GUJARAT TECHNOLOGICAL UNIVERSITY

Students Community Innovation & Co-Creation Centre(C-i-C3)

(http://cic3.gtu.ac.in/)

Gujarat Technological University

(http://www.gtu.ac.in/)

New Campus: Visat-Gandhinagar Highway, Nr. Visat Three Roads, (Campus of Vishwakarma Government Engg. College & IIT Gandhinagar), Chandkheda, Ahmedabad 382424, Gujarat, INDIA **Tel.: +91- 079-23267500**

Ahmedabad Campus : 2nd Floor, ACPC Building, L.D. College of Engineering Campus, Navrangpura, Ahmedabad – 380015, Gujarat, INDIA **Tel.: +91-079-26300499/599 Fax:+91-079-26301500**

Gandhinagar Campus : E-4, K-6 Circle, G.I.D.C. Electronics Estate, Sector-26, Near Gandhinagar Polytechnic (Old GNLU Campus), Gandhinagar 382010, Gujarat, INDIA **Tel.: 079-23267800**

Email: info@gtu.ac.in

Note: During the last week of January, a Request for Proposals for hosting C-i-C3s was prepared and issued through a circular at http://www.gtu.ac.in/circulars/14Feb/C-i-C3circular.pdf and proposals were invited from Colleges/ Institutions.

GUJARAT TECHNOLOGICAL UNIVERSITY

1.0 Two Dimensions:

The First dimension : GTU has set up 25 GTU Innovation Sankuls supported by GTU Innovation Clubs (Udisha Clubs) in every College. The 25 Sankul Committees have about 1,000 leaders as the members. About half of them are Principals/ Directors of GTU institutions. The other half are leaders of industries. The UDISHA clubs at GTU had, at the last count, more than 7,000 faculty members and students as members.

The Second dimension: GTU has started the process of building three Skills Councils and twenty five Sectoral Panels.

The first task taken up by the first dimension is the industry-anchored Final Year projects for Final Year students. Similarly under the second dimension, GTU will be working for small immersion projects in three major areas of interest in the MBA program, in addition to the Comprehensive Project and the Country-specific Study. The Skills Councils are to start an electronic newsletter. The Councils will work with industries and businesses and will engage in intensive research to be able to visualize the needs of the industry. This work will result in MBAs, who will be able to lead the businesses of tomorrow. It will also contribute to making the industries and businesses more professional in their working.

GTU has to build incentives by way of micro-venture fund for the best of IDPs and by way of awards at all levels. GTU will also have to create a structure, which will form the nucleus of the state-wide distributed system.

2.0 Increased Responsibilities of UDISHA Clubs:

A) Moving towards creating Student Centers at twenty five Sankuls: GTU requires that at every College a GTU Innovation Club (called UDISHA Club) be formed. In September 2012, GTU had been able to obtain the data about 296 such Clubs. (*The Colleges will apply for extension during the next few weeks. So the updated data will also become available by 31st December 2013*.) The Clubs consist of student representatives from each year and from each department and these have a Faculty Coordinator from each department.

B) The first two responsibilities of the Clubs were (i) to establish a strong linkage with the industry by a continuous flow of industry professionals to the College and by organizing Shodh Yatras to the industries and (ii) to work jointly with the Trainng and Placement Officer of the College/ Institution for crating a student-driven Placement Cell. The Clubs are supposed to work closely with the Sankul leadership. However at the Sankul level, the Sankul Co-Chairs have not been able to inter-act closely with most of the Clubs on the basis of an informal relationship of two Sankul Committee members – namely the Co-Chair (Industry) and the respective Principal/ Director. Hence there is a need to strengthen institutional links between the Sankul Committee and the Clubs at Colleges.

C) *Appendix 1 shows the requirements and expectations from an UDISHA Club, when the Clubs were set up in January 2011.*

For MBA Colleges, on June 25, 2011, additional requirements were created when GTU established three Skills Councils- namely Financial Services Skills Council (GTU-FSSC); Council for Human Resource Studies and Organizational Structures (GTU-CHRSOS); Skills Council for Marketing (GTU-SCM) - with 25 Sectoral Panels. Every Club in an MBA College was required to develop active linkages with at least three Sectoral Panels.

For Engineering Colleges, some of the faculty members were trained through Faculty Development Programs organized through US Department of Energy-GCCI, German International Development Agency and GOI's Bureau of Energy Efficiency. So possibilities of helping SMEs through measuring boiler efficiencies, measuring air-water pollution and energy audit arose. The Clubs were advised about taking up the tasks, wherever appropriate trained faculty was available.

Appendix 2 shows the new Circular for UDISHA Clubs, issued on 23rd February 2012.

D) GTU has been working to establish Open Source Technologies Clubs (OSTCs) and Mobile Technologies Clubs at its Colleges. Seventeen Colleges have informed GTU about establishment of OSTCs and the list of the office-bearers of these Clubs have

been published on the GTU's web-site. These Clubs are supposed to be parts of the UDISHA Clubs.

On 31st August 2013, GTU has launched the idea of establishing **S4 Extension Centers** at every College.

GTU has been organizing FDPs to create a framework for bringing design-orientation to the classrooms, laboratories and workshops. (*Appendix 4 is about the Industrial Design Center at GTU.*)

GTU wants to set up a Community Innovation Co-Creation Center at each one of the twenty five Sankuls. The objectives of such a Center will be as follows:

i. Inculcating design thinking and foster/promote the open source hardware/software community in Gujarat.
ii. Provide students with the latest open source hardware boards and modules which are in par with the industry standards.
iii. Create an online community to overcome problem of physical constraints and sharing knowledge with those, who cannot come to the Community innovation & Co-Creation Centre .
iv. Assist students to create innovative and creative projects that solve real world problems.
v. Conduct local events like Hackathon/Workshop etc. to provide students a platform for showcasing their talents and establish linkages with the local tech community
vi. Capacity building and scaling such efforts in nearby colleges in the entire Sankul. Help teams doing IDP/UDP to get access to its facility and hone their skills and help them design and fabricate prototypes.
vii. Organize networking events and facilitate other exchanges among start-ups and mentors, both online and offline
viii. To be able to become a hub, which provides an open space for pursuing technology-based ventures and which provides a place for the local tech community of geeks and creative people to meet, swap experiences and organize/ participate in training programs about practical aspects of technology and new developments
ix. Establishing inter-action with Africa's AfriLabs (www.afrilabs.com), MIT's Fab Lab, Cornell's Tinkering Lab
x. Help social entrepreneurs and support/ spearhead the growth of tech enterprises

Appendix 3 gives the proposal for the Students Community Innovation Co-Creation Center.

Thus the UDISHA Clubs have increased responsibilities and a bouquet of possibilities, which can be of interest to different groups of students.

3.0 Students Community innovation & Co-Creation Centre (C-I-C3):

To build capacity in the student leadership for discharging the responsibilities of the Clubs, it is proposed to attach, with every Sankul, a **Students Community Innovation & Co-Creation Centre (C-I-C3).**

C-i-C3 will be a part of the Sankul Committee and it will work to support the GTU Innovation Club (UDISHA Club). It is proposed to establish 25 C-i-C3s over two years. But during 2013-14, it is proposed to establish 10 C-i-C3s.

Each C-i-C3 will be responsible for supporting the activities as given in Appendix 1 and 2. In addition each C-i-C3 will support the activities under the following areas:

1. S4 Extension Center
2. Hardware Design Innovation Co-Creation Center
3. Open Source Technology Clubs
4. Mobile Technologies Clubs

C-i-C3 will be set up in those Colleges, which are prepared to provide space and residential facilities for the employee. In addition hostel facilities for students from other Colleges will be required. The college may be located in an area, which is easily accessible from major population center. The College should have a working hostel for boys and girls and it should be possible for the Center to work **after office hours, since the students will work on their projects after their classes. The Center must be open even during holidays and during the summer.** The College should agree to host 30 students (male and female) from outside the College but from within GTU in the hostels.

Initially the facilities for hands-on work in Electronic Engineering may be made available at the Centers. As the Lab attracts progressively greater usage by the students, the University will add modern facilities like 3 D printers, 3 D scanners etc for fabrication of prototypes by

students. At some of the C-i-C3s, we may add facilities similar to those in the Tinkering Lab at Cornell or the Fab lab at MIT, depending upon the use of the existing facilities and the needs at a particular site.

Note: *After GTU decided about establishing 25 C-i-C3s, Kerala Government has announced to set up such labs which will follow the specifications and directions of Massachusetts Institute of Technology (MIT) in the US, where this concept was originally started. (To get a better idea about a Fab Lab, please see http://articles.timesofindia.indiatimes.com/2013-12-15/india/45215138_1_tiecon-kerala-government-engineering-colleges-kerala-government)*

As the Lab attracts progressively greater usage by the students, the University will add modern facilities like 3 D printers, 3 D scanners etc for fabrication of prototypes by students.

Annexure 1 shows some photographs of AfriLabs network in Africa- pp 6-7
Appendix 1: Circular of 11th January 2011 for setting up the UDISHA Clubs – pp 8-13
Appendix 2: Important Agenda for "GTU Innovation Clubs (UDISHA Clubs)", 23rd February 2012 – pp 14-15
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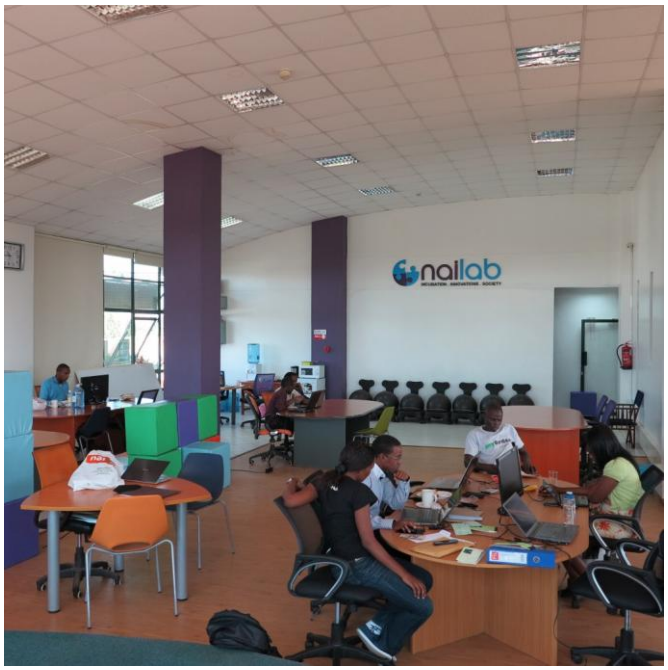
Appendix 4: Centre for Industrial Design: OPEN DESIGN SCHOOL – pp 21- 30

Annexure 1: AfriLabs Network:

iHub: Nairobi's Innovation Hub

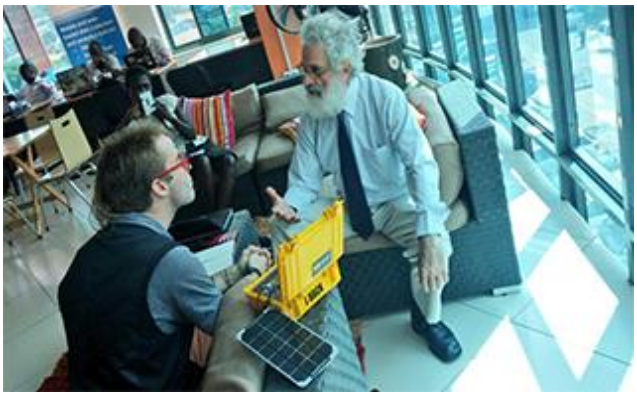
- **A part of AfriLabs network**



Nailab: Nairobi's Incubation Lab

- **A part of AfriLabs network**

Iceaddis: Ethopia University' Innovation Hub
- **A part of AfriLabs network**



Hive Colab: Uganda's Open Space
- **A part of AfriLabs network**

Branson Center of Enterpreneurshp
- **A part of AfriLabs network**

Appendix 1: Circular of 11th January 2011 for setting up the UDISHA Clubs

To
Principals/ Directors,
All the colleges, affiliated to GTU

Principals of all the colleges, affiliated to GTU, are requested to set up Clubs as given below. Please complete the process of setting up the Club at your College and please send the following information on or before 15th February 2011 to GTU:

(i) The contact details (e-mail addresses and mobile Tel. numbers) of the Coordinator of the Udisha Club and the Principal

(ii) the names of the Club Executive Committee

Please send the information to Ms. Toral Vandara at patovc@gtu.edu.in

Clubs in GTU Colleges

GTU Innovation Sankuls: To bring industries, businesses and GTU Colleges together, GTU is setting GTU Innovation Sankuls. Each Sankul represents a cluster of GTU Colleges and the industries in the area. As you may be knowing, your college is a member of one of the Sankuls.

A Club at every GTU College: To take advantage of the Sankuls and to organize other placement activities at each College, it has been suggested that every GTU college should set up a Club. The Club may be called the GTU Innovation Club or **Udisha**[1] (Universal Development of Integrated Skills through Higher Education) **Club of the College**.

The Principals/ Directors of every GTU-affiliated institution should set up the Club to kick- start the activities before 15th of February 2011.

General Guidelines for setting up a Club:

- Each club will have an Executive Committee.

- The Executive Committee will have some faculty and students of various branches as members. One of the faculty member will act as its Coordinator.

- Faculty Members: As far as possible, each Branch should have one faculty member in the Executive Committee.

- Student Members: As far as possible, from every Branch, there may be one student from each year. For example, for a 3-Year DE program, there may be three students, one each from the first, the second and the third year respectively.

The members of the Executive Committee at a College will be nominated by the Principal/ Director of the College. The Training and Placement Officer of the College may be an important member of the Club.

The Principal/Director will appoint one of the faculty members as the Coordinator of the Club

The Principal/ Director will be the Patron of the Club.

Activities:

1. The club will coordinate the activities of corresponding GTU Innovation Sankul at the college level.

    a. To establish a close and continuing inter-action between the industries and the College

    b. To decide about the Final Year projects in consultation with industries

    c. To be able to seek and get the help of industries in execution of the Final Year project by way of

        - Mentoring
        - Help by way of materials
        - Help in evaluation of the project

    d. To identify and to help solve the problems of the industries.

e. To have students and teachers visit industries.

f. To have summer internships in the industries

g. To work out exchange of teachers and professionals from the industry

h. To participate in the activities of the industry associations for developing a closer inter-action by helping the associations in organization of their activities

i. To organize continuing education programs for industries by assessing the needs of the industry and society.

j. To harness the effective potential of young technical minds and faculties.

2. The Club will work towards ensuring that every student gets an excellent placement after she/ he completes his/ her studies. For this purpose, the activities will be as follows:

a. The Club would provide information about career options and job avenues

b. Career counseling and placement.

c. Training for developing Soft skills and Activities for inculcating the habit of reading books (Vanche Gujarat)

d. Motivational activities

e. Organizing mock-interviews to equip students with interview etiquettes at college level

f. Arranging local campus / interviews

g. Helping organize sports or cultural activities at the College and helping participate in such activities at the University and at the Inter-University level

The Club may consult the Principal if it wants to take up any other extra-curricular activity.

3. **Additional Activity for MBA Colleges** Only:

The Udisha Clubs at MBA Colleges have to work for two additional things:

1. Organizing programs for Global Country Studies:

The Club should organize cultural activities relating to the countries under study at the College.

The CEOs of the companies having linkages with the country may be invited for a face-to-face inter-action.

Any other activities, which strengthen the Global Country Studies Report (GCSR) program. *(Please see the Annexure for a brief description of the GCSR program.)*

2. **Organizing Immersion Studies**:

In every College, a regular placement of students for a 3-day or 5-day work to do a small project in every subject is required. The learning processes in the class-rooms and laboratories should be so scheduled during a week that students are able to go either every day for half a day or for full days for 2 or three days a week.

The Club should be able to inter-act with industries and businesses directly or through their Sankul Committee for organizing the Immersion Studies for all the courses.

An UDISHA Club is required to be set up in every College(Engineering, Pharmacy or Business/ Management Studies or Computer Science and Applications) **affiliated with GTU.**

Annexure to Appendix 1 for the MBA Colleges Only:

GTU's Global Country Studies Report (GCSR)

MBA students have to prepare studies on strategies required for global businesses. So they have to study and prepare papers on some specific countries. The Report, which a student submits about a country after studying business aspects of some product or service or company is called a Global Country Study Report (GCSR).

When a student is encouraged to do an original case-study, it also helps him become a more creative person.

GTU Objectives in developing GCSR: GTU Colleges have been using Harvard case studies as well as similar material from other good sources. In some of the good Colleges, some studies about businesses with China, USA and some other countries have been made. However Indian Universities must study the business environment from the Indian perspective for all the 270 countries of the world. A study from the Indian perspective may lead to a different understanding as compared to a study from the American, European or the Chinese perspective. These may add value to the world's store-house of knowledge and may be valuable to Indian businessmen.

GTU's Strength for becoming a leader in country-specific studies: Universities can conduct such studies and can keep them updated through relay-studies by successive cohorts of students, whereby the work, done by one cohort, is carried forward, improved and updated by the students of the next year's cohort. GTU has about 100 Management Colleges and more than 1000 faculty members in these Colleges. GTU proposes to conduct such studies year after year and put them on its web-site for wide dissemination and for obtaining feedbacks.

Process for the Global Studies Program:

a. During the visits to the businesses and industries, every student should learn about linkages of these businesses with countries in the third and the fourth world. Then one should try to locate an Industry Defined Problem (IDP) for a case study.

   In case no business, with external linkages can be located thorough visits to the industry, one may take the help of trustees, teachers and friends to locate some such businesses.

b. During the summer after the first year, preparation of a report about a couple of countries by a class. Each report should include the following for each country: (each component may be taken up by a Group of about 6 students)

   (i) Its economic history and its historical context

   (ii) Its trading partners and the products

(iii) Its economic linkages with India

(iv) Its major companies

(v) Any Indian-owned businesses

(vi) Any prominent Indians in the country

(vii) Good Business Colleges

c. Submission and Evaluation of the Report at the start of the third semester

d. Using the IDP, preparation of an 'Intent to do – a Case Study' about some business aspect in the country of interest by every group of 6 students during the third semester.

If possible, some students may plan to visit the country-of-interest during the term-break between the third and fourth semesters for one to two weeks.

e. During the fourth semester, analysis of a global strategy problem of a firm/country of interest. The case study should identify mechanisms for winning the global strategy game and for overcoming cultural/social and institutional differences in the country. The outputs should be a Case-study and a 30 minute presentation

The issues involved in the MBA programs in our country are that most of the programs in their syllabus content and in the way these are delivered do not inculcate and encourage the spirit of creativity and innovation. GTU is attempting, through both the design of its new MBA program (i) to create a syllabus, which has an intimate relationship with the local context, while it is designed to prepare managers for the flat world of today and (ii) to deliver the program such that the native creativity and spirit of innovation of a student is sharpened and the student starts feeling comfortable in using his own ideas, along with the ideas of great management thinkers, for solving practical business problems. The objective is that a GTU MBA should be able to face the uncertainties and challenges at his work place by calling upon his native creativity and spirit of innovation.

Appendix 2:

Important Agenda for "GTU Innovation Clubs (UDISHA Clubs)"

23rd February 2012

During the academic year 2011-12, GTU introduced the innovative concept of IDP/UDP and an active inter-action with industries/ businesses for the Final year projects of students of all the affiliated institutes. To ensure sustainable execution of the concept, GTU has asked every College/ Institute to establish an UDISHA (Universal Development of Integrated Skills through Higher Education) Club. Every UDISHA Club should take up the following tasks during the next two months:

1. UDISHA Club must arrange the presentation of all final year projects (IDP/UDP) in presence of all the Pre-final & final year students of every branch separately. The presentations by all the Final Year students must be completed by 10th March, 2012 in every Branch. At the presentation, the students should share their experience, methodologies and innovation related to their projects.

Please note:

a. IDP/UDP presentation sessions are to be separately organized for each department.

b. The following members are to be invited for presentations:

i.Industry Mentors

i) Co-chairman – Academia of your Sankul

ii) Co-chairman – Industry of your Sankul or his/her nominee

Iii) Prominent industry leaders from your area, in particular -

Director of your Sankul

Dean of your region

c. Each Department should prepare a report in MS Word (in the format of this message) for publication on the web-site of GTU. The Report should include photographs of the presentation event along with data of the number of teams, date and information about special innovations.

2. Every Department of your College/ Institute should invite at least one Industry leader/ Professional every 2 weeks for delivering a lecture to the students and faculty members and for exchange of views with the faculty. Please convey the Name, the Contact information (telephone number, Fax number, e-Mail address), Name of Company, Designation, title of the talk, date and time so that University may announce the program on the website.

3. Every Udisha Club should form a Placement Committee, consisting of all the Pre-Final Year students of the Club. The Committee should study the scenario of

placements and should work with the Training and Placement Officer of their College for placement of the graduating student of their College in good positions.

4. All UDISHA Club members must meet once in a month (The date to be fixed by the College/ Institute) and submit the monthly report of the activities to GTU Innovation Council. That report will be published on GTU's web-site.

5. The UDISHA Coordinator should make a list of innovative projects, completed or being done by the students and inform GTU Innovation Council. GTU will be able to bring recognition to the student, the Department and the College by showcasing the projects at the state or the central level.

6. The Club members (particularly the pre-final year students) must try to find out ways of visiting Industries/Estates in nearby area for performing jobs like

a. Measuring boiler efficiency
b. Measuring Air / Water pollution
c. Energy audit, etc.

7. Special task for the UDISHA Clubs of MBA Colleges.

a. During the 3rd and the 4th Semesters of MBA, the course of Global / Country Study Report (GCR) has been introduced. Students at every college have studies the business environment of two countries. The Undisha Clubs sould organize the following activities for the two countries :
    i. Celebration of the national days and festivals of the two countries.
    ii. Other activities, which bring eminent people, business people, and embassy officrs of the two countries to the College / University
    iii. To send reports of these events of the events of (i) and (ii) to GTU to Mr. Hiren Thaker at overseas@gtu.edu.in

b. To organize activities of GTU's Skills Councils in Marketing, Finance and HR in these College and to send reports of these to Ms. Krutika Desai at secvc@gtu.ac.in

Appendix 3:

GTU's Students Community Innovation Co-Creation Center

C-i-C3 is designed to strengthen the UDISHA Clubs by strengthening their ties with Sankul Committees. Every C-i-C3 will be managed by a Committee chaired by Co-Chair (Industry) of the Sankul, with all the members of the Sankul Committee as Members. For C-i-C3, the Principal/ Director of the College, in which it is located will work as the Joint Chair of the managing committee of the Center.

The Sankul Committee and the Sankul Committee may be the same if the Center is located in the College of the Co-Chair (Academic). In case it is not so, the difference will be that the Chair of the Managing Committee will be the Co-Chair (Industry) and its Joint Chair will be Principal/ Director of the College, where the Center is located. All other members of the Sankul Committee, including the Co-Chair (Academic) of the Sankul will be members of the Managing Committee of the Center.

Objectives:

i. To build capacities of the UDISHA Clubs so that the Clubs are able to work for the objectives, specified in Appendices 1 and 2.

ii. In addition each C-i-C3 will support the activities under the following areas:

a) To support Student Start-up Support System (S4) Extension Centers,

b) To promote Open Source Technologies Clubs (OSTC)

c) To promote Mobile and Wireless Technologies Technologies Clubs (MWTC)

d) To develop Hardware Design Innovation Co-Creation Center: Under this Center, the objectives will be as follows:

- To promote open-source hardware technologies
- To inculcate design thinking and to foster/promote the open source hardware/software community in Gujarat.
- To provide students with the latest open source hardware boards and modules which are in par with the industry standards.
- To create an online community to overcome problem of physical constraints and sharing knowledge with others who cannot come to the Community innovation & Co- Creation Centre .
- To assist students to create innovative and creative projects that solve real world

problems.

- To conduct local events like Hackathon/Workshop etc. to provide students a platform for showcasing their talents.
- Capacity building and scaling such efforts in nearby colleges in the entire Sankul.

Help teams doing IDP/UDP to get access to its facility and hone their skills and help

them design and fabricate prototypes.

Requirements:

- Basic Electronics Components like Resistors, Capacitors, Relays, ICs, breadboards, wires etc
- Soldering stations and tool-kits
- Good Power Supply options
- Popular Open Source Hardware boards e.g Arduino, Raspberry Pi, Beaglebone Black,
- Pepilo Board, Pandaboard
- Different sensors to work on
- Different actuators to work
- Small scale DSO, CRO

The C-i-C3 Team:

Board of Mentors: The Mentors may be faculty members and professionals from the industry, well known hackers/programmers who are able to guide the students in their hardware projects or to connect with them with the appropriate people in the industry, academia or research. The role of the Board will be as follows:

- Evaluation of Project applications from students for using the facilities at the Center during registration of users
- Assessing the progress of the projects at every 3 months interval.
- Mentorship and feedbacks on project

Managing Committee: It will consist of students, who are very active in the maker community, and who build or hack a lot of projects. It will include Professors, who have a passion for encouraging students to work on hardware projects. The Committee will be responsible for interacting with the students on a continuing basis and will help solve trivial problems. If the situation at hand cannot be solved by the Managing Committee, then it will be passed on to the Board of Mentors.

Working Group: The Working group will consist of GIC Fellows, who volunteer to work for organizing events or help with logistics or to facilitate the working of C-i-C3.

C-i-C3 Fellows: These are students/developers/hobbyist who works on their projects in the C-i-C3 Lab.

Project Application Requirements:

To make sure CiC3 gets genuine innovative and research based projects, students will have to follow certain guidelines while submitting their projects

- The project must be really innovative in nature and not just a hack that has been copied off the internet. Originality of the idea is a must!
- The project should have a potential application upon completion be it commercially or in any other aspect.
- Students must be able to prove or showcase their relevant expertise in the domain in which their project is based.
- The project should aim to solve a particular real world problem.

Project Selection Process:

- Students need to login to CiC3 website, create an account and submit their project idea with relevant information.
- The student committee will then review all the selected proposals and get in touch with students if any information is missing. The aim here is to help the applicants make a better proposal. After the necessary changes have been done, the student committee will shortlist innovative and research based proposals and passes it on to the mentorship committee for review. This is really helpful as now the mentorship committee does not have to read each and every proposal but only the best ones.
- Now, the mentorship committee will review the shortlisted proposals and grade them.
- After all the proposals have been grade, depending upon the quota the top few proposals (ideally 10-15) will be selected and accepted into Maker Labs. There will be also be a waiting list should the selected applicants decline for whatever reason.

Fee Structure:

- GTU students, faculty members and staff are free to use any resources of Lab. The registration will be free for them.
- Persons, who are not in GTU, will be charged an appropriate fee, to be determined by the Board of Mentors.
- Freelancers/ Industrial employees will be charged a membership fee, which meets the expenses incurred on them by the Center.

Program:

Selected students can apply for enrollment in C-i-C3 for a 6 month or a 12 months long

program. Throughout the course of the Fellowship, the Fellow will work on the project. Each project will be reviewed every 3 months and if it is not deemed up to the mark, it will be discontinued. Attendance will also be taken regularly at the lab to analyze a student's enthusiasm.

Initial Material:

C-i-C3s will be built progressively according to the needs at each of the Centers.

	Initial set of Items
A	Initial Capital Cost
a	Hardware Expenses
	Basic Electronics Components
	- Resistors
	- Capacitance
	- Relays, Motors, Switches
	- Basic ICs
	- GPP, Solder Iron, Multimeters, Pliers, Cutters, BreadBoards
	- Cables, Adapters
	Enclosure Boxes
	Power Supply, Basic Function Generator, DSO, Logic Analyzer
	Open Source Hardware boards
	Different Sensors
	CAD Software, AutoCad, Other related softwares
b	Minimum Utilities at each C-i-C3
	Cupboards
	Tables
	Chairs
	Desktop PCs, printer, scanner
	CCTV Camera System
	Wifi router

B	Recurring Costs
	Server Cost
	Internet Cost
	Stationary, Magazines
	Employees Salary (1 person per centre including TA)

For the second year, the requirements may change. As the usage increases, more equipment may be required.

For 2013-14, it is proposed to have one Center at the Ahmedabad Campus, 2nd floor, ACPC Building. At this center, two persons may be employed.

Other Centers will be hosted by Colleges. Facilities like Seminar Rooms, Halls, Library will be provided free by the College, which hosts C-i-C3.

References:

- http://hackerspaces.org/
- http://techshop.ws/
- http://fab.cba.mit.edu
- http://makerlab.illinois.edu

Appendix 4:

Gujarat Technological University
(http://www.gtu.ac.in/)

GTU POST-GRADUATE RESEARCH CENTERS

Centre for Industrial Design

OPEN DESIGN SCHOOL

Gujarat Technological University

(http://www.gtu.ac.in)

Centre for Industrial Design

Introduction:

The old method of using a blackboard for conveying knowledge from a teacher to students is being replaced with an LCD projector. However this change, unless used with care, may increase the pace of presentation by the teacher, making it more difficult for a student to grasp the lecture fully [1].

Traditional methodologies of learning and models of professional education may fall short in the changing economic context, said Ellen Yi-Luen Do (GeorgiaTech) and Mark D. Gross (Carnegie-Mellon) in their paper on ,'Environments for Creativity – A Lab for Making Things'. New technologies may not usher in the desired change, if the technologies are not coupled with new and carefully worked out processes of learning.

The Do-Gross paper says that engineering curricula are strong on teaching analysis and principles and light on the actual practice of making things. Learning to make things is learning to design and learning to be creative. They say that everyone can be creative, because everyone has the ability to create or to make things. But "Engineering and computer science students tend to be less well prepared for open-ended investigation than those who have studied design. Engineering and computer science students with whom we have worked are happiest when we present them with a specification of work to be accomplished," say Do and Gross.

As engineering education has become mature, as empirical and analytical processes have become well-defined, the strait-jacket of working out a 'design', using the complete specifications, has become the norm. *When one does not look at new materials and at alternative solutions, when one does not consider different ways of solving the same problem, when solving a design problems requires plugging in some values in certain empirical or analytical formulae or into a software package, one does not learn design even though in the class-room an illusion of teaching design may be created* [2].

In reality, a student does not learn creativity or design or the art of making new things, if she forgets to look at new materials, contexts of usage and the possibilities of modulating the specifications to obtain a better product. If a student focuses on only the manipulation of the given data to obtain a solution, she may earn an engineering degree but she may remain innocent of the art of engineering design. "Exploring the alternatives — is what distinguishes routine acts of making, that is to say production, from more creative acts of making that may result in innovative ideas," say Do and Gross. They say that if creativity is crucial in the new economy, then perhaps we can foster creativity by putting *making back into education*. According to them, there is nothing new about that idea, but for a variety of reasons, learning to make things has become conspicuously absent in most courses of higher education.

It is true that analysis is an important part of engineering studies but learning of analytical procedures can degenerate into study of manipulation of mathematical equations which are devoid of any reference to practical applications of these mathematical formulations. The net result is that engineering education can become boring and purposeless where the four years are used not for learning engineering but for building a transcript, semester by semester and then for acquiring a parchment which certifies that the young person has spent four years at an engineering college.

Gujarat Technological University (GTU) has started the process of bringing excitement of learning into the laboratories, classrooms and workshops. Besides other initiatives, one strand in the process is to imbue the whole of the learning process, during the under-graduate studies, with design orientation.

Other Related Work:

The work in the rest of the world on making engineering studies more interesting has involved the following experiments [3]:

1. **Project Oriented Problem Based Learning (POPBL)** has been used in the open and distance learning mode by an international consortium of universities called the Global Engineering Team (GET). GET has been working to take projects from the industry and to have them implemented in different cultural environments at universities located in Europe, South America and Africa.
2. **Problem Oriented Project Organized Learning (POPOL)** can be divided into two main themes – design oriented which solves practical problems by synthesizing knowledge form many disciplines (know-how), and problem oriented which solves theoretical problems by use of any relevant knowledge (know-why). At Aalborg University in Sweden, experiments in both the methodologies of POPOL have been tried.
3. **Project Based Learning (PBL)** leads to active learning processes which encourages student to think critically and to solve problems through a focus on practical task. Students can work in a group and learn from each other through group discussions. PBL leads to motivated students. It creates student centered environment where the instructor is not supposed to have the initiative in the learning process but he is supposed to act as a mentor and a guide. The challenge in PBL process is to select projects which can be managed by the young students and which emphasize the application of theory, use engineering design processes, and meet the standards and safety criteria.

The Work at GTU:

GTU has been working so that the learning processes in engineering move towards design of systems rather than being oriented to synthesis and analysis of individual components. For this purpose GTU has conducted many workshops for faculty members to sensitize them towards using examples of design in their respective courses, so that learning processes can challenge a student to design a small product, system or process.

GTU is in the process of updating its syllabi after its first cohort of 4-year degree engineering students have graduated out. In the new syllabus, we want to put into every course a module which asks the students to complete assignments on design relating to the course that they are studying. When such a process is followed right from the beginning of engineering education, a young person will start thinking creatively and the processes of rote learning will progressively be de-emphasized.

Since such projects have to be found for a large number of courses in different branches, GTU proposes to organize meetings of faculty members along with the resource persons for each course so that a set of example projects can be worked out for every course. The syllabus may include a module where the faculty member is supposed to give practical projects, which require a student to design some product, system or process, as assignments. The projects may be taken from an industry or these may be specified by the faculty members or the students may come up with appropriate proposals.

The progressive assessment system at GTU has 30 marks for continuous assessment by the faculty members, 50 marks for term work, assignment and laboratory work and 70 marks for end semester exams. The objective is that in every engineering subject, a part of the 80 marks of progressive assessment may be used to assess the design based assignments.

The faculty member in each and every college may assess the design-projects and while submitting the assessment of the 80 marks to the university he or she may also upload the best three such assignments / projects.

While framing the syllabus, the experts may have given only a couple of example assignments. However at the end of the semester, the university may have a few hundred examples of projects which have been found to improve learning process in the colleges. The experts may meet again to have a look at the new projects and redefine the example projects to be made available for the next year. In this way hundreds of teachers and thousands of students will be able to progressively improve the project/ design based learning and make the system of engineering education more interesting.

The German Development Agency (DAAD) has supported, jointly with many industries, GET projects for the last few years [3]. A similar effort through international collaboration among Latin American and Caribbean Consortium of Engineering Institutions (LACCEI) has been reported in [4]. These projects have been the final year projects of engineering students. When GTU students start going through design oriented learning in various courses from first year to fourth year, it will become possible for GTU to join such international consortia for further improvements in the quality of engineering education.

GTU Center for Industrial Design:

GTU hopes to attract a few professors for its Center for Industrial Design to lead and manage the design-oriented learning processes at all its Colleges. The Center may accept consultancy assignments for design from the industries and may thus be able to help the industries improve the design processes. While the Consultancy projects may help the industry, the objectives during the

initial years would be to build and improve capacities among the faculty members. Secondly such projects would provide opportunities to the students to work on real-life problems.

GTU has set up 25 GTU Innovation Sankuls to bring all the 167 industrial estates into active collaboration with GTU's affiliated Colleges.

In every field, GTU is creating strong networks among Colleges, so that they can work together to improve the quality through boot-strapping. GTU works to build capacities in Colleges and it works to coordinates collaborative efforts among Colleges. This model of a hub at GTU and spokes networking and strengthening the Colleges is being used widely by GTU. We propose to follow the same model at the School of Industrial Design by setting up an Open School of Design for building capacities all over the State. The School will work as the Hub, with spokes going through the twenty five Sankuls towards all the 167 industrial estates.

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Annexure to Appendix 4*:*

GTU's Project on

Active Learning & Creating Excitement

in ***Laboratories, Workshops*** *and* ***Classes (ALCE)***

ALCE aims at bringing excitement of learning into the laboratories, classrooms and workshops of Colleges, affiliated with GTU. This may be done by using ICT more effectively, by sensitizing the faculty members and by preparing courseware, which is interesting and which provokes one to think. This project on the delivery of GTU's academic programs is designed to generate a system, which nurtures creativity among the young and fosters the environment for research.

The first deliverable, under the project, is the best of courseware for the GTU syllabi. The courseware must not be power-point slides, which have text or equations only. The slides should include content with animations, pictures, videos, applications of concepts, under discussion etc.

Learning processes of education in technology must be made more interesting, if the nation is to develop. For making his classes interesting, a Professor at IITKh has taken his students out of the classroom to study a machine or a system or a process. They have been asked to sketch the mechanism or the process and they have been asked to suggest improvements in the product or process. He has used games like Antakshari to check whether the students remember technical words. He has used jig-saw puzzle to see whether the students understand a process and whether they understand common formulae, used in the subject, under discussion.

The methods of the nineteenth and the earlier part of the twentieth century in engineering Colleges in India were good when we wanted to train only a small number of engineers and when we only wanted to produce efficiently goods, which had already been designed and produced in the developed world . When the nation is developing at a fast rate, it requires a large number of well-trained engineers, who can develop innovative products, which can remove drudgery from the work of an ordinary Indian and which can improve the quality of life in India and the world.

Active learning requires that the academic processes become student-centric. A student can learn better when learning processes bring the real world into the class-room. When the real word cannot be brought in, the learning spaces, outside the classroom, may be chosen.

Today when Internet can be used to convey information efficiently, the classroom should be used for exercises, coaching and discussion. This is called 'flipping the classroom'. Listening to the video-lectures and using other resource material may be a pre-class-room activity. The classroom may be for understanding the applications, for discussing the philosophy and history of development of the concepts and for estimating the trends of new developments and research.

Assessment processes may also use as much of technology as possible. Technology can track a student's progress and obtain useful data about a student's successes and shortcomings in learning.

The classroom or individual time with the teacher may be used for a joint analysis of the data and for devising new challenges for the student.
Thus classroom ceases to be a place for teaching. It becomes a place for learning and the faculty member becomes a mentor.

PRACTICAL WORK: Practical work is of great importance for technology education. The objectives of the work in the laboratories and workshops are as follows[1,2,3,4]:

1. Cognitive Learning: The practical work leads to a better comprehension of the theoretical concepts
2. Discovery Learning: It begins with formation of hypothesis, design of an experiment for proving the hypothesis, interpretation of results
3. Vocational Training: For learning current practices and learning professional ethical behaviour
4. Development of Personal Skills: Learning the art of Report Writing, Team Working, Communication and interpersonal relations, safety precautions, about maintenance of clean environment, proper attitudes and values.

It is not only the students, who have become examination-oriented, the syllabus designers have also started sacrificing learning for ease of conducting examinations. A normal practice today is that the syllabus for a course contains a set of experiments, which every student is supposed to perform and the practical examination is supposed to ask a student to perform one of the set. The practical work, then leads to meter-reading and graph-reading exercises, which may lead to satisfaction of some of the skills, mentioned in item 4 above. But such processes lead to a complete elimination of the other three objectives.

A better practice would be to gradually progress through Herron's Four Levels of Control[5] for a Lab/ workshop work after specifying a general theoretical area on which the practical work is to be done:

Level 1: Pre-set elements and students follow instructions
Level 2: Leave the answer open.
Level 3: Leave the answer and the methodology open.
Level 4: Leave the answer, the methodology and the specific aims open.

The progression from level 1 to 4 may be used at first year, as one moves from the first week of studies towards the last. However the Level 1 should be avoided in higher classes.

The Syllabi are designed by senior teachers. They feel that if they leave it to the College or the faculty to decide about the practical work, the young and inexperienced teachers may not be able to get the right kind of practical work done. But the solution should not be a tight straight-jacket of pre-specified set of experiments. The right solutions are as follows:

- to give a sample set and then ask every faculty member to apply his own mind: Thus Dr L. N. Mittal [2] has given the following examples:

  - In Concrete Laboratory, practical work may be to 'Design Concrete Mixes' of different grades by conducting relevant tests. By including such experiments, all students will be busy in designing the mixes and develop professional competencies.
  - In estimating & costing, practical exercise may be to 'Prepare Tender Documents'
  - Providing dissemble/assemble experiences of machines/equipment etc.
- to organize a large number of FDPs on how to get the lab work done well.

Dr. L. N. Mittal [2] has suggested four useful practices:

i. Each teacher should be asked to write 4 to 5 questions as to what students will be able to do after the completion of the practical work of a session.

ii. After finishing a practical assignment, teacher should emphasize that the students are able to draw conclusions of the practical work done by them by administering viva-voce questions.

iii. Record of attendance and practical done by individual students should be maintained. A student not attending practical classes regularly should be warned and defaulters may not allowed sitting in the semester examination.

iv. While conducting final practical examination, the external examiner may
   a. ensure that a student has attended practical classes regularly,
   b. ensure conduct of practical work,
   c. check the record of observations and
   d. administer viva- voce questions based on all experiments for each individual student.

WORK DONE BY GTU's ALCE UNIT:

1. GTU has organized workshops for sensitizing teachers.

2. Initially eight courses (four for Diploma Engg and four for Degree Engg) were selected and meetings of teachers for each of the eight courses were organized. Through workshops, teachers were encouraged to develop new kind of courseware.

3. Three workshops of NPTEL leaders have also been organized. The IIT Madras unit professors have promised to help tailor the NPTEL videos to GTU syllabi.

4. Under the ALVCOM (Active Learning Video Lecture Communication) program, regular telecast of lectures was initially started for the eight first year courses of BE and DE on Saturday, 1st September 2012. During the second semester of the academic year 2012-13, nine courses (five for Diploma Engg and four for Degree Engg) were selected.

   This venture of GTU is supported with the help of technical facility through **Bhaskaracharya Institute for Space Applications and Geo-Informatics** (BISAG). ALVCOM **e**nables students of GTU affiliated colleges to have an access to video

lectures from eminent faculties from all over Gujarat. Thus ALVCOM is creating a platform of knowledge sharing.

The video-recordings of the lectures, which are telecast, are available at the GTU web-site.

5. Involving all faculty and students in preparation of courseware: Active Learning Assignments for students in the new syllabi (available at http://www.gtu.ac.in/syllabus/NEW%20BE/Teaching%20Scheme%20of%202013-14_Group%20I%20for%201st%20year.pdf) of 2110014, 2110002, 2110005, 2110006, 2110013, 2110007, 2110015, 2110003, 2110011, 2110001, 2110004 have been prescribed. Preparation of the courseware, under ALCE by students, can be a good way for creating an environment, wherein both the 17,000 faculty members and 400,000 students are engaged in making the learning process an exciting experience. This can also provide the professors get real data as to what material just isn't clicking for their students.

PROJECT-BASED (or Problem-based) learning processes can hold a student's interest much better. The learning systems will become more student-centric, if project-based or problem solving or design-based methodologies are used in as many courses as possible.

GTU has organized a number of faculty development workshops for preparing a framework for design-based learning processes.

WORK BEING DONE BY GTU's SYLLABUS COMMITTEE for DEGREE ENGINEERING PROGRAMS: Dr. L. N. Mittal [2] laments the fact that , curriculum of Mechanical Engineering does not have a subject on CNC machines and the curriculum of Civil Engineering does not have a subject on 'Estimating and Costing/Tendering.

At GTU under its Vishwakarma Yojana (VY), during the academic year 2012-13, Final Year Engineering students have prepared Detailed Project Reports for 68 villages by working with the village leadership for about 10 months. During 2013-14, 187 villages have been selected for a similar study.

An innovative course called Contributor Personality Development Program, which inculcates values among the young citizens of India, has been designed and is required to be taken by every student, who graduates from GTU.

After the first cohort of students passed out last year, a Committee was set up under the leadership of Dr Nilesh Bhatt to redesign the syllabus. The Committee has already designed the syllabi for the first year. For the three courses - 2110005 (Elements of Electrical Engineering), 2110006 (Elements of Mechanical Engineering), 2110004 (Elements of Civil Engineering)- (available at http://www.gtu.ac.in/syllabus/NEW%20BE/Teaching%20Scheme%20of%202013-14_Group%20I%20for%201st%20year.pdf)-, a case study of systems is required to be prepared by every student, who goes through the course.

However a great deal of work remains to be done by the Syllabus Committee and it is engaged in the process of designing an innovative syllabus.

Both the syllabus Committee and the ALCE unit have to work to bring design-orientation into the syllabi and into the learning process. Both have to work to make the practical work in the laboratories and workshops as voyages of discovery.

The laboratories and the workshops of our Colleges should become development centers for the small and medium enterprises around the colleges.
The students and faculty members should be able to routinely take up and solve the problems, being faced by the industry. Since the industries may be too busy in their day-to-day operations, they may not be aware of the new developments in materials and processes. The faculty may be able to use their knowledge of the new frontiers of technology and the students may be able to use their fresh young minds to solve these problems and to keep the SMEs competitive in the market-places of the world.

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Chandkheda Campus : Academic Unit including Course Development Cell; Board for Green and Environment Technologies; Twelve Post-Graduate Research Centers; Research Projects Unit; Indo-German Studies Center; Faculty Development Program Unit; Indo-Canadian Studies Center; Global Countries Studies Report (GCSR); International Students Cell; International Experience Program (IEP) unit; International Adjunct Professors Unit; Vishwakarma Yojana Cell; e-Library Unit; Financial Services Skills Council (GTU-FSSC); Council for Human Resource Studies and Organizational Structures (GTU-CHRSOS); Skills Council for Marketing (GTU-SCM); GTU Alumni Association (GTU-AA); Centers of Excellence and CCI Awards Unit; Conferences Unit; Integrated Training And Placement unit (I-TAP); Accounts Unit; Human Resource Department; RTI unit; Examination Unit

Sabarmati-Koba Highway, Nr. Visat Three Roads, (Campus of Vishwakarma Government Engg. College & IIT Gandhinagar), Chandkheda, Ahmedabad 382424, Gujarat, INDIA.

Tel.: +91- 079-23267500 **Email: info@gtu.ac.in**

POST-GRADUATE RESEARCH CENTERS:

1. Center for Environmental and Green Technologies
2. Center for Mobile Computing and Wireless Technologies
3. Center for Cyber Security
4. Center for Environment & Energy Efficiency Tools (CE3T)
5. Center for Infrastructure, Transportation and Water Management (CITWM)
6. Center for Technology Education, Public Policy and Universities of the 21st Century
7. Center/ School for Global Business Studies: It has an Indo- German Study Center, an Indo-Canadian Study Center, a Global Country Study Report program
8. Center for Business Ethics and CSR
9. Center for Financial Services
10. Center for Marketing Excellence
11. Center for Governance Systems in Businesses, Industries, Universities, Hospitals, NGOs and Governments
12. Center for Pharmaceutical Studies and Drug Delivery Technologies: A Center for nano Applications is proposed to be developed under the Center.
13. Center/ School for Industrial Design
14. Center for Project Management in Chemical Engineering

Ahmedabad Campus : Board for Wireless and Mobile Technologies; Open Source Technology Clubs unit and Mobile Monday Clubs unit; Active Learning and Creating Excitement in the Laboratories, Workshops and Classrooms (ALCE) and Active Learning Video Lecture Communication (ALVCOM) Unit; GTU Innovation Council (http://www.gtuinnovationcouncil.ac.in); Student Start-up Support System (S4); S4 Co-Creation Center (S4-C3); S4's Student Startup Showcase Stage (S4-S4); Young Entrepreneurs for S4 (YES4); S4 Extension Center Unit; Research & Consultancy Services Cell (RCSC); Sports Council, Youth Festival Council, Social Work Council (Blood Donation Camps and Thalassemia Testiing)

2nd Floor, ACPC Building, L.D. College of Engineering Campus, Navrangpura, Ahmedabad – 380015, Gujarat, INDIA. **Email**: gtu_innovation_council@gtu.edu.in

2nd Floor, ACPC Building, L.D. College of Engineering Campus, Navrangpura, Ahmedabad – 380015, Gujarat, INDIA. **Tel.: +91-079-26300499/599 Fax:+91-079-26301500**

AWARDS:

1. ASSOCHAM Best University of the Year Award, February 2014
2. Dainik Bhaskar National Educational leadership Award, October 2013
3. CCI Technology Education Excellence Awards 2013 for being the Best University in Internationalization of its faculty and students at Ahmedabad
4. CMAI's ICT World Communication Award 2013 for being Pioneer in ICT Education; the Award presented by Kapil Sibal, the Union Minister for Communication & IT, Dr. S.S. Mantha, Chairman AICTE, Hamadoun Toure, General General ITU and others at Delhi
5. World Education Award 2013 for GTU's project on Active Learning at Delhi
6. ASSOCHAM (Associated Chambers of Commerce and Industry of India) National Excellence Award 2013 for Best Government University for Promoting Industry-Academic Interface, delivered by Dr. M.M.Pallam Raju, the Union HRD Minister at Delhi
7. DNA & Star Group Award for the Best Education in Business Studies 2013 at Mumbai
8. AIMS International Innovative University Award 2013, at IIM Bangalore

9. The Best Jury Award in the category of Best Interface between Academia – Industry at the World Education Summit 2011
10. GESIA Award – 2011
11. Sherdil Gujarat Award -2011
12. Thalassemia Awareness & Testing Program Award -2011
13. Thalassemia Awareness & Testing Program Award -2010
14. ICT Enabled University Award E-India 2009
15. Manthan Award South Asia – 2009

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E-4, K-6 Circle, G.I.D.C. Electronics Estate, Sector-26, Near Gandhinagar Polytechnic (Old GNLU Campus), Gandhinagar 382010, Gujarat, INDIA. **Tel.: 079-23267800**