

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

GTU has been striking out in new directions in its determination to solve its problems and not to live with them for decades. Today GTU is considered to be the benchmark for the tech universities in India. (Report of the work during June 10- June 16. Detailed information available in circulars at GTU's web-site):

I. Enhancing Practice Orientation & Infusing Start-up Culture

(pages 1-10) First out of VII parts

1. Practice Orientation through 25 GTU Innovation Sankuls, 270 GTU Innovation Clubs (<http://www.gtuinnovationcouncil.ac.in/gicclub/>) and introduction of Industry Defined Projects:

1.1 GTU's Innovation Council (GIC):

GIC was established on August 2, 2010. GIC coordinates the work of (i) GTU's Student Start-up Support System (S4), established on 25th February 2012; (ii) GTU IPR Cell, instituted on 3rd September 2011; (iii) the S4 Co-Creation Centre (S4-C3) established on May 1, 2013 for providing co-working space to student start-ups; (iv) GTU's ShodhYatras (The first ShodhYatra was organized on 14th February 2011) to SMEs and (v) the structure of GTU Innovation Sankuls.

GIC is, by far, the most active University Innovation entity and S4-C3 continues to serve the students and alumni 24/7, all through the year.

Under GIC, twenty-five GTU Innovation Sankuls were established between 2nd August 2010 and 14th February 2011. The Principal of every College is a member of the Sankul Committee in its area. In April 2011, every College and Polytechnic, affiliated with GTU was asked to establish a **GTU Innovation Club**. The Club is a student-driven entity and it helps the Faculty Members and students to develop a close inter-action with industries, through the Sankul Committees.

The Sankul movement was so successful that more than 70% of Final Year Projects were based on **problems obtained from SMEs** (called **Industry Defined Problems** or problems for solving MSME challenges and for developing innovations), in the very first year in 2011-12. After the projects were completed in May 2012, 1900 industries gave the feedback that they had benefited from the work of GTU's Final Year students during 2011-12.

1.2 Encouraging Entrepreneurship and Innovation at GTU and the Student Start-up Policy:



GTU was the first affiliating-type University, which formulated and released its own Student Start-up Policy in November, 2014. The Policy was released at the hands of the Honourable Education Minister. This policy was developed during the last five years, brick by brick and it was validated through a very large number of GTU students and activities for promoting student start-ups.

(Please see:

http://files.gtu.ac.in/circulars/14DEC/05122014_02.pdf)

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

1.3 Student Start-up Support System (S4):

GTU is organizing student start-up activities on a hub and spoke model at the University and at Colleges. Today S4 is the most active start-up system with regular events every day of the week. Thirty **S4 Extension Centers** have been established in Colleges.

GTU's S4 has taken a crucial lead in the nation for advocating suitable policy interventions at state, university and college level. It has hosted national conferences, workshops, symposia and roundtables to discuss and deliberate on the need and to develop strategies and implementation pathways to make it happen at grassroots level. This is the first of its kind and the largest intervention to promote student start-ups in India.

GTU has built an ambitious S4 program for its students. With this program GTU aims to give an experiential learning of entrepreneurship to its students.

The Incubation Cycle may be distributed into three steps:

- Ideas to proof of concepts
- Proof of concepts to products
- Products to markets.

GTU wants to encourage its students and graduates through the entire cycle.

1.3.1 Specialization in Entrepreneurship or a Minor in Entrepreneurship:

To take advantage of (i) the availability of online MOOC's and (ii) a sunrise start-up ecosystem that may propel India from a developing nation to a developed nation, GTU Academic Council has decided to offer Specialization in Technology Entrepreneurship (or a BE Minor in Technology Entrepreneurship). This will be an optional additional learning for the students in addition to their regular Bachelor of Engineering Program. It is expected that the students will be oriented to entrepreneurship if they are exposed to incubation value chain and design thinking from the early semesters itself, so that they may plan their academic course work such as micro projects, mini projects, assignments, electives, workshops, design projects, practical labs, seminars and final year project towards achieving practical and real world outcomes that are measurable and verifiable at the end of the four year course. To develop a collaborative start-up eco system in Gujarat, GTU has invited Technology Business Incubators to join GTU in this task. (Please see the invitation at <http://gtu.ac.in/circulars/15June/TBI.pdf> , http://www.gtu.ac.in/circulars/15May/16052015_12.pdf and http://files.gtu.ac.in/circulars/16Feb/15022016_01.pdf)

For more details, please see http://gtu.ac.in/circulars/15June/29062015_04.pdf. GTU is the first university to offer such a facility in 2015-16 and 3,800 students have joined the program.

Enhancing Practice Orientation & Infusing Start-up Culture.....continued on the next page

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

1.4 SME Nursery:

On 12th April 2016, GTU inaugurated the SME Nursery. This is to help the start-ups and SMEs to manage themselves better and to help the large number of sick SMEs.

A large number of small units do not have adequate systems for accounting (like periodical financial statements), for financials (leverage analysis and its impact on earnings) and for costing (to properly price the product). Due to lack of systems and structures in place, such small units are not in a position to get better rating. (Sometimes they do not simply go for rating). Due to this gap, their interest cost of borrowing would be higher. This pushes up their finance cost. The other important cost component is operational cost. SME Nursery will be able to help bring down these two costs.

SME Nursery would work closely with rating agencies and with the banks and financial institutions. The Nursery will help obtain tailor-made solutions according to the needs of the SMEs.

Specific activities at the Nursery may be as follows:

- Breakeven Point Pricing
- Inventory Management including introduction of Just-in-Time System
- Managerial Decisions like Make or Buy, etc.
- Credit Rating – how to get good Credit Rating
- Profit Planning
- Ideal Capital Structure
- How to Borrow Money
- Cheapest Source of Funds
- Government Incentive Schemes
- Preparation of Cashflow Statement
- Performance Measurement Tools

2. IPR Initiatives at GTU:

- Since Sept 3, 2011, GTU's IPR Cell has organized 65 workshops, in which more than 4,700 Faculty Members have participated. Today GTU has become the highest IP literate State Technological University in the nation.
- Under PSAR program, more than 77,000 students have studied and prepared, as a part of their Final Year project work, more than **3,88,000** patent search and analysis reports during the two academic years 2013-14 & 2014-15.
- Under PDE activity, more than **28,000** provisional patent documents have been drafted as learning exercise by teams of students during the two academic years 2013-14 & 2014-15.
- Since September 2014, GTU has started a one year Post Graduate Diploma in IPR (PGDIPR). This is the first such program in the western part of India.
- GTU has information about 327 patent applications, filed by GTU students since 2012. **During the period from 2012 to 2015, GTU students and Faculty Members have filed more patent applications than is the case by any institution of Higher Learning in India.**

Enhancing Practice Orientation & Infusing Start-up Culture.....continued on the next page

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

- On 12th October 2015, the newspapers reported a Gol grant of Rs 22 lakhs for preparing a Prototype for one of the patent applications.
- On 12th December 2015, GTU launched the “Certificate course in **IP Valuation & Management (IPVM)**”. This is a six month, off campus program, which is being offered for the 1st time in India.

3. Grassroot Innovators:

15 Grassroot Innovators, who have designed engineering systems, which are in use, were recognized as Honorary Lecturers of GTU. The Colleges were asked to invite them to the Class-rooms.

4. GTU's Work in Villages:

(i) Vishwakarma Yojana



2012-13: DPRs for 68 villages were prepared by 191 students of 10 Degree and 18 Diploma Engineering Institutes with the guidance of 32 Faculty Members. As an experiment 18 PG students also worked on the project.

2013-14: DPRs for 187 villages were prepared by 759 students of 23 Degree and 26 Diploma Engineering Institutes with the guidance of 61 Faculty Members.

2014-15: Due to un-availability of funds, the direction was changed. 455 Final year Civil Engineering students, from 18 Degree and 15 Diploma Engineering Institutes with the guidance of 33 Faculty Members, worked for the RIDP under MGNREGA for 48 blocks by covering 242 villages and prepared Quality Audit report of the civil works for these villages.

2015-16: DPRs for 238 villages will be prepared by 862 students of 37 degree and 22 diploma institutes with the guidance of 74 Faculty Members. DPRs, prepared by the students during 2012-13 are now being implemented in some of the villages.

(ii) Work on Social Problems with Sabarkantha District Panchayat and Ahmedabad District Panchayat:

GTU students, in association with local administration, scouted socio technical challenges and developed problem statements with the help of GTU's Open Design School. Innovative solutions were developed at a 36-hours Hackathon on 27-28 October 2015. Now strategies to implement them at grassroots level are being made. Two dynamic and committed IAS officers – Shri M. Nagarajan and Ms Bhargavi Dave worked with Mr. Naresh Jadeja and Dr Indu Rao of the GTU office and a number of young Professors of GTU and officers of the two District Panchayats, to make it a success.

Since the problems required an IT solution, the work was named as the CODE FOR GUJARAT. Please see the Report for Code for Gujarat, along with a report on the

Enhancing Practice Orientation & Infusing Start-up Culture.....continued on the next page

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

background work at http://files.gtu.ac.in/circulars/15Nov/10112015_3.pdf. The Brochure for Hackathon 2015 of Oct 27-28 Oct, 2015 is available at:

http://files.gtu.ac.in/circulars/15Oct/23102015_11.pdf. A full-day Design Thinking Workshop by GTU for government employees of Ahmedabad District Panchayat and Sabarkantha District Panchayat was organized on 15th Oct 2015 and its Report can be seen at:

http://files.gtu.ac.in/circulars/15Nov/10112015_2.pdf

10-11-12 March 2016: 36 hours Hackathon on Social Problems, as a part of the inter-zonal TechFest at VGEC was started in the evening of 10th to the morning of 12th

- (iii) **Research Project on Study of Model Villages:** GTU has taken up a research project on studying the model villages in Gujarat for preparing Guidelines for the Final Year projects in villages for the year 216-17.
- (iv) **NSS – 24,000 students visit a village for 7 days:** GTU's NSS groups have been working on both school education and Swachh Bhart Abhiyan at various places all over Gujarat.
- (v) **GTU's IT Infrastructure Abhiyan (ITIA):** has been working on developing web-sites for schools in rural areas in Mehsana district. GTU's students, as a part of their Final Year project, computerised GCCI's Women's MSMEs, under the leadership of Prof Manish Garhwal of LJ Campus.
- (vi) **GTU's Post-Graduate Research Centre for Infrastructure, Transportation and Water Management (CITWM):**
 - On Saturday, 3rd August 2013, the Center organized a Half-day Seminar on **Affordable Housing**.
 - The University also organized a Preparatory Meeting and a Half-day Seminar on Saturday, 10th August 2013 on **Solid Waste Management** systems. The Center has also been working on 'Affordable Housing- Land use, Policies Financing & Smart Growth'.
 - **Krupali Raval** and **Priyanka Deliwala**, two young women-students at LJ Institute of Engineering & Technology developed an innovative system of solid waste management as their Final Year project. They have studied the properties of the solid waste in Ahmedabad and the **dumping site of Pirana**. On 13th May 2014, the Vice-Chancellor of GTU inaugurated the use of the system for the entire LJ campus. GTU promised to the LJ Campus management all the help, if the technology for solid waste management were to be implemented in a village by any volunteer group of LJ Campus.

(vii) 500 Colleges-500 Villages project:

With the new cohort of students of August 2015, GTU has brought together all the strands:

- a. Infrastructure Development – as is being done under **Vishwakarma Yojana**
- b. Digital India project- as was being done under **IT Infrastructure Abhiyan**
- c. Rural Entrepreneurship- a follow-up on the **S4 work for SMEs and Social Enterprises** (S4 stands for **Student Start-up Support System** at GTU. S4 is the nation's most active pre-incubation system.)

Enhancing Practice Orientation & Infusing Start-up Culture.....continued on the next page

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

- d. Technology innovation, appropriate and sustainable technologies, traditional knowledge and bio-diversity
- e. Education and cultural innovations – **as is being done under the NSS project**

The program has been started in 111 Engg Colleges in August 2015. Under this program, **646 villages** in all the districts have been taken up by about 40,000 students.

5. **Design Thinking and Design-Based & Project-Based Learning System:**

GTU is the leader in embedding Design Thinking in all its engineering programs in India. More than 2,400 Faculty Members from various Colleges have participated in FDPs in Design Thinking at GTU. GTU is the Director for India in Asia-Pacific Engineering Network (APEN), which is working for Project-based learning systems to Asia.

(In Jan 2014, a Retreat of the Directors of all the IITs and the CEOs/ Technical Directors of major industries of Government took place. The discussion was on producing engineers for the India of tomorrow. At the Retreat, IITs have decided, to introduce Design Thinking in all the programs at IITs. The Kakodar Committee Report for NITs has also asked that all the NITs should introduce a spine of Design courses in all the programs. Accordingly 15 Professors from IITs have been sent to US Universities for training in Design Thinking.)

GTU has established a Centre for Industrial Design (and its associated OPEN Design School). This is one of the 14 Post-graduate Research Centers at GTU. This Center is required to coordinate and lead the design-based learning processes at all its affiliated Colleges. At GTU, we have used the MOOC courses of Stanford University, visiting US professors and other resources to build our program.

The first cohort of 4-year degree engineering students graduated out in May 2012. On 2nd February 2012, GTU started the process of updating its syllabi. It was decided to develop a design-based learning system. (In Chemical Engineering and in IT, one uses the term 'Project-based Learning' for a similar idea.) So design orientation has been embedded into the new syllabi from July 2013 and open-ended problems were included in the practical work.

A strong 6-semester spine of design engineering has been included in the syllabi. On 9th January 2014, experts in design engineering from all over the country were invited to present their views on how Universities could permeate design engineering into the whole of the engineering syllabi. At GTU, the processes of designing the project at the Final year and of the spine of Design Engineering, from third to eighth semester of degree engineering programs, have been synchronized in the interest of seamless progression of learning. Design thinking based curricula were introduced beginning from the academic year 2013-14. The first Design Engineering course was offered at the 3rd Semester of Degree Engineering in GTU from 2014-15. The students used a framework developed by Open Fuel and implemented every step from empathization to ideation to product development. During 2015-16, more than 80,000 students of the 2nd and the 3rd Year of B.E. are using the new syllabi.

Enhancing Practice Orientation & Infusing Start-up Culture.....continued on the next page

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

In July 2014, GTU has become the Director for India on the APEN. APEN has been working to introduce project-based and design-based learning systems in the engineering education systems of Asian countries.

Achievements of Centre for Industrial Design (Open Design School) since August 2014:

- Thirty (32) Faculty Development Programs till September, 2015. More than 2400 trained faculty members from 111 engineering colleges affiliated with GTU.
- National workshop on “Understanding International perspective and Methodologies used in Delivering Design Engineering Courses” by Prof. Libby, UPEI, Canada on 22nd – 23rd April 2015.
- Two day workshop which was held to sensitize GIC club coordinators on 15th -16th May 2015 for the flow of IDP/UDP projects through the 7th - 8th semester students.
- “Industrial Shodh Yatra (ISY) 2015 for final year projects (IDP/UDP) based on Design Thinking methodology” was organized on 28th -31st May 2015 to scout for industrial problems.
- GTU has been appointed as “Director for Indian Chapter of APEN”. GTU’s Design Team met representatives from universities from Japan, Korea, Singapore, China, Vietnam, Cambodia, Indonesia, Thailand, Malaysia, Laos, Philippines, Brunei and Myanmar on 6th June 2015 at a Board of Directors’ meeting of APEN. All universities are working on introducing Design Thinking and Project-based learning in their syllabi.
- Workshop on “Integrating Projects and Design into Core Engineering Courses: Enhancing Learning and Preparing Professionals”. A unique 3-Part course offered by GTU in collaboration with Purdue University, USA expert faculty Prof. Bill Oakes, Director, EPICS Purdue University on 17th July 2015.
- Two day Workshop on “Innovations in Design Based Learning: Transforming Engineering Education” by Prof. Geetha Prakash {Professor, Dept. of ECE, PESIT Bangalore} on 3rd - 4th October 2015.
- Design Thinking workshop for scouting problems within rural areas was organized on 15th October. It was a part of the 36 hours Hack-a-thon event “CODE FOR GUJARAT”, that was organized on 27th – 28th October 2015. It was organized jointly with District Panchayats of Sabarkantha and Ahmedabad. (Please see the [Work on Social Problems](#) on page 4 also.)
- International Conference on “Infusing Design Thinking in Engineer’s Mindsets across Industries and Building a Spine of Design Engineering Courses in Academia” was organized on 4th – 5th January 2016 to strengthen the Design Spine in the undergraduate Engineering Education and to discuss how engineering education may cater to the needs of Industry today so that the “Make in India”, “Start-up India, Stand-up India” dreams can be realized.

Enhancing Practice Orientation & Infusing Start-up Culture.....continued on the next page

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

6.Skilling Mission Policy to bring practical training from out of its outdated mode: GTU has started along the path. An industry partner has come forward for setting up the first state-of-art Welding Lab at Ahmedabad for GTU. This Workshop will generate at least 400 trained welders. In addition GTU's Faculty Members and students will be able to get one week's training and these programs will be run all through the year. The University wants to establish 4 more Welding Workshops. It also wants to establish 90 other state-of-art workshops in other technologies. (Please see <http://files.gtu.ac.in/circulars/14DEC/22122014.pdf>).

But this important project requires adequate support from various agencies like NSDC, CED etc. and the State Government will have to help in reaching out to the right agencies and to get the necessary support since the kind of things, which GTU is doing, have not been attempted other universities. So the agencies have to be convinced about the credibility of GTU. This can be only done when the Government and GTU work together.

7.Skills Councils: For managing immersion studies programs in Management institutes, for a closer working with businesses and for professionalizing the disparate set of professional certifications, operating in small silos:

To enable each specialized area to be handled by the experts, each Council has Sectoral Panels and each Panel is co-chaired by a senior academician and a Business Leader. GTU Financial Services Skills Council (GTU-FSSC), GTU- Council for Human Resource Studies & Organizational Structures (GTU-CHRSOS) and GTU-Skills Council for Marketing (GTU-SCM) have 10, 8 and 7 Sectoral Panels.

Every Management College is supposed to use at least some Sectoral Panels of Skills Councils active in the College.

8.Community Innovation & Co-Creation Centre (C-i-C3):

On 1st May 2013, a common laboratory, where students and alumni can work to develop their own products, was established, in a 1,500 sqft of space adjoining GTU's Co-Working space (called S4-C3 where C3 stands for Co-Creation Centre). The Lab is called C-i-C3 and it is available after-hours and on holidays. It has a stream of mentors and geeks from the local community. C-i-C3 is designed to have facilities like those in the Tinkering lab of Cornell University plus the Fab lab of MIT. The Lab is also supposed to make the maker's movement as a deep rooted culture across GTU.

C-i-C3 is a part of the Sankul movement. Each C-i-C3 is responsible for the supporting activities under the following areas:

- S4 Extension Centres
- Hardware Design Innovation Co-Creation Centre
- Open Source Technology Clubs (exist in 90 Colleges, with Nodal Centers at 22 places)

Enhancing Practice Orientation & Infusing Start-up Culture.....continued on the next page

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

- Mobile & Wireless Technologies Clubs (exist in 30 Colleges)

As the Lab attracts progressively greater usage by the students, the University will add additional facilities for fabrication of prototypes by students.

GTU proposes to establish ten C-i-C3s in Sankuls as soon as the space becomes available. We proposes to establish more C-i-C3 in the next year so that one such lab becomes available in each one of the Sankuls. This will provide facilities for students or alumni all across the State.

Establishing the C-i-C3s and execution of the Skilling Mission requires adequate support from various agencies like NSDC, CED etc. and the State Government.

The kind of work, which GTU is doing, has not been done by other universities. So the agencies have to be convinced about the credibility of GTU. This can only be done when the Government and GTU work together.

9. Technological Skill Development Center associated with Community Innovation & Co-Creation Centre (C-i-C3):

With the first C-i-C3 at Ahmedabad, we are going to establish a Telecom Skill Development Center in Fibre Optic technologies.

- GTU wants to add such Technological Skill Development Centers with every C-i-C3. (Please see <http://files.gtu.ac.in/circulars/14DEC/22122014.pdf>).
- This will help develop not only Skill Development but also ensure that every GTU graduate has state-of-the-art skill-set.

Establishing the C-i-C3s and execution of the Skilling Mission requires adequate support from various agencies like NSDC, CED etc. and the State Government.

The kind of work, which GTU is doing, has not been done by other universities. So the agencies have to be convinced about the credibility of GTU. This can only be done when the Government and GTU work together.

10. Centers of Excellence:

The first five Centers of Excellence are being built jointly with Bosch-Rexroth. It is proposed to have 25 Centers in different technologies so that when a student goes to an industry, he/ she would be aware of the kind of technologies, used today. Moreover the Centers will permit master's and Ph D students to use the facility for their thesis work.

Enhancing Practice Orientation & Infusing Start-up Culture.....continued on the next page

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

11. Graduate School of Smart Cities Development:

The School was inaugurated by **Shri M. Venkaiah Naidu**, the Honourable Minister of Urban Development on April 18, 2015. The Graduate School has offered training programs for municipal officers from 9 States. It is continuously organizing capacity-building programs for its 19 Research Partners. It is also offering e-courses on Smart Cities.

The School has been working on the concept of **Smart Villages** and **Smart Towns** under its **Graduate School of Smart Cities Development**.

12. Making MBA program more practice-oriented:

The process of linking real-life SME challenges with MBA students was initiated in August 2011, when the new Global MBA program was implemented. A sample of four out of 27 activities, taken up under the management program is as follows (The Reports of all the activities are available on GTU's web-site.):

- a) 16th April 2016: **Industry Pain Points and Solutions**: 52 SMEs participated and GTU's Management School is, at present, working on each of the issues to determine whether these could be sorted out along with the government so that industrial development may be faster.
- b) 5th & 6th February, 2016: 5th International Conference on **"Impact of Business Ethics, Governance and CSR on Society"**
- c) 9th and 10th October, 2015: **International Conference on "Ease of Doing Business"**
- d) 25th and 26th April, 2015: 3rd International Conference on **"Gujarat Model of Governance: Lessons and Future Scope"**
- e) January 6th to 8th, 2012: First International Conference on **"Dynamics of Global Recession and Economic and Corporate Strategies for Survival and Growth"**

(Please also see information about SME NURSERY on page 2.)

II. The Best of Learning Systems at GTU (pages 10-12)

1. Faculty Development:

GTU has the largest Faculty Development program in the country. Every week-end, GTU is humming with large groups of Faculty Members, participating in different programs.

2. Active Learning and Creating Excitement in the classrooms, laboratories and workshops (ALCE):

FDPs and Workshops are organized under this program. Under its Active Learning- Creating Excitement in the laboratories, workshops and classrooms (ALCE) project, GTU has put a special emphasis on

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

the learning of Mathematics. A great deal of work has been done on Faculty Development Programs for a geometrical visualization of partial differential equations and learning of Calculus through practical examples. Please see <http://files.gtu.ac.in/circulars/15SEP/29092015.pdf> for a new program of 40 hours for Calculus.

FLIPPED CLASS-ROOM PROJECT: Under ALCE, GTU has offered to support the **flipped class-room** project in a few colleges to make the learning systems at GTU more meaningful. (Please see http://files.gtu.ac.in/circulars/16JAN/Circular%20at%20GTU_Ver%202.pdf and http://files.gtu.ac.in/circulars/16Feb/09022016_01.pdf).

ALVCOM PROJECT: At every week-end, GTU telecasts for 4 hours lectures from the best of teachers for eight subjects of the first year classes, under its **Active Learning Video-lecture Communication (ALVCOM)** series. More than 1,045 hours of videos of these telecasts are available on YouTube at https://www.youtube.com/channel/UChNAV4wMylEu3QtV_QuKhig. There is a Facebook page of ALCE for students at <https://www.facebook.com/gtuactivelearning>.



'DESIGN YOUR OWN COURSEWARE' contest for the students has the objective of preparing the best of courseware for the GTU syllabi.

CONFLUENCE is a project, which is designed to change the way the question papers are set. The idea is that a good question paper should assess understanding of concepts rather than rote-learning. The project is now in its second year for engineering and in its first year for the MBA programs.

ATELIER PROJECT: This is a student-driven Boot-strapping effort for improving soft-skills (http://files.gtu.ac.in/circulars/16Feb/11022016_02.pdf) and employability. This has been added to the repertoire of earlier work for graduating out excellent graduates. The project is called ATELIER.

BLENDED MOOCs at GTU: GTU-MOOC is a blended MOOC/ e-education project, designed to strengthen the existing conventional teaching methodology adopted by the institutes by blending their learning systems with online MOOC/e-courses. The following strands have been working in tandem with ALVCOM at GTU:

For two semesters, starting with the 1st semester of 2015-16, using A-VIEW, a series of lectures were offered for EC students for the projects of 5th and 7th semesters: Three lectures a week were offered by using A-View by Dr Vital Kamat for students, pursuing projects for building embedded

MOOCs-The Best of Learning Systems at GTU.....continued on the next page

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

solutions on an ARM Cortex- M0+ platform, understanding I2C bus, peripherals such as state configurable timers, Switch matrix for reconfigurable I/O ports, switch mode power supplies, etc. The sessions focused on debugging, debugging tools, programming concepts such as In-Application Programming in Flash memory. Case studies of embedded applications with 'Smart features' were also covered.

Some of the other activities, designed to encourage the Colleges to use the available MOOCs were as follows:

- 27 July 2015: GTU decided to award Activity Points to students, who complete some MOOC courses
- 14 March 2015: <http://gtu.ac.in/circulars/14March/28032014.pdf>: EdX course on OSTC
- 15th Jan 2015: <http://www.gtu.ac.in/circulars/15Jan/MOOCs%20at%20GTU.pdf>: Faculty meeting on MOOCs
- 2nd Feb 2015: <http://gtu.ac.in/circulars/15feb/Students.pdf>, <http://gtu.ac.in/circulars/15feb/FacultyMembers.pdf> and <http://gtu.ac.in/circulars/15feb/10022015.pdf>: On taking advantage of IIT Bombay's Blended MOOCs in Signals and Systems (2141005), Computer Programming and Utilization (2110003) and Engineering Thermodynamics
- 14 Feb 2014: http://www.gtu.ac.in/circulars/14Oct/The3rdGTUUSD_October_2014.pdf: Dr. Hiteshkumar Nimbark, Director OM Engineering College, was given an award for using MOOCs and NPTEL courses for quality education

The basic issue for MOOCs is of non-availability of an 'authentic' degree to those, who take the courses. Degrees have been used, during the last 158 years to give structure and meaning to the process of learning. To move in the direction, GTU has taken the following steps:

1. By making learning through MOOCs as a part of the 100 Activity Points, a tenuous relationship with a degree has been established.
2. For the e-courses of the Graduate school of Smart Cities Development, GTU is proposing to offer a Diploma, after GTU is able to have a good number of courses in this field.
3. For the e-courses in IPR, GTU is proposing to offer/ offering Certificate and Diploma courses.
4. When UGC and AICTE permit a greater flexibility to universities, which are supposed to be autonomous, GTU may consider offering degree programs through the blended MOOC route.

The issue for State Universities is of hiring top-rated technicians, who can continuously keep the systems operational, efficient and user-friendly, in a world where the definition of the word and expectations from user-friendliness are up-graded with new technologies and devices continuously. When the State Universities are permitted to hire adequately paid professionals, by using their autonomous status, this issue may be resolved.

Note: MOOCs are referred on page 2 in Minor in Technology Entrepreneurship and on page 6 in Design Thinking.

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

- 3. Nurturing the Next Generation: Value-Based Education:** GTU has been working for Value Education and for transforming the attitudes of students for better work-ethics and social responsibility. GTU has designed and implemented a course called '**Contributor Personality Development Program**' for offering value-based education. The course was basically designed by Illumine Inc for re-training of SBI staff. They re-designed it for GTU. The program has been running in GTU since 2012 for 5 streams (i) B.E. (ii) Diploma Engineering (iii) B. Pharm. (iv) MCA and (v) M.E in 334 Colleges. For teaching this transformational course, GTU put in place a large Faculty Development Program (FDP), called **Swami Vivekanand FDP (SVFDP)**. SVFDP was supported by Adani Foundation and was executed by Illumine Inc, Mumbai. Since 2012, this course has been offered to more than 400,000 students.

III. Internationalization

GTU has, by far, the largest Internationalization program in the country.

- Since 2011, GTU has been sending, during every summer, groups of students to foreign Universities for 6- 8 weeks. During 2016, students of MBA, Electrical Engg have gone for summer study to a German University. The students of EC and of Mech Engg are studying two subjects each at a University in USA. Students of B Pharma and IT/MCA/Computer Engg have gone during the summer to a University in Canada and students of Civil Engg are at a Russian University.
- For the last three years, a group of about 20 students and two Faculty Members from **DHBW (university) Stuttgart** have been spending two weeks at Management colleges, affiliated with GTU. The students study various issues relating to India's business environment.
- During 2015-16, 297 foreign students from 40 countries are enrolled with GTU for its programs in engineering, management and pharmacy.
- Under the Global Country Study (GCS) Program, GTU students study a 2-semester course on one country. In all **110 countries** are studied by our students. **During the last few years, the ambassador of more than twenty countries have visited GTU. GTU celebrates the national days of many of these countries.** This is, by far, the most intensive country study program by any university in India.
For the students of different Colleges, GTU plans to establish an innovative **School of Languages**, which should be able to help the students of the affiliated university by use of ICT.
- GTU attempts to have eminent Professors from good Universities as Co-Supervisors for its doctoral students. Such Professors are appointed as Adjunct Professors at GTU. 63 of the Adjunct Professors are from universities in USA, Canada, China and Europe. One is from IIIT,

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Allahabad. (The Doctoral program at GTU was started on 30th September 2011.)

- The Post-graduate Research Center for Global Business Studies has three regional study centers: Indo-German Study Center, Indo-Canadian Study Center and Indo-East Asian Study Center.
- Since 2013, GTU has been organizing an **Annual Afro-Asian Conclave** for helping improve our studies in the GCS Program.

IV. World-Class Doctoral and Master's thesis work and networked Research Projects

(pages 13-16) Fourth out of VII parts

1. Annual Research Week and other innovations:

GTU has set up a target that the Master's and Doctoral theses approved by GTU for the award of degrees should be, on the whole, as good as those at any good University of the world.

It has therefore started implementing the concept of an open and centralized review of literature survey and defence. The third concept is of Research Week for reviewing the work on theses, every year through experts. Experts from all over India and some from outside India come together to review the work of research students of GTU. All the students are required to make a presentation in an open forum. Since 2012, Gujarat Technological University has been conducting the Research Week for the Master's and Ph.D. students of Engineering, Pharmacy & Management streams. More than 500 senior professors and experts from all over the country and some from foreign countries are invited to review the work of students during every Research Week.

While the morning sessions, from 9 AM to 2 PM, are review and mentoring sessions, the evenings are used to organize more than 100 different Workshops by the visiting experts from IITs, NITs, Central labs, Industries and some other reputed educational institutes like NIPER from India and some from outside India. Tens of parallel review sessions in different sub-fields in the morning and a number of workshops in the evening make the Research Week look like a Kumbh Mela of experts and researchers. It is aimed to inculcate the habit of questioning and also provide a platform for budding innovators and researchers to become acquainted with the state of art technology through various workshops organized during research week form experts across the country and world

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

2.Kotler's Incubator for Ayurvedic Medicines (GTU-k-IAM):

World Marketing Summit (WMS) is an initiative of World's most influential marketing Guru Professor Philip Kotler with the mission of creating a Better World through Marketing. GTU has been assigned 'Health' as a topic for incubation, with **Kellogg School of Management, Northwestern University, Illinois, USA as the mentor.**

At GTU, the project was launched on 5th May 2012 in the presence of Shri Jaynarayan Vyas, the then Cabinet Minister, Government of Gujarat. The project is designed to help begin research in Marketing at the affiliated Colleges. It is also designed to establish working teams of researchers located at different locations.

Universities in India will be able to become great only through bootstrapping based on collaborative working. Hence this project is an experiment, which aims at inculcating a culture of research, where none existed and to create teams of researchers for achieving a common objective.

3.ORGANIZATION OF RESEARCH WORK at GTU:

GTU is an affiliating-type University. GTU's research structure has been organized in 3 tiers.

3.1 The **Post-graduate Research Centres** work as catalysts for infusing the spirit of innovation and research among the Gujarat Technological University (GTU) community, through actively involving Faculty Members of Engineering, Architecture, Planning and Management and post-graduate students in research and development. The Centres are supposed to encourage Faculty Members and research students to apply for research grants and establish research laboratories.

The Centres are to establish active linkages with the industry and research institutions in India and abroad.

The Centres also aim to become institutional 'public intellectuals' or independent think-tanks to which scholars of the whole world should be invited and where they would like to come to expound their ideas to a receptive, knowledgeable but critical audience.

GTU has instituted 14 Research Centers.

Graduate School of Smart Cities Development is associated with the Center for Infrastructure, Transportation and Water Management.

3.2 The **Research Groups** are associated with the Research Centers. Every Group is designed to involve researchers and Faculty Members in all the Colleges in research in a hub-and-spoke model, with the Center working as the coordinating hub. GTU provides all the necessary infrastructural support to the Research Groups for organizing seminars, workshops,

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

conferences and expert lectures. The objective of the Seminars, Workshops and Conferences is to build a culture of research and raise the levels of work through interactions with the outside world.

Thus for a conference on '**Ease of Doing Business**', organized on 9-10 October 2015, three steps were taken.

Many months before the conference, 15 micro-areas were selected by the Professors at the Research Center and the Colleges.

About three weeks before the last date for submission of papers, the professors were invited to a meeting at GTU for learning through inter-action within the GTU community. The papers, which were selected were presented at the conference, where many researchers from all over the country presented their work.

Three weeks after the conference, the Professors at the Research Center and the Colleges again met to see how the research work can be carried forward.

Thus every single seminar, workshop or conference is designed to help our researchers improve essentially through boot-strapping but with some triggers from the inter-actions with others.

There are 16 Research Groups.

Meetings of these Research Groups are happening through Google Hangout to discuss collaboration in research.

3.3 The **Research & Development Boards** are for involving the Faculty Members and research students with the whole of the society. There are four Boards at GTU.

3.4 COLLEGES AS RESEARCH PARTNERS: GTU **Graduate School of Smart Cities Development** has 19 Colleges as its Research Partners. The Smart Cities technologies are multi-disciplinary in nature and the different departments of every one of the Research Partners are working on different aspects of technologies.

A similar system is being worked out for the proposed **Graduate School of High Speed Railroad Transportations**.

The Research Partners along with the Graduate School strengthen the School and encourage research work in the Colleges, which have joined as Research Partners.

4. Other Networked Research Projects:

As in the Kotler's Incubator, GTU is encouraging joint research by Colleges so that active groups of researchers can be formed:

- 4.1.1 **GTU Board for Mobile Computing and Wireless Technology:** issued a Request for Collaborative Research Proposals (RCRP) in the area of Mobile Computing, Networking and Applications (MNA). (Please see URL: http://gtu.ac.in/circulars/11DEC/MNA_RCRP.pdf).

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

4.2 Two Joint Research Projects with a German University: On 16th August 2012, GTU has joined on two research projects, for which the Chief Investigators are Professors Dr. Friedrich Augenstein of DHBW Stuttgart, Germany and Dr. Ramesh Shah from DHBW. The two projects were developed in Germany but are of equal interest to India.

On 28th and 29th November 2012, GTU organized two workshops on (i) Survey on Cooperation Management and (ii) Indo-German Business Activities- Dos and DON'Ts. Dr Ramesh Shah was the Resource Person for the two Workshops.

4.3 Five Joint Research Projects in HR: (Mentored by Dr T. V. Rao of IIM, Ahmedabad and some leading professionals from the industry): Through a participative mode, FIVE areas of Research were shortlisted through consensus namely;

- (i) Employee Engagement, Commitment and Satisfaction: Defining Patterns and Indicators in Schools and Banks
 - a. Shri M V S Murthy – Head –HR & LD at FVRL (Technical Services), Future Group, whole heartedly declared his support in all possible forms, throughout the research work.
- (ii) HR and OD : Needs and Practices (People related issues) of MSMEs
- (iii) Innovative HR practices in IT industries and IT based departments where again Shri M V S Murthy – Head –HR & LD at FVRL (Technical Services) , Future Group, whole heartedly declared his support in all possible forms, throughout the research work.
- (iv) 360 degree feedback in small scale industry – the power of 360 degree feedback
- (v) HR in public services like community hospitals, schools like HR Needs, Competency Mapping etc.

5. Common Pharma Research Lab: GTU will set up a common sophisticated research laboratory for pharmaceutical sciences for common use by the researcher.

V. Re-Imagining a University and Innovations in the Normal working at GTU

1. A Research project on Designing the Structure of a University for the India of the 21st Century (DSTU):

India has universities modelled on the University of London of 1850s. These are affiliating-type universities, which cater to about 94% Of students in higher education. The first three were started in 1857.

We have universities modelled on the MIT model, as decided by the Sarkar Committee,

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

appointed by the Viceroy's Council. The Report was received in 1946. The first IIT was established in 1956. By 1963, the number of IITs was six. Now we have 16 IITs. We have established NITs, NIPERS, IISERs, IIMs and IISc.

In 1960s agricultural universities were started on the Land Grant model. We have a large number of deemed and private universities, based on the model of single-campus universities, which exist in USA.

In all we have 734 universities. This large country must have had many intelligent persons as Vice-Chancellors. There must have been many good administrators with passion for education and with a burning desire to offer quality education to the young as Directors of Higher Education.

If since 1857, no university in India has been able to attract good students from the whole of the world for study and if no good scholar has been attracted to our shores to work in any of our universities, there must be some structural issues.

Looking to the future, GTU decided to do research in the kind of structure we should have in higher education so that after 1196 (the year when Nalanda was burnt down) we may again have a university, in which we may be able to take pride. Till now the Research Project has organized seven plenary sessions in which more than 150 Vice-Chancellors, Deans and educational thinkers from outside Gujarat and many from Gujarat have participated. **The project has led to the development of an indigenous policy framework for higher education, which can lead to a higher education system, which may be able to satisfy the requirements of India and the world during the 21st century.**

2. Innovative methods of designing syllabi through a five-step process:

- (i) determining needs of industries, businesses and others through extensive surveys and seminars
- (ii) designing the syllabi
- (iii) Validation seminars where the syllabi are presented to the stake-holders from industries, businesses and other organizations
- (iv) extensive Faculty Development Programs and
- (v) External evaluations, after the new syllabi have been delivered at least two times.

For our new Global MBA program, which we implemented in August 2011, the evaluation is proposed to be done through Management Associations of Ahmedabad, Vadodara, Rajkot and Surat. For the '**Contributor Personality Program**', the evaluation has been done by Indian Institute of Teachers Education.

The Diploma in engineering program syllabi have been redesigned after an extensive survey of the needs of more than 1,000 industries. The syllabi were designed and the pedagogical help was taken from National Institute of Technical Teacher Training and Research, Bhopal. The syllabi were validated by five conferences, to which professionals from various

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

industries were invited to have a careful look at the syllabi. The new syllabi have been implemented in August 2012.

VI. GTU Post Graduate School

GTU PG School at BISAG:

When it was found that the facilities for Laboratories and class-rooms for GTU would take time, GTU requested for a facility at BISAG and it started four courses:

- M.E. Computer Engineering (IT Systems & Network Security)
- M.E. Computer Engineering (Wireless & Mobile Computing)
- M.E. Computer Engineering (High Performance Computing)
- M.E. Electronics and Communication Engineering (VLSI & Embedded System Design)

These courses have been designed so that there should be zero-industry-academia gap. The courses are taught by CDAC experts from Pune, Bangalore, Trivandrum, Chennai and Calcutta.

GTU is also working with Texas Instruments , DRDO, IBM etc to develop more such programs.

VII. Creating a Complete University System

1. Annual Leadership Summits:

For the last five years, GTU has been organizing a summit for HODs and Principals/ Directors to discuss the issues of leadership, responsibility and accountability. Unless Colleges and Universities have leaders, who can take responsibility and who can provide good leadership, the institutions cannot make progress.

2. Integrated Training & Placement (ITAP) Cell:

It has done excellent work wherever the Colleges work together under the umbrella of GTU. Thus ITAP has worked very well for Pharma students since more than 40 teachers from different Colleges work together to make every Pharma Job Fair a success.

The success of the five large Pharma Placement Fairs have led to a change in the market perception of the Pharmacy program and the number of students, opting for the Pharmacy programs, has increased dramatically in 2016.

The program of Dewang Mehta Awards is organized by NASSCOM, with the help of ITAP every year.

3. TechFest, Youth Festivals and Sports Festivals:

For each one of the three Festivals, the competitions are organized in every zone. Then an inter-zonal competition is organized at Ahmedabad. More than 10,000 students participate in each

Innovative Initiatives by GTU

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

of these festivals. Teams are selected from these competitions and are sent for participation in AIU festivals.

4. GTU Conferences, Workshops and Seminars:

These are designed for improving the quality of GTU's educational programs or research by bringing experts for an inter-action with our Faculty Members and researchers.

Or these are designed to upgrade our knowledge system by bootstrapping. Thus for a recent conference, many months before the conference, 15 micro-areas were selected by the Professors at the Research Center and the Colleges. About three weeks before the last date for submission of papers, the professors were invited to a meeting at GTU for learning through inter-action within the GTU community.

The papers, which were selected were presented at the conference, where many researchers from all over the country presented their work. Three weeks after the conference, the Professors at the Research Center and the Colleges again meet to see how the research work can be carried forward. Thus every single seminar, workshop or conference is designed to help our researchers improve essentially through boot-strapping but with some triggers from the inter-actions with others.

5. GTU: Leader in Examination Process:

GTU's examination process is leading in the use of computerized systems. Progressively such systems go on becoming larger and demands of users go on increasing. However to sustain such large systems with good security, integrity and efficiency requires competent System Analysts, Data Base Administrators, Network Administrators, Security Specialists and System Architects.

7. GTU Motor sports & GTU Robocon:

GTU has brought many colleges together for programs like GTU Motor sports , GTU Robocon etc. This leads to huge co-creation across colleges and pedagogically it brings in spirit of innovating together.

8. CEOs in the Classroom and Entrepreneur-in-Residence:

Programs like CEOs in class room etc have brought external industry experts to GTU classrooms which in turn has motivated students to work more on real life issues and adopt suitable ways to deliver global standard output.

9. Relationship with Defence Studies:

EME School Vadodara has been affiliated with GTU for defence-related programs of study.

10. Research & Consultancy Services Cell:

Through RCSC , GTU has developed a window for providing consultancy services to various public and private sector units by using its in house talent pools of researchers and academic support systems.