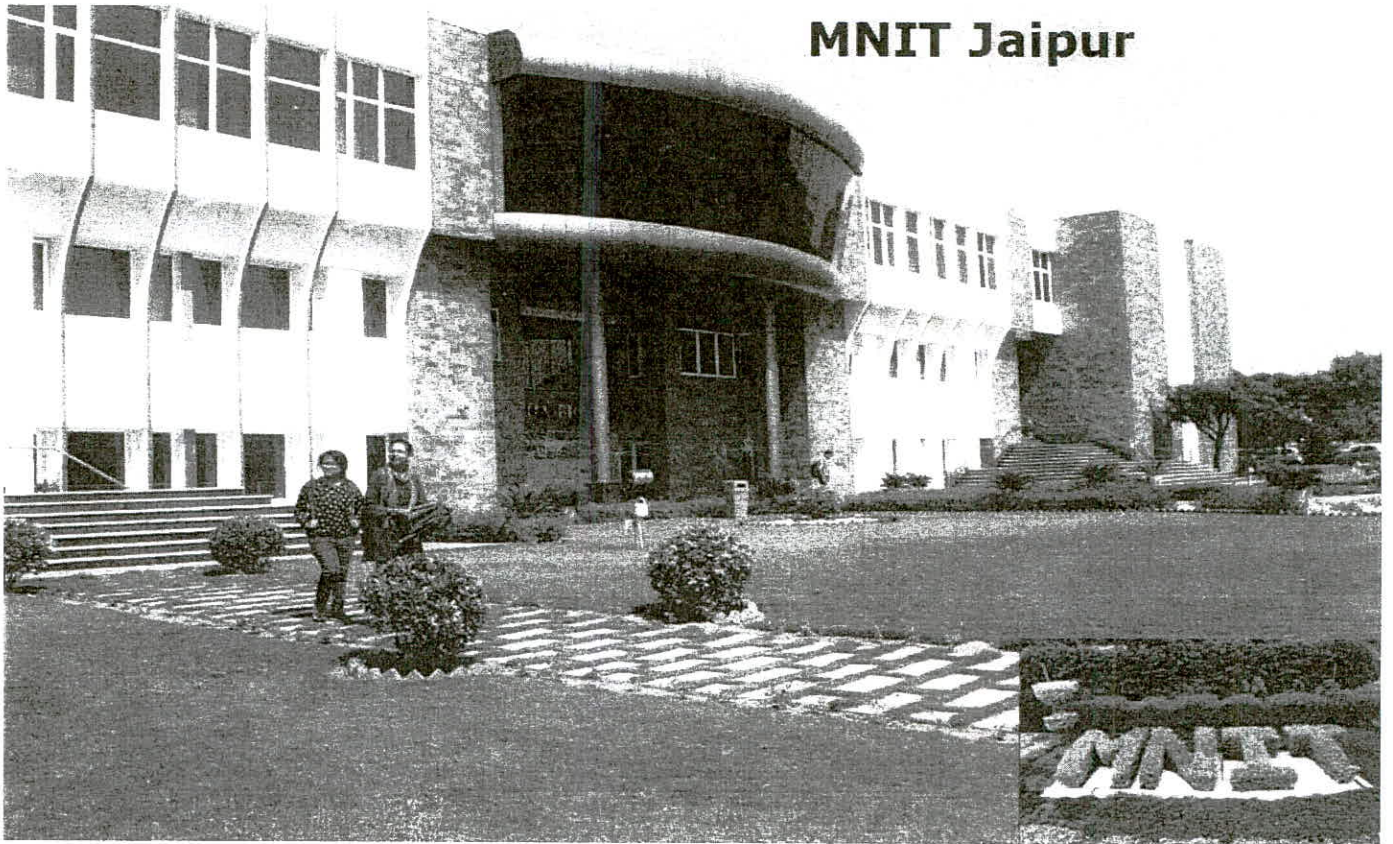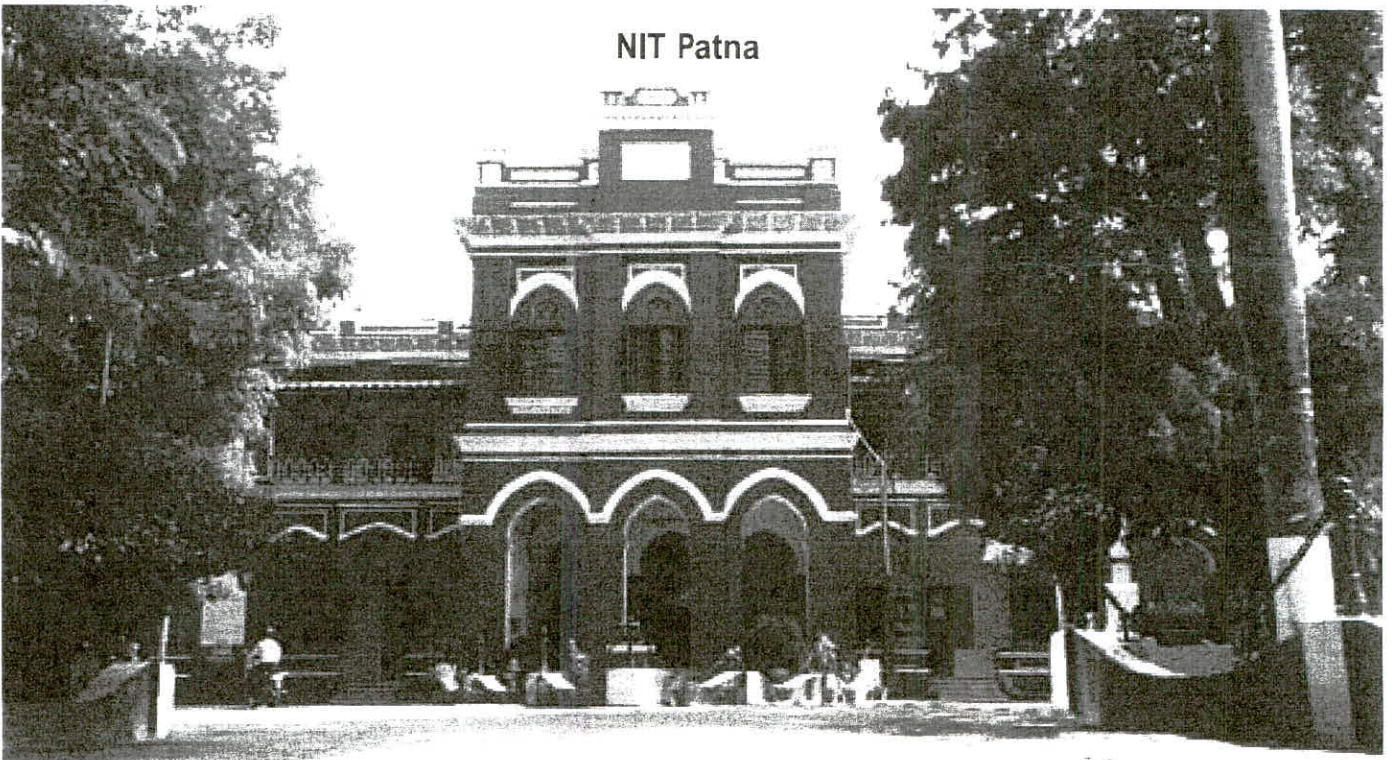
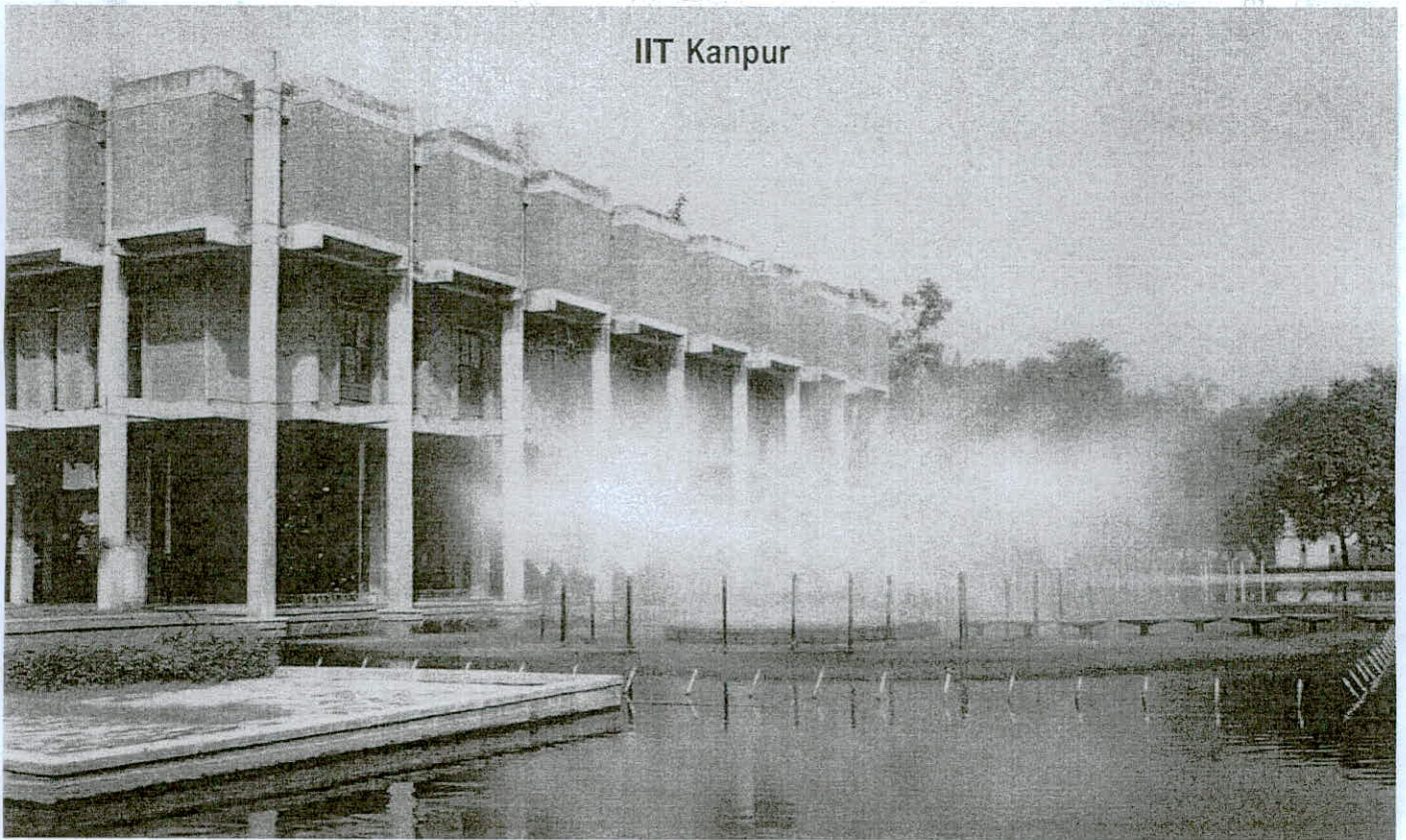**FARMING DATA**
Vast farm data is stored on cloud, fed to advanced analytics engine and used by agro-input companies to customize serving and farmers to make timely operating decisions to enhance yield and profitability

AUTONOMOUS TRACTOR
GPS-controlled autonomous tractor charts its route automatically, ploughs the land saving fuel, and reduces soil erosion and maintains soil quality

WEATHER FORECAST
Enables decisions about when to plant, what area and crop variety to plant, when to apply fertilizers and when to harvest

CROWD SOURCING
Establish agribusiness communities of practice to share insights or videos/pictures, also share information with other farmers in rural areas
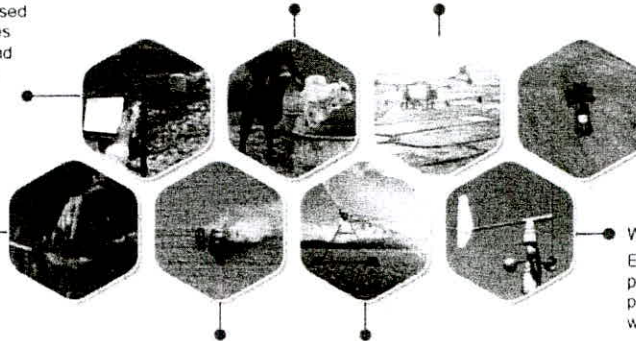
FLEET OF AGRIBOTS
Agribots tend to crops, weeding fertilization and harvesting, reduce fertilizer cost up to 90% and eliminate human labor.

SOIL SENSORS
Provides information for ground-truthing irrigation decisions and fine-tuning irrigation practices, avoids under and over-irrigation saving crops from yield loss, water-related diseases, nutrient losses and leach-outs

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