INFRASTRUCTURE AND FACILITIES

Central facilities are being developed in the Institute to be used not only by a specific group but also by the entire IITGN community. Some of these facilities, for example the library, are open to outsiders as well. Currently, the following facilities are functioning:

- Library
- Computer Centre
- Medical Centre
- Laboratory Facilities
- New Buildings

Library

The Central Library of IIT Gandhinagar is being developed to make it one of the best libraries in the area to attract scholars in different fields from all over the country. The Institute liberally allocates funds to meet and exceed the teaching and research needs of the students and faculty. Sufficient copies of text and reference books are procured for the courses offered. Other books of interest to students, staff and faculty are also readily acquired. The library ordered about 1700 books during the year 2010-11. The library has an arrangement with IIT Bombay and IIT Kanpur to obtain books and journals on loan from their library. Most of the reputed research journals are now available through on-line resources such as Annual Reviews, American Chemical Society, American Physical Society, ASME, IEEE, JSTOR, MathScinet, Science Direct, and SpringerLink. All these journals can be accessed through the library's home page, which also provides easy access to open databases, public access catalogues and directories. IITGN is an institutional member of the American Mathematical Society (AMS). Feasibility of subscribing to other journals is under review. Many popular science journals, news magazines and Indian journals, not available on-line, are received in print edition. The library sends regular emails to users on new arrivals, status of requested books, faculty publications and complimentary newsletters.

The Library is open from 9:00 AM to 10:00 PM on working days and till midnight during the examination. The circulation service is available to all students, faculty and staff from 9:00 AM to 6:00 PM. Other individuals and organizations can also become authorized users to avail the facilities. Facilities for photocopying and printing are available to everyone.

Computer Centre

Computer facilities at IITGN have been developed with high-end hardware, a wide range of software and excellent connectivity so that students, faculty and staff can carry out their work without interruptions. They can view and download information efficiently for their research, home assignments and other scholarly activities. The LAN setup integrates the entire IITGN community into a single unit. The Institute premises and the student hostels are Wi-Fi enabled. This allows one to connect to the internet from anywhere within the Institute. Over 50 PCs are available to the students in a common Computer Laboratory for programming and other purposes. The Computer Laboratory is also used for teaching. All faculty members and research scholars have been provided with individual PCs and printers with scanning and photocopying facilities. A few high-end printing and photocopying machines are available for communal use. Individual email accounts have been provided to IITGN students, faculty and staff with the facility of sending bulk email to common groups, for example, sending home assignment to students in a course or to students in a particular branch and year. Important scientific software such as Mathematica, PSCAD 4.2, STATA 11.1, AutoCAD have been procured.

Medical Centre

A qualified medical practitioner (M.B.B.S., Diploma in Medicine, Fellow Infectious Diseases, Italy) is available on the Institute premises for several hours on working days to provide medical advice to students, staff and faculty. The doctor can also be consulted at her clinic as well as at the Life Care Hospital situated nearby. Hospitalization expenses of all students are covered under a medical insurance policy. A trained male nurse is available full-time to provide emergency first aid and for routine medical services such as checking temperature, blood pressure, blood sugar, oxygen level and dressing of wounds. He dispenses many common medicines stored in the medical room, against the doctor's prescription or through phone consultation. He also assists in maintaining medical supplies and keeping medical records. An Electrocardiogram (E.C.G) machine has now been added to the other diagnostic facilities for the doctor's use.

Laboratory Facilities

Laboratories are an indispensable component of engineering and science education. The laboratory courses are designed for the students to practice principles taught in the theory courses, and also to get hands-on training on basic machines and tools. In addition, the laboratory facilities are required by the students and faculty to carry out experimental research and development work. The current status of the Institute laboratories is outlined below.

Chemical Engineering

All Chemical Engineering undergraduate students are required to take a laboratory course in each semester from 3rd to 7th semester. The Chemical Engineering laboratory, with an area of 165 sq. m., includes experimental set-up on Unit Operations, Reaction Engineering, and Process Dynamics. The current facilities include Double pipe/Coiled/Plate/Fluidized/Fin-Tube Heat Exchangers, Chemical Reactors, Differential distillation set-up, Packed-bed absorption column, Sieve-plate distillation column, Interacting/non-interacting tanks set up (all from Shree Fabricators and Engineers), Calorimeter and refractometer (both from Scientific Products India), and Batch dryer (from Technical Education, Bangalore). The laboratory also has several set-ups to demonstrate the basic principles of fluid flow such as flow measuring devices, centrifugal pumps and pipe fittings apparatus. The facility is being further expanded to include experiments based on Process Controls and Advanced Separation Techniques.

The present Chemical Engineering faculty has research interests in the fields of Particle Formation for Drug Delivery, Biochemical Engineering, and Systems Biology. An area of 155 sq. m. has been provided for their research activities. A Particle Size Analyzer (Coulter Private Ltd) and an Optical Microscope with Camera facility (Nikon) have been procured to build a Particle Formation research facility. A Freeze dryer (Martin Christ), Zeta-sizer (PSS NICOMP) and Peristaltic Pumps (Watson Marlow) have also been procured. A particle size analyzer to characterize gaseous micro-bubbles and liquid drop suspensions and high pressure vessels for particle formation using high pressure CO_2 have been ordered. A High Pressure Liquid Chromatography (HPLC) system (Waters), a Gas Chromatography (GC) system (Perkin Elmer), Fermentor (Sartorious), Microplate Reader (TECAN), Polymerase Chain Reaction Thermocycler (Eppendorf), Deep Freezer (-86˚C) (Thermo Fisher Scientific) and other basic biology laboratory utilities have been procured for Biochemical and Biomolecular Engineering research.

Chemistry

A laboratory course in Chemistry is compulsory for all undergraduate students. The chemistry lab is housed in an area of 115 sq. m. and allows the students to practice the principles of organic, inorganic, and physical chemistry taught in the theory class. The current experiments include estimation of calcium in commercial milk powder, estimation of salts in given salt solution using titration techniques, inversion of sucrose using a digital polarimeter, complex formation reactions using colorimeters, electrolytic conductance experiments with Conductometers, basic chromatographic separation techniques utilizing Thin Layer Chromatography, measurement of energy of activation using principles of chemical kinetics, Organic Synthesis (Aldol Condensation & Diels-Alder reaction) experiments emphasizing the importance of green chemistry.

The present faculty research interests broadly encompass Organic and Inorganic chemistry disciplines. Present research efforts are concentrated on porphyrin macrocycle synthesis for molecular recognition applications and synthesis of π-conjugated organic molecules for photophysical and photochemical studies. Instrumentation such as UV-Visible Spectrophotometer (Shimadju), Rotary Vacuum Evaporators (Buchi), NIR-Spectrofluorometer (Horiba Jobin Yvon Inc), a quaternary High Pressure Liquid Chromatography (HPLC- Agilent), Digital Polarimeter (Rudolph) and General chemistry research facilities like TK water purification system, analytical balances (Mettler-Toledo), magnetic stirrers, fume hood, recirculating chillers, hot air ovens, air and vacuum Schlenk lines have been procured and installed.

Electrical Engineering

The Department of Electrical Engineering currently offers one laboratory course to all undergraduate students and five additional laboratory courses to only Electrical Engineering undergraduate students. Laboratory facilities for all courses are located in an area of 300 sq. m. Experiments include basic studies of characteristics of semiconductor devices, active filters & Schmitt trigger, digital circuits, building counters & shift registers, timer circuits and analog-to-digital converters, microprocessor- and microcontroller-based experiments, characteristics of electrical motors and generators, speed control of motors, synchronization of alternator with infinite bus or another alternator, performance of various power electronic converters.

The laboratory facility includes Xilinx FPGA kits and ISE software that are being used for several undergraduate laboratories and project work. The laboratory is equipped with ARM, PIC controller, AVR and microcontroller boards, digital storage oscilloscopes, digital multi-meters and IC testers, universal IC Programmer, ScopeCorder, Precision Magnetics Analyzer and all other electrical engineering laboratory utilities. In addition, the Power Systems Simulation Laboratory has PSCAD software licensed for 25 nodes.

The current Electrical Engineering faculty has research interests in Image Processing, Power

Systems, Renewable Energy, VLSI and Fibre-optic sensors. The current research facilities include transformers of different winding geometry. IITGN has collaboration with Cadence under its University Programme. The VLSI design research and development work greatly benefits from this collaboration through the availability of many tools and facilities provided by Cadence. A Fibre-optics lab is also being developed for research in the field of optical sensor technology.

Mechanical Engineering

The Department of Mechanical Engineering currently offers five undergraduate laboratory courses. All first year undergraduate students are required to take a laboratory course on Workshop Practice. The Manufacturing Laboratory, in an area of 110 sq. m., has facilities including lathes, milling machine, vertical machining centre, electric discharge machine, welding, fitting and tin smithy equipment. The Manufacturing Laboratory is also being used for two laboratory courses on Manufacturing Practices and Processes for second and third year Mechanical Engineering students. It is also being used as a workshop for fabrication of undergraduate student projects as well as equipment and accessories related to research. Coordinate measuring machine (CMM) and profile projector have been acquired as part of Advanced Manufacturing Laboratory (AML). A rapid prototyping machine, CNC lathe, and CNC milling machine are on order. An associated Mechanical Systems Design Laboratory (MSDL) is also being developed.

All second year Mechanical Engineering students are required to take a laboratory course on Solid Mechanics and Experimental Stress Analysis. The laboratory, in an area of 70 sq. m., has two MTS Universal Testing Machines of 100 kN and 200 kN capacity, Charpy impact testing machine of 450 J capacity (MTS), torsion testing machine (500 Nm) and Rockwell and Vickers hardness testing machines (Zwick Roell), and a fatigue testing machine.

The third year Mechanical Engineering undergraduate students are required to take a laboratory course on Fluid Mechanics and Fluid Machines. The laboratory has an area of 155 sq. m., and has setups for conducting experiments on fluid statics and fluid dynamics. Several common turbo machines such as gear pump, centrifugal pump, Pelton wheel along with various flow measuring devices and accessories have also been installed. A wind tunnel and a water tunnel for teaching and for basic research have been built in-house, and are being commissioned.

The current Mechanical Engineering faculty research interests include Aerodynamics, Flight Mechanics, Fluid-Structure Interaction, Polymer Composites, Dynamics and Control of Fluid-Thermal Systems, Hydrodynamic Stability and Computational Modeling of Engineered Systems. The Manufacturing Laboratory and the Solid Mechanics and Experimental Stress Analysis Laboratory include many fabrication and testing facilities required for research projects. The facilities are currently being expanded.

Physics

All first year undergraduate students at the Institute are required to take a laboratory course in basic physics. The laboratory consists of a room for general experiments and a dark room. There are 12 experiments covering Optics, Electricity and Magnetism, Modern Physics, Thermodynamics and Classical Mechanics. The procured equipment include Grating Spectrometer and Fresnel's Biprism with optical bench (Indosaw), Newton's Rings (Holmarc), Frank Hertz Experiment and Planck's constant (Scientific Equipments India Ltd). The equipment that were fabricated pertain to the Helmholtz Coil experiment and the Thermistor Characteristics experiment. Four sets of all experimental equipment are available to the students for hands-on experience. Apart from these experiments, the Physics laboratory also has Moving coil galvanometers (spot reflection type and suspended mirror type) and compound pendulum experiments. Cathode ray oscilloscopes (Scientech, Scientific and Aplab), Signal generators (Scientech, Scientific), DC power supplies and several optical components are available for use in many experiments.

Three new experiments that were recently added include Universal B-H Curve Tracer, Dielectric Constant (Mittal Enterprises) and Measurement of e/m by Thomson method (Besto). The first two are based on the concepts of Electricity and Magnetism and the third is based on Modern Physics.

The students of IIT Gandhinagar, in collaboration with the Inter-University Center for Astronomy and Astrophysics (IUCAA) Pune developed an astronomical telescope, which is being used for general sky observation by IITGN students. An experimental kit (electricity, magnetism and thermodynamics) prepared by the Indian Academy of Sciences, Bangalore is also available in the Physics laboratory.

The present Physics faculty have experimental research interests in the areas of High Pressure Raman and Infrared Spectroscopy of novel materials and ferrofluids. The research equipment already procured include a Cone/Plate Viscometer (Brookfields, USA), a Thermal Conductivity Measuring System LAMBDA (F5 Technology, Germany), pulsed field magnetometer (manufactured locally) and other facilities used for wet chemistry research. An AC susceptometer for magnetic measurements is being fabricated.

New Buildings

Two new temporary buildings, each with an area of 1000 sq. m., have been built by the Institute on the VGEC campus through the CPWD. The construction of these buildings was carried out on a war footing in order to house expanded laboratory facilities, provide office space to faculty and research scholars and meet the requirement of new class-rooms. Another building with an area of 2010 sq. m. is under construction.