Physical Progress Report

of

Design Innovation Centre

at

Islamic University of Science and Technology

Awantipora, J&K

7th June, 2016

Summary

Design innovation centre at Islamic University of Science & Technology (DIC@IUST) was established in collaboration with the University of Delhi, Jamia Milia Islamia, and School of Planning & Architecture (New Delhi) under the MHRD scheme of 'National Initiative for setting up of Design Innovation Centres, Open Design School & National Design Innovation Network'.

With a major theme as 'Product Design', DIC@IUST has since then been involved in establishing the Innovation Lab with state-of-art facilities. A state of art hardware and software has been put in place, especially towards realizing product design. Students and faculty have a hassle free access to such facilities for realizing their innovative projects and ideas.

One of the major projects currently being funded is "Development of a Haptic Device for enhancing Pedagogy in Education at school and K-12 level". Apart from this, fourteen student projects are currently being funded, of which most of them are B-Tech final year projects promising some innovation.

DIC@IUST is currently offering three elective courses to the students of School of Technology, IUST – Microcontroller based System Design, Introduction to Computational Electromagnetics, Mechatronic System Design.

DIC@IUST has initiated a series of workshops to foster the spirit of creativity and innovation in the students of IUST (from all backgrounds). The first of these workshops, Innovation Frontiers-I was organised on 28th April 2016, in which participants were introduced to the contemporary technologies like 3D printing and CAD, along with a design thinking exercise.

Winter trainings on Embedded Systems and Robotics and Winter INnovation Award (WIN) were launched in January 2016, in which the students independently worked on their innovative ideas. DIC@IUST will be offering summer internships and a certificate course on product design and development from Autumn 2016.

Contents

DIC@IUST (Brief Overview)

The basic purpose of setting up Design Innovation Centre at Islamic University of Science and Technology is to promote a culture of innovation and creative problem solving, to serve as a place that imparts design based education and practice and to create an ecosystem facilitating students and faculty to take their innovative ideas from classrooms/labs to market/people.

Specific Targets and Objectives:

1. Setting of an Innovation Lab with state-of-art facilities
2. Elective courses on Product Design, Embedded Systems, Mechatronics, etc
3. Certificate courses focussed on Product Design and Development
4. Design and Innovation related workshops
5. Winter trainings
6. Summer Internships
7. Grand challenges in design

DIC@IUST Management Team:

1. Dr. Shahkar Ahmad Nahvi(Coordinator, DIC@IUST)
2. Dr. Faroze Ahmad Mir
3. Mr. Kaiser Giri
4. Dr. Majid H Koul
5. Dr. Basharat N Dar

DIC@IUST Staff:

1. Mr. Peerzada Shaoib Hamid(DIC Fellow, M.Tech E&C Engineering)
2. Mr. Tanveer Ahmad(Office Assistant)
3. Miss Shabroza(Attendant)

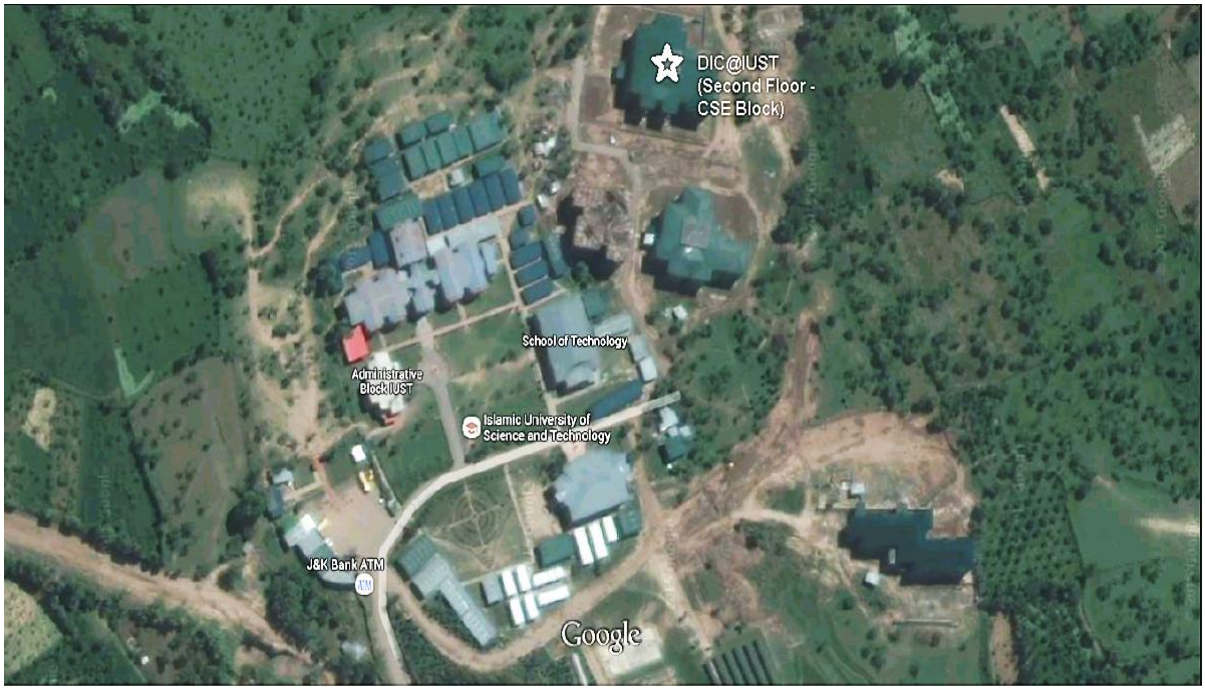


Figure 1: Location of DIC@IUST

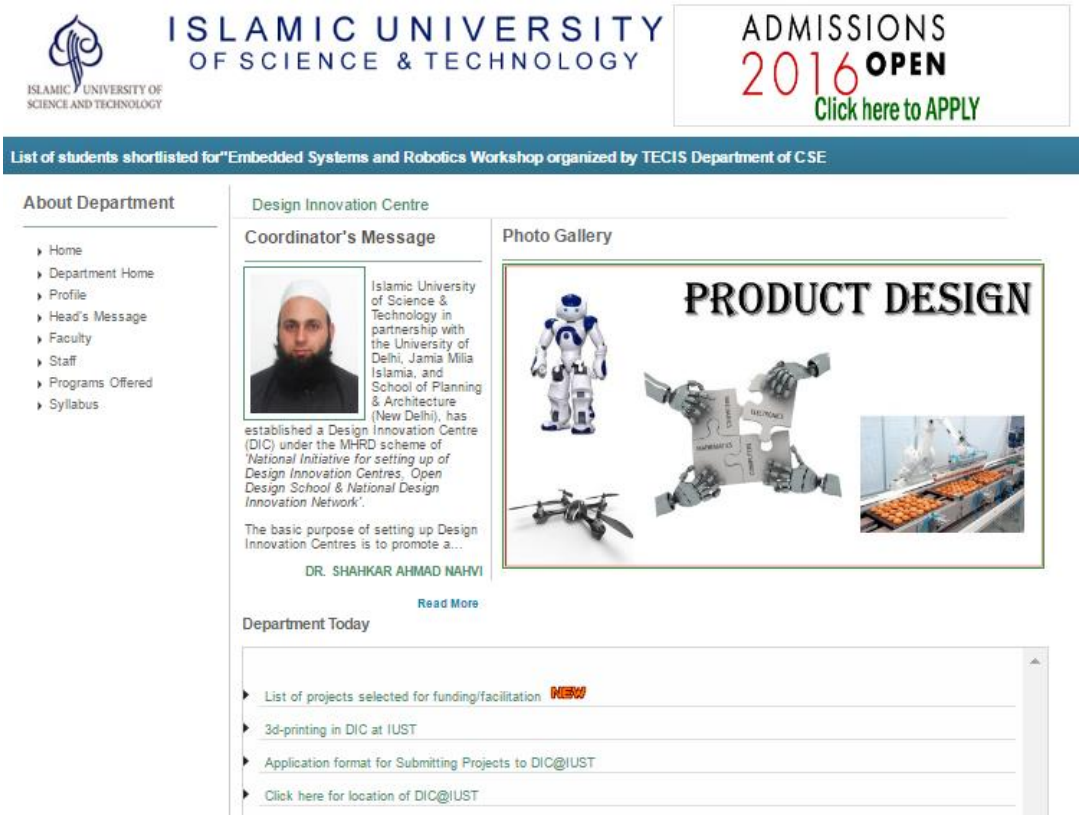


Figure 2: DIC@IUST web presence

Figure 3: DIC@IUST LAB

Courses: Programmes introduced

1. **Microcontroller Based System Design**

   Type of course: Open Elective (Autumn session)

   L-T-P: 0-0-6

   This course was designed to provide practical and project based emphasis on the application of microcontrollers and logic devices like FPGA's in designing an embedded system based product.

   Students were encouraged to work in groups, with emphasis on working towards a major project. Student performance was evaluated based on their attendance in the lab and their performance in the major project. Each student project in the course was funded by DIC after appropriate review of the project feasibility and the performance. In fact, an opportunity was provided to all the groups to present their proposals for extending their work as a B.Tech Project. Only a few (two) were selected for funding by DIC for their major project.

   Eligibility: Final year students of Electrical, Electronics and Communication, Computer Science and Engineering, and final year students of Masters in Computer Applications.

   Intake Capacity: 20.

2. **Introduction to Computational Electromagnetics**

   L-T-P: 2-0-0

   This course will be offered as open elective from DIC@IUST from Autumn 2016 (Subject to the approval of BOS).

3. **Mechatronic System Design**

   L-T-P: 2-0-0

   This course will be offered as open elective from DIC@IUST from Spring 2017 (Subject to the approval of BOS).

   The purpose of this course will be to study the basics of automata (Electromechanical Systems) from an engineering perspective and to serve the purpose of controlling advanced hybrid systems such as production systems (3D Printers), automotive subsystems such as anti-block system, everyday equipment such as autofocus cameras, CD players, washing machines, legomatics, etc.

Lab setup

A Wi-Fi enabled laboratory with 24x7 Uninterrupted Power Supply (UPS) has been established with the following facilities:

1. **IT Infrastructure:**

S. No.	Item	Quantity
1	Workstations with Intel Xeon E52630 Processor, 16 GB DDR4, RAM, 1 TB Hard Drive and 4 GB NVIDIA Quadro Graphics	3
2	Desktop PC's with Intel core i7 processor, 8 GB DDR3 RAM and 1 TB Hard Drive	3
3	Laptops – Apple MacBooks with Intel i5 Processor and 1 Dell	2
4	Laptop with Intel core i7 Processor, 8GB DDR3 RAM, 1 TB Hard Drive and 2 GB NVIDIA Graphics	1
5	Desktop PC's with Intel core i3 processor, 8 GB DDR3 RAM and 1 TB Hard Drive (Office Purpose)	2

Figure 4: IT Infrastructure at DIC@IUST

2. Rapid prototyping:

S. No	Item	Quantity
1	Ultimaker-2 3D Printer	1
2	Ultimaker-2 Extended 3D Printer	1
3	Ultimaker-2 3D Printer	1

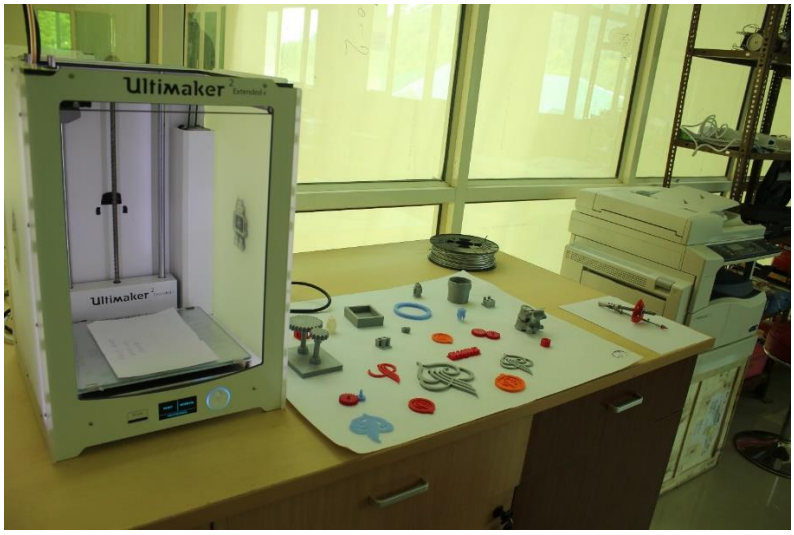


Figure 5: 3D Printer and 3D Printed Objects

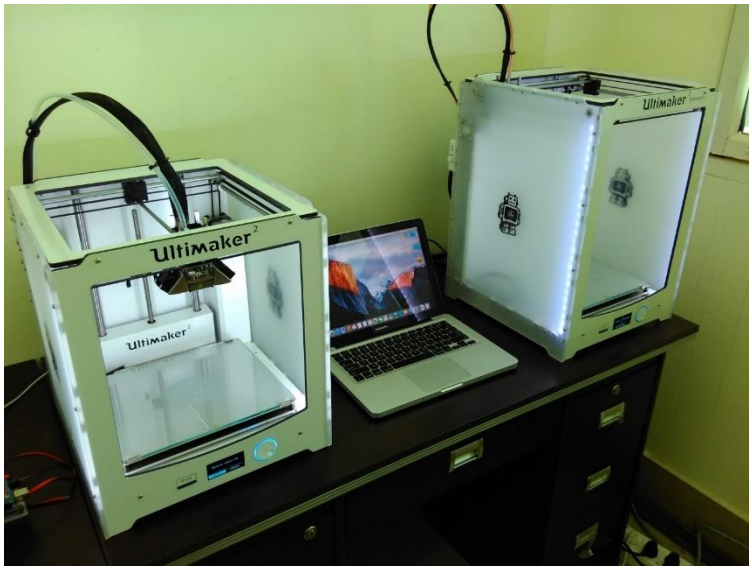


Figure 6: Ultimaker 3D Printers, with higher workspace

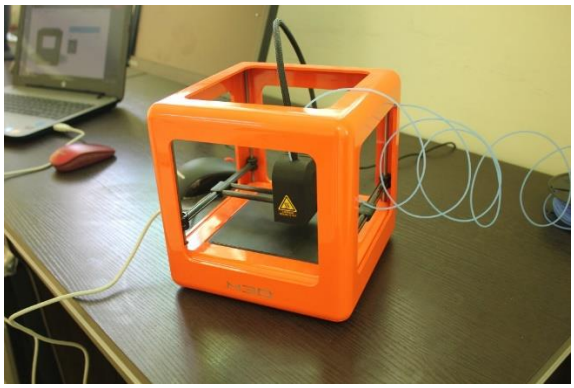


Figure 7: Micro 3D Printer

3. Machining Facilities

S. No.	Item	Quantity
1	Mini Lathe	1
2	Mini Milling Machine	1
3	Drilling Machine	1
4	Cut off Saw	1
5	Other Tool Kits: Angle Grinders, Screw Drivers, Bench Vice, Pliers etc	--

Figure 8: Mini Lathe and Milling Machine

4. Electronics Setups:

S. No.	Item	Quantity
1	Four Channel, >100Mhz Digital Storage Oscilloscope	1
2	Dual Channel Oscilloscope	2
3	Dual Power Supply	2
4	Triple Power Supply	1
5	Digital Multimeters	6
6	Analog Multimeter	1
7	Clamp Meter	1
8	Microcontroller Kits and Development Boards(Atmel, ARM, PIC)	7
9	Arduino Boards	7
10	FPGA Kits based on Altera Cyclone 3 and Spartan-6	2
11	Raspberry Pi Kits	2
12	6-DOF Robotic arm	1
13	3-DOF Haptics Kit with GUI	1
14	Universal IC Tester	1
15	Microcontroller Burners	1

Figure 9: Electronics Setup

5. PCB fabrication

S. No.	Item	Quantity
1	Soldering and Desoldering Stations	3
2	Soldering Irons	2
3	Laminator for PCB	1

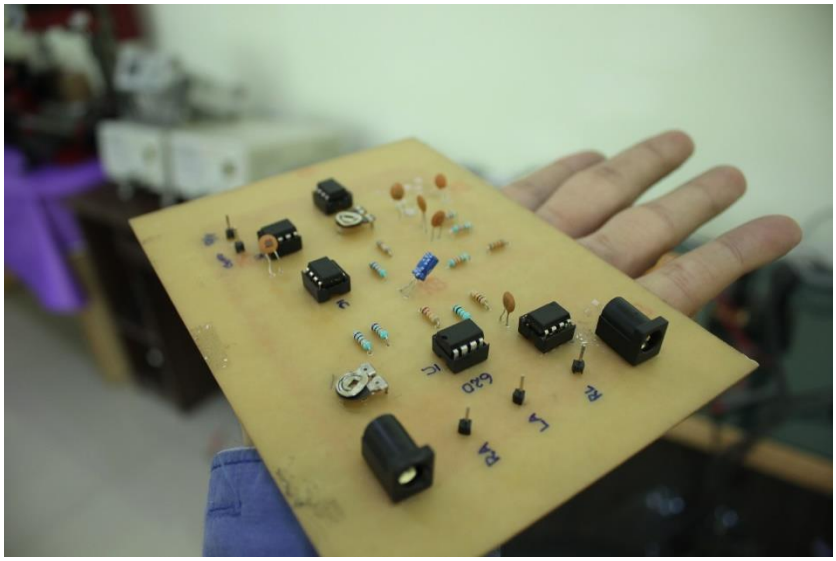


Figure 10: PCB fabricated at DIC@IUST

6. Softwares

S. No.	Item	No. of Licence
1	ANSYS Academic Teaching Mechanical + CFD	5
2	Autodesk Inventor Education Version 2015	Student Version
3	Keil C51, Editor, Debugger, Compiler for Microcontrollers	
4	Google Sketchup, for design	

7. Office Hardware: In addition to these, DIC lab has two PCs, two Printers and a Xerox Machine for office related work.

Interdisciplinary Research

The major project currently being funded by DIC@IUST is "Development of a Haptic Device for enhancing Pedagogy in Education at school and K-12 level".

Student projects currently being funded:

1. E-compass: A Compass that draws ellipses.
2. Wireless ECG Monitoring System
3. Smart Restaurant
4. Autonomous Quad copter Simulation and Realization
5. Energy Meter Testing
6. Design and Data Based Control of a PMDC Motor Drive
7. Implementation of different control strategies for mobile robot navigation
8. Sun tracking solar panel
9. GSM based automatic energy meter reading
10. Development of sustainable urban transport for Srinagar
11. Drowsing Detector: Driver's Alarm'
12. Computer aided Design of electromagnetic systems
13. ATM security system using GSM and MEMS Module
14. Arduino based mobile ultrasonic RADAR

Figure 11: Wireless ECG Monitoring System - Project in progress

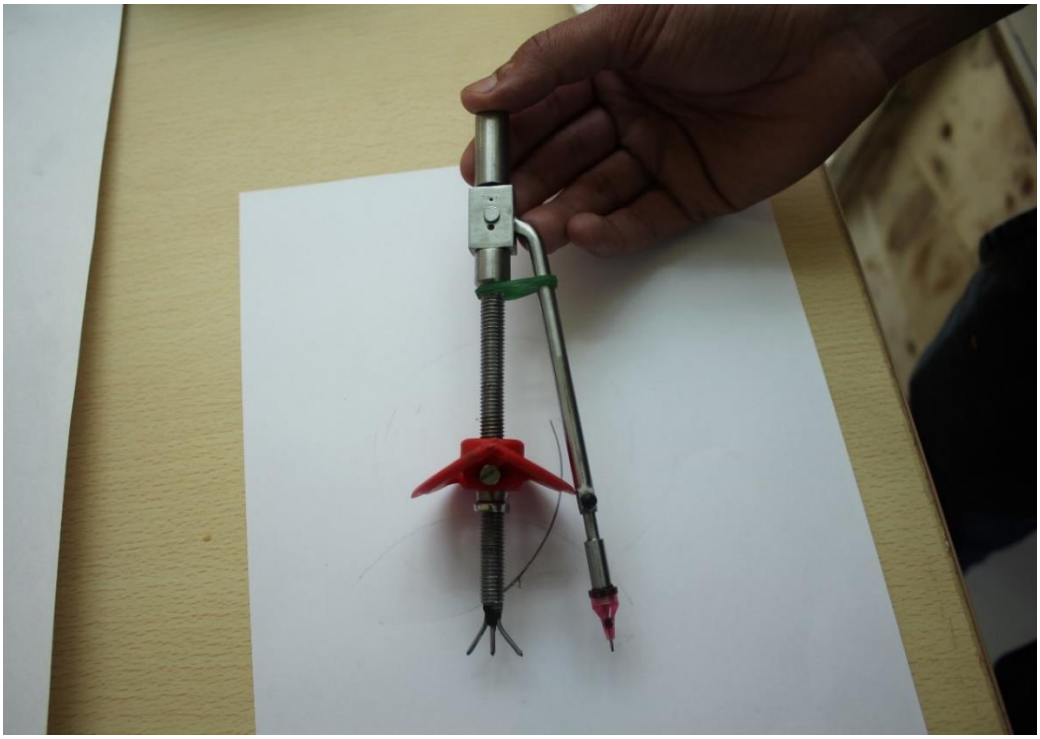


Figure 12: E-Compass- Project

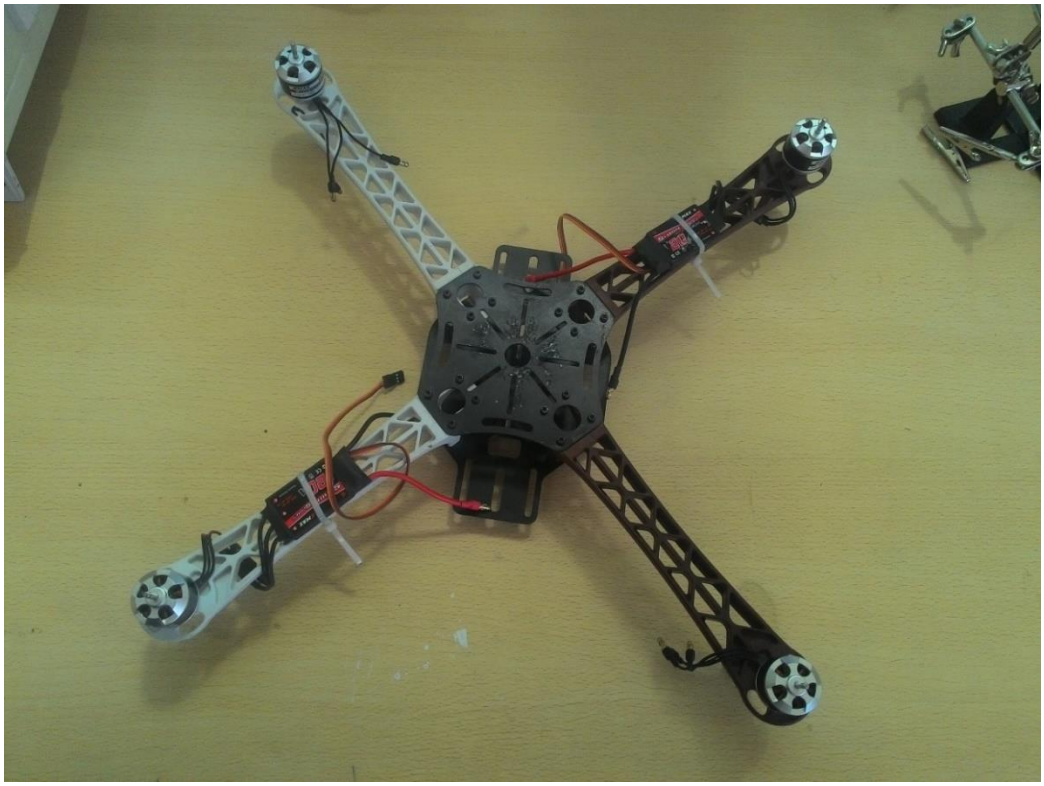


Figure 13: Autonomous Quadcopter - Project in progress

Students initiated innovations

1. **Workshop: Innovation Frontiers-I**

   A workshop 'Innovation Frontiers-I' was organized in April 2016. The participants were introduced to contemporary technologies like 3D printing. There were lectures on innovation and design. Also there was a design thinking exercise.

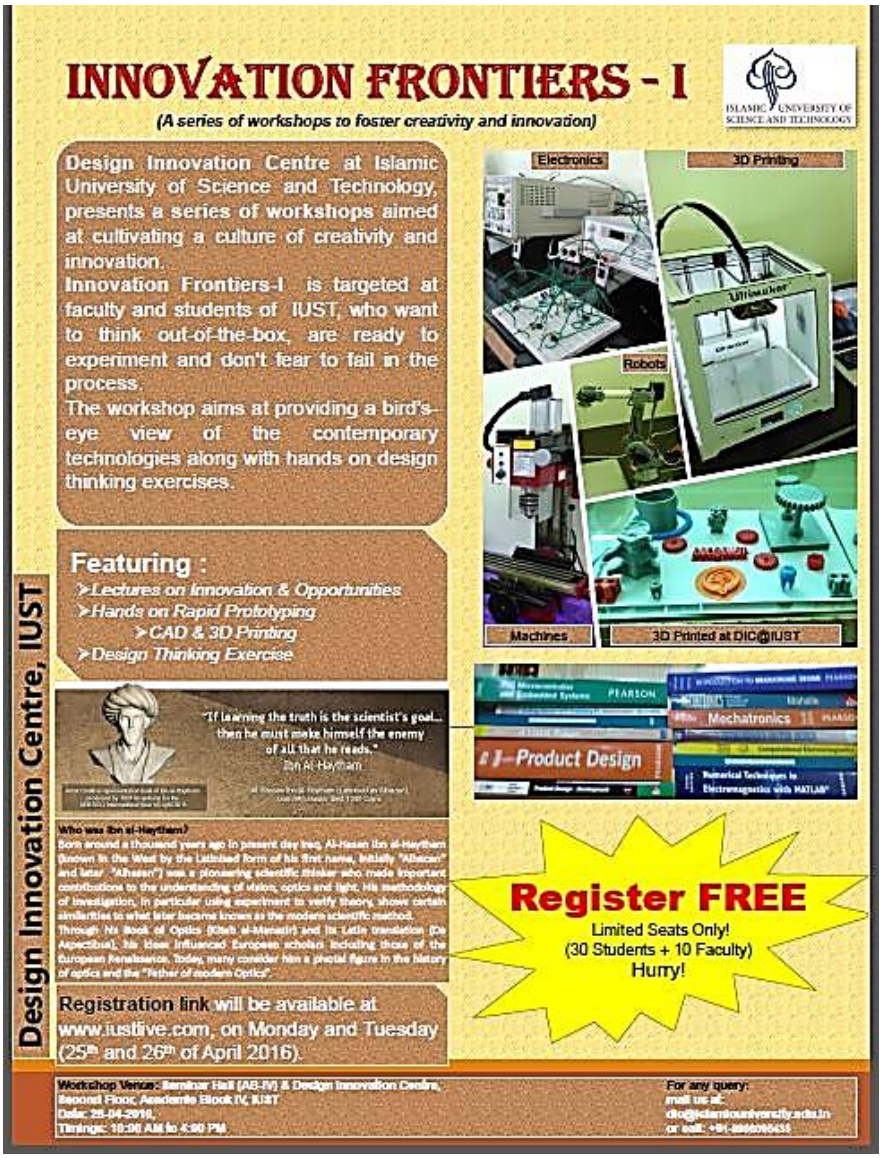


Figure 14: Innovation Frontiers-I Workshop

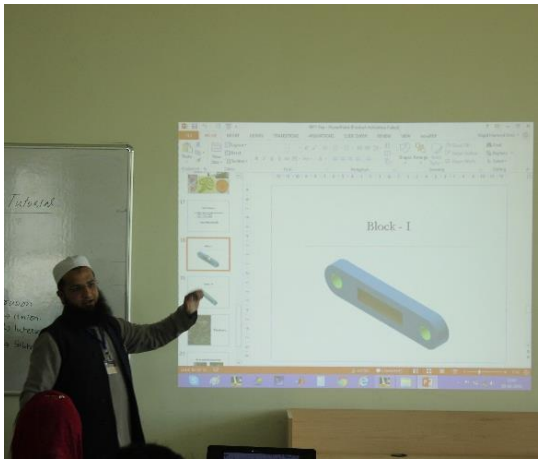


Figure 15: Participants during Innovation Frontiers-I

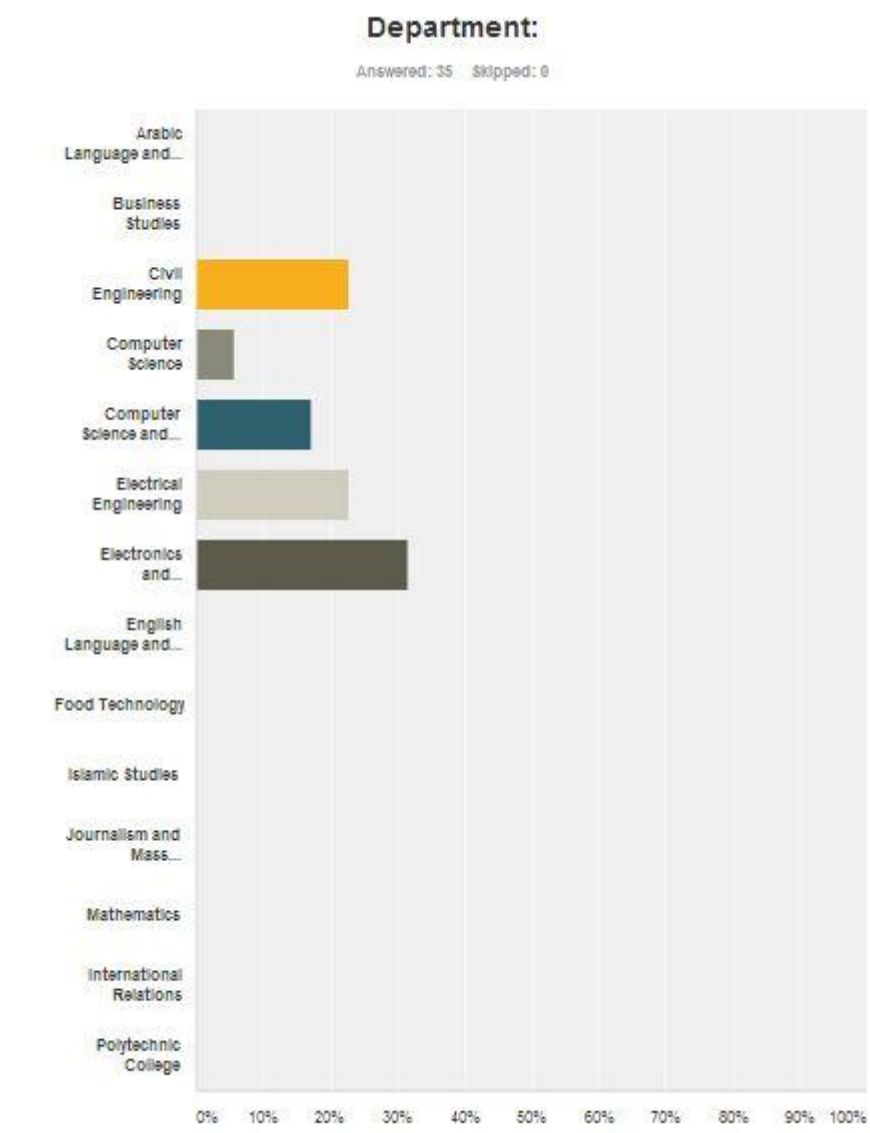
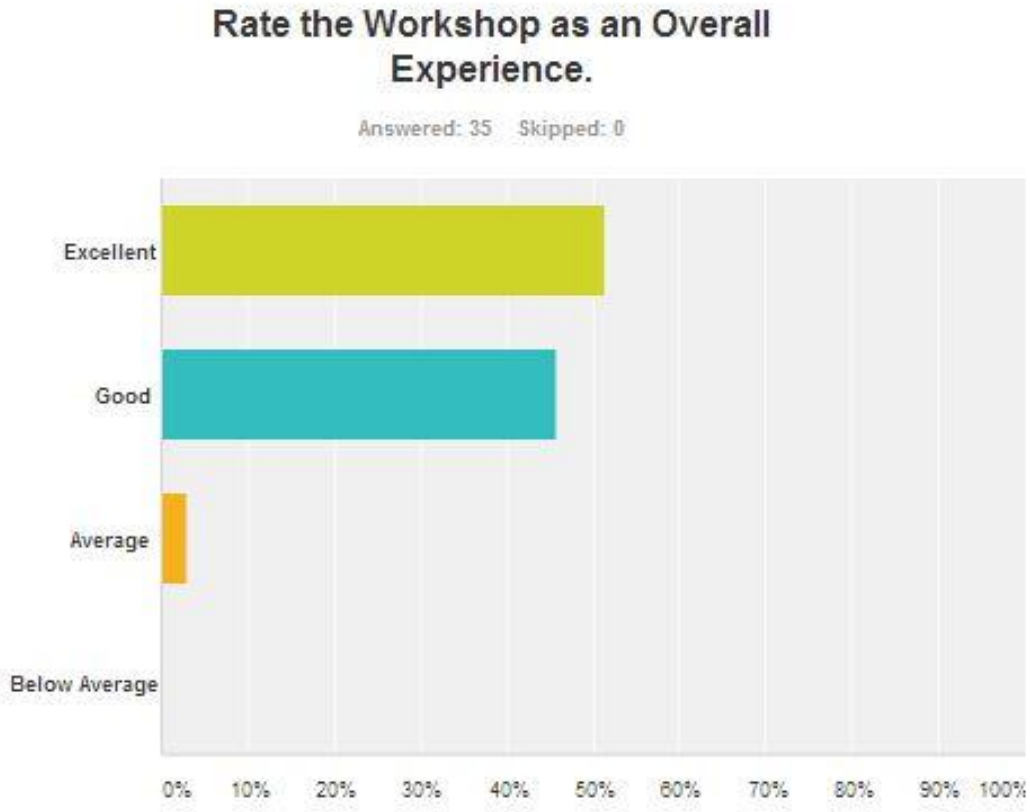


Figure 16: Department Wise participation in Innovation Frontiers-I

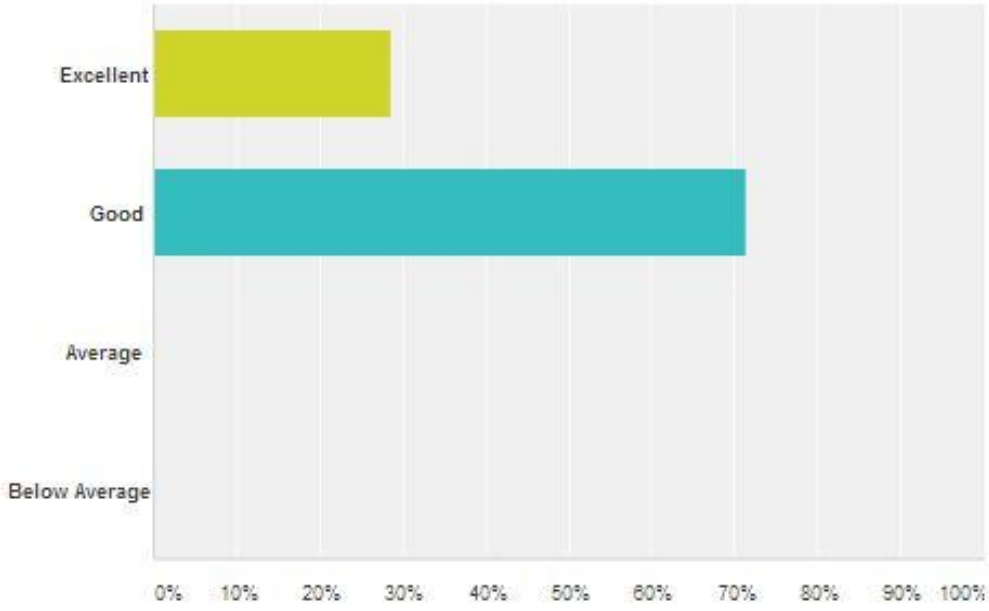


Answer Choices	Responses	
Excellent	51.43%	18
Good	45.71%	16
Average	2.86%	1
Below Average	0.00%	0
Total		35

Figure 17: Participant feedback of Innovation Frontiers-I

Rate the Technical and Scientific content of the Workshop.

Answered: 35 Skipped: 0



Answer Choices	Responses	
Excellent	28.57%	10
Good	71.43%	25
Average	0.00%	0
Below Average	0.00%	0
Total		35

Figure 18: Participant feedback of Innovation Frontiers-I

2. Winter INnovation Award

In Dec 2015 DIC@IUST introduced Winter Innovation award in which applications with project proposals were invited from the students of the state to work on innovative ideas of their choice during winter vacations. A total of 15 applications were received by DIC@IUST. Shortlisting was carried out by an evaluation committee in two stages (written proposal review and presentations). Four projects were shortlisted out-of which two submitted their final prototypes.

- All Weather Umbrella
- Thermal Torch

The award carried a stipend of Rs. 700/week per student apart from project grant up to a maximum of INR 25,000.

Figure 19: Winter INnovation Award

3. **Training: Embedded System and Robotics**

In Jan-Feb 2015 DIC@IUST introduced winter trainings on Embedded Systems and Robotics for engineering students of the state. 16 students registered for the same. Students were introduced to various microcontrollers apart from lectures on robotics. Student were charged a fee of INR 5000 for the 4 week program.

Figure 19: Embedded System and Robotics Winter Training Program

Future Proposed Work

- Certificate Course "Product Design and Development" to be offered from August 2016
- Design Thinking Workshop (August 2016)
- Summer Internship Programme
- Innovation Frontiers – II (Workshop)
- Outreach Programme for School Children
- Outreach program for School Teachers to train them in creative thinking.