BIT Centre for Innovation, Incubation and Entrepreneurship (BIT – CIIE)

1. Overview

The BIT-CIIE has been started to promote both theoretical and experimental research in areas of both industry relevance and social importance. It is an inter-disciplinary research center to promote amalgamantion & fusion of ideas amongst the various schools of the College. At present, The School of Engineering (SET) and the School of Management (SoM) is contributing through its faculty & research scholars registered in its various disciplines like Mechanical, Electrical, Electronics, Computer Science, Physics & Chemistry and Management. In the near future, the innovation center will work closely with the School of Pharmacy.

2. Mission

To build the environment that will promote technical and social innovation and foster the spirit of incubation and entrepreneurship to develop solutions through innovative and creative thinking using interdisciplinary approach.

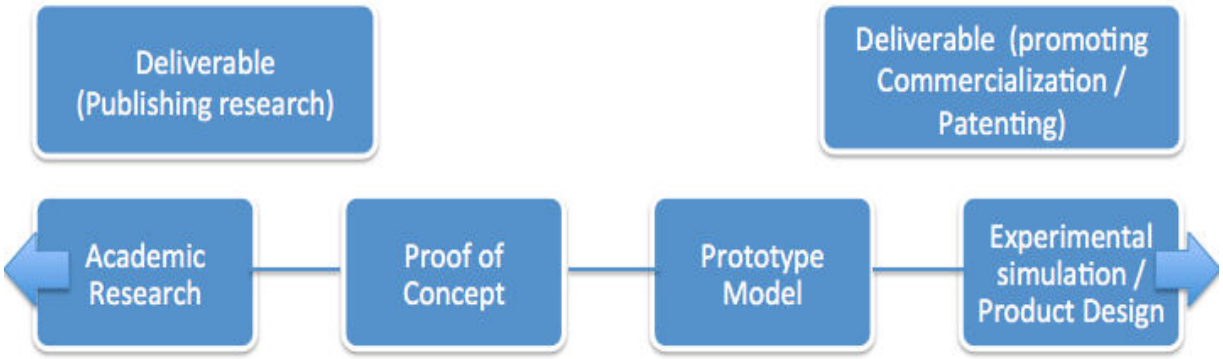
Another objective of the Innovation center is to foster and generate interest among under graduate students to carry out socially relevant projects as part of their end-semester project, offer avenues for practical research to M. Tech and Ph. D scholars. This centre will nurture and encourage entrepreneurial approach among students and faculty in fostering creativity, idea generation and product development besides closely working with the local industry. It will facilitate inter-disciplinary research and provide incubation facilities to start ups and budding entrepreneurs, In the near future the innovation center will also provide support in the patenting process.

3. Broad Objectives

- For the development of skills of students BIT- CIIE promotes 3P model. A **3P Model** is a model that is based on **identifying a Problem** from our surrounding or industries that will involve creativity and innovation of young minds using **Project based learning** and eventually lead to **Product prototype** or **commercialization of the prototype.** (3P = Problem solving or idea generation ➔ project / prototype ➔ product development)
- Foster and generate interest among under graduate students to carry out socially relevant projects.
- Conduct school outreach programs to promote interests in science and society
- Nurture and encourage entrepreneurial approach among students and faculty in fostering creativity, idea generation and product development.
- Closely working with the local industry. Strengthening Industry fusion of cutting edge tools and technologies in academic curriculum.
- Develop research cases and publish research papers.
- Inviting upcoming, successful and eminent innovators and entrepreneurs as part of Platform Lecture Series

- Organize Faculty Development Program and Workshops for students, researchers and faculty members.
- Promoting socially and practically relevant academic research among M. Tech, Ph. D scholars and Faculty members.
- Facilitate inter-disciplinary research
- Provide incubation facilities to start ups and budding entrepreneurs
- Lastly, in the near future the innovation center will also provide support in the patenting process.
- To encourage Industry to participate and work closely with faculty and students on R&D projects

Workflow Chart



4. Centres of Excellence: Thrust areas

4.1 Solar Energy: Thermal and Photovoltaic Lab (Domain: Mechanial and Electrical engineering)

Government of India announced the National Solar Mission Policy in March 2010. The mission envisages installing 20,000 MW of solar power by 2020. Some of the key drivers for this initiative are abundant availability of solar energy in India, energy security, rapidly increasing energy demand and increasing pressure from international community to curb CO2 emissions. The mission also aims at strengthening indigenous manufacturing capability, and achieving 15 million sq. meters solar thermal collector area by 2017 and 20 million by 2022 and numerous regulatory and policy measures are being formulated to achieve these targets.

There are a handful of companies globally with proven solar thermal technologies for large scale power generation plants. Current designs of these plants utilize specifications provided by a limited number of solar thermal components manufacturers. A number of new entrants are emerging in component manufacturing, but have to undergo a fairly long development and demonstration period to make inroads in the market. Solar thermal technologies for process heat applications are more widely available, including a few Indian technology suppliers.

Newer solar thermal technologies are making use of unconventional materials like aluminum, and replacing conventionally used materials like copper and steel. Light-weight and stiff, aluminum space frame technologies are increasingly being favored by designers as it reduces initial capital cost and recurring O&M costs for solar trough technologies. There is also increasing interest newer materials for solar reflectors. Similarly, for low temperature solar thermal technologies monolithic structures are proving beneficial than ones using copper tubings on both cost and performance. BIT-CIIE is to provide high efficiency and low cost solutions in the field of solar power and PV cell. Dr. Vipin Jain, a certified energy auditor from Bureau of Energy Efficiency and Mr. Musheed are working in this project.

4.2 Multi agent systems and Solar Micro Grid (Domain: Electrical Engineering, Computer Science and Management)

Microgrid is a localized grouping of electricity sources and loads that normally operate connected to and synchronous with the traditional centralized electrical grid (macrogrid), but can disconnect and function autonomously as physical and economic conditions dictate. Generally, In Microgrid power is supplied by solar inverters and renewable energy resources. Proper synchronizing between microgrid and macrogrid is necessary and a challenging issue. Frequency fluctuations in microgrid may immediately effect macrogrid. BIT-CIIE provides solutions to these problems. Prof. Deepak Dahiya and Dr. Amit Bhardwaj are working in this project.

4.3 Embedded System Design and Robotics (Domain: Electrical and Electronics Engineering)

Computing systems are found all over the world. Millions of computing systems are embedded inside larger electronic devices. These are found to be repeating a certain function which often remains totally unrecognized by the user. Any computing system apart from a desktop, laptop or mainframe computer is an embedded computing system. Embedded systems are electronic computer systems that serve domain specific tasks. It is estimated that 98% of computing devices today are embedded systems. Designing embedded systems is one of the fastest growing technical fields and many industrial bodies recognise it as one of the leading forces for future innovations.

The embedded system designer must construct an implementation that fulfills desired functionality, but a difficult challenge is to construct an implementation that simultaneously optimizes numerous design metrics. BIT- CIIE is engaged in providing easy solutions of embedded-systems and microcontroller interface.

4.4 Cyber Security (Domain: Information Technology and Computer science Engineering)

The explosive growth, complexity, adoption and dynamism of cyber space that have enhanced social interaction and expanded ability to productively utilize the environment have also introduced new adversarial threats and challenges to the society. Cyber-bullying, cyber-crime, cyber-terrorism, adversarial state-sponsored activities, and so on, are all exemplars of malevolent attributes of cyber space. Mitigating these malevolent attributes requires an agile, legal and ethically compliant, interdisciplinary and scientifically-based research and exploratory development program in cyber security. The cyber security research challenge over-all resides within a particularly complex area, being at the intersection of behavioral

sciences, formal sciences and the natural sciences. BIT-CIIE coordinates research activities to get end state of a healthy cyber ecosystem. The main challenges for which BIT-CIIE provide solutions are:

- Improve Signature Management and Signature Quality: A signature is a distillation (usually a hash encoding) of a malicious pattern. Signatures are widely used, for example, to tersely identify cyber threats and, most widely, for the identification of viruses. The challenges identified here aim to improve the quality, effectiveness and timeliness of signature-based techniques
- Increase effort on anomaly detection and support discovery: Anomaly detection refers to behaviour that does not conform to expected behaviour or usage patterns. From a cyber security perspective, for example, anomalous traffic patterns in a network could suggest that a system has been penetrated and sensitive data is being exfiltrated. The challenges identified here target areas where anomaly detection and discovery could be materially improved
- Streaming and event driven analytics to reduce time to action: Streaming analytics refers to the inline analysis of data (e.g., I.P. packets, stock trades, currency trading, health monitoring) so as to rapidly and intelligently respond to evolving situations, potentially in near real time. (There is a spectrum of algorithms, ranging from near real-time algorithms supporting almost instant response to adversarial situations; through to algorithms that take a longer-term, almost forensics-like, perspective. Identifying this algorithmic taxonomy is a research challenge in its own right.)
- Dynamic defence at the network edge and beyond: A network edge is the location where the processing and enforcement of organizational policies commences. This hard problem focuses on developing dynamic defence techniques that can rapidly interdict network attacks, using both network and host-based capabilities
- Cloud (Virtualization): Cloud computing is the delivery of computing resources over a network. Cloud computing brings challenges pertaining to scale, security and privacy. Challenges arise from the evaluation, architecture and design of such systems. Furthermore, there are specific concerns about contagion of malware infections across virtual instances and into the underlying base image.

Prof. Deepak Dahiya and Mr. Kshitiz Saxena are working in this project.

5. Innovation Centre Team

Prof. Deepak Dahiya (Head, BIT-CIIE)
Dr. Vipin Jain (Team Lead, Electrical Engineering Department)
Mr. Kshitiz Saxena (Computer Science & Engineering Department)
Mr. Musheed (Mechanical Engineering Department)
Dr. Amit Bhardawaj (MBA Department)
Mr. Sandeep Gupta (Electronics Engineering Department)

6. Workshops and Training

BIT-CIIE organizes training programmes and workshops for students / faculty members / technicians / manpower from industry for providing hand on practice. BIT-CIIE has conducted following workshops and training programs in the past:

(i) "Instructional Planning & Delivery" from 7th – 11th July 2014, conducted by NITTTR, Chandigarh at BIT- CIIE.

(ii) "Control System" from 12th –26th July 2012 at BIT-CIIE arranged by Electronics Engineering Department

(iii) "Power Electronics and drives" from 10th –24th June 2011 at BIT-CIIE arranged by Electrical Engineering Department

(iv) "MATLAB Applications" from 14th –28th June 2010 at BIT-CIIE arranged by Electrical Engineering Department

7. Publications

The research output of BIT-CIIE is summarised in the shape of research papers also. A list of prominent research papers are:

[1] Vipin Jain et al., "Effect of TCSC on Power System Stability" The Journal of CPRI, Vol. 11, No. 4, December 2015. (Publisher: Central Power Research Institute, Bangalore. Ministry of Power, Government of India)

[2] Deepak Dahiya et al. "IT assets, IT infrastructure performance and IT capability: A framework for E-Government", International Journal of Transforming Government: People, Process and Policy, Vol. 10, Issue 3, July 2016, Emerald Publishing Ltd., UK .

[3] Deepak Dahiya et al. "Aggregation of Cloud Providers: A Review of Opportunities and Challenges", Paper published in the IEEE proceedings of the International Conference on Computing, Communication and Automation (IEEE ICCCA 2015), Galgotia University, India, pp. 620– 626.

[4] Deepak Dahiya et al. "Distributed Task Allocation in Dynamic Multi-Agent System", Paper published in the IEEE proceedings of the International Conference on Computing, Communication and Automation (IEEE ICCCA 2015), Galgotia University, India, pp. 643–648.

[5] Rajni Mohana and Deepak Dahiya. "Secure Content based Dissemination of XML Content Inspired by DNA Cryptography". Paper published in the Journal of Computing and Information Technology (CIT), Vol. 21, No. 2, 2013, University of Zagreb, Croatia, pp. 71 – 84.

[6] Komal Mahajan, Ansuyia Makroo and Deepak Dahiya, "Round Robin with Server Affinity: A VM load balancing Algorithm for cloud based infrastructure". Paper published in the International Journal of Information Processing Systems (JIPS), Vol. 9, Issue 3, September 2013, Korea, pp. 379 – 394.

[7] Deepak Dahiya, Saji K. Mathew, "Review of Strategic Alignment, ICT Infrastructure Capability and E-Government Impact". Paper published in the web proceedings of the 5th ICT Innovations Conference 2013, Ohrid, Macedonia, pp. 42-51.

[8] Vipin Jain et al., "Analysis and Design of Wide Area Damping Controller for STATCOM in Series Compensated Power System" accepted in Majlesi Journal of Electrical Engineering (publisher: Islamic Azad University, Iran)

[9] Vipin Jain, Vinod Kumar Mehta, "Relationship Between Per Unit Reactance and Per Unit Inductance" International Journal of Modern trends in Engineering and Research, Vol. 2, No. 11, Nov. 2015.

[10] Vipin Jain et al., "Designing of supplementary controller for STATCOM for Mitigation of Oscillations in Power Systems" Journal of Engineering, Science & Management Education, Vol. 8, Issue 2, August 2015, pp. 124-133. (Publisher: National Institute of Technical Teachers Training & Research, Bhopal. Ministry of Human Resource Development, Government of India).

[11] Vipin Jain et al., "Designing of supplementary controller for STATCOM for mitigation of subsynchronous resonance in series compensated power system" The Journal of CPRI, Vol. 10, No. 04, December 2014. (Publisher: Central Power Research Institute, Bangalore. Ministry of Power, Government of India).

[12] Vipin Jain et al., "A novel auxiliary controller of STATCOM for mitigation of subsynchronous resonance" ISST Journal of Electrical & Electronics Engineering, Vol. 5, No. 02, December 2014.

[13] Vipin Jain et al., "Mitigation of Subsynchronous Resonance in Power system through STATCOM and auxiliary controller" The Journal of CPRI, Vol. 10, No. 02, June 2014. (Publisher: Central Power Research Institute, Bangalore. Ministry of Power, Government of India).

[14] Vipin Jain, Arvind Raja, Sunil Bansal "Comparison of Supplementary Controllers for TCR- FC for Damping Oscillations in Power System" International Journal of advances in Engineering Science and Technology, Vol. 2, No.1, March 2013.

[15] Vipin Jain, Sajiv Kumar, "Comparison of Effectiveness of Auxiliary Signals Incorporated in STATCOM for improving Transient Performance of Power System" IEEE International Conference on Power Electronics, IICPE -2012, (December 6-8, 2012), Delhi Technological University, Delhi.

[16] Amit K. Dash et al. "A newer approach on cash flow diagram to investigate the effect of energy payback time and earned carbon credits on life cycle cost of different photovoltaic thermal array systems" Solar Energy (Elsevier), Vol. 124, 2016, pp. 254-267