Dare to Imagine beyond conventional Engineering and Technology?? If yes, opt for

B.Tech (Engineering Physics) @ DTU

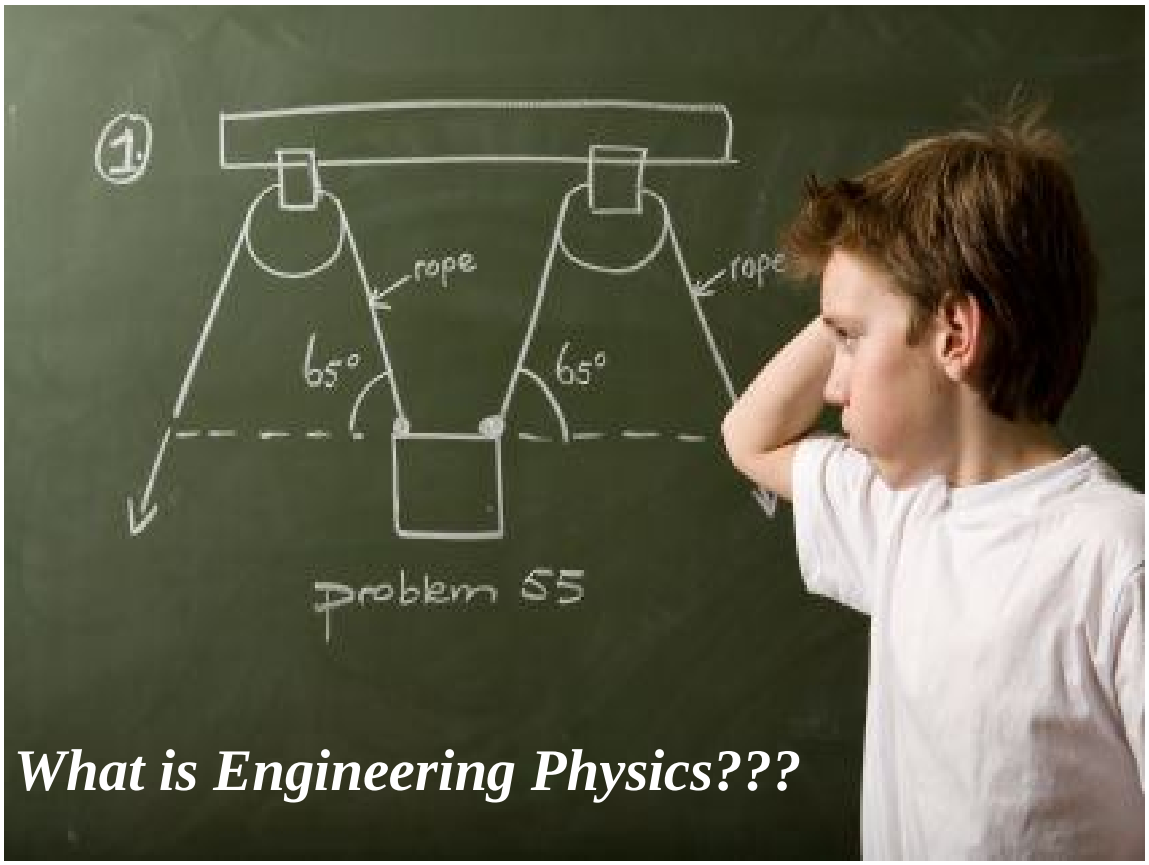
The Program

B.Tech. (Engineering Physics) was introduced in 2009-10 and is designed for students who have an interest in and an aptitude for both engineering and physics ranging from system oriented thinking to problem solving skills. B.Tech. (Engg. Physics) offers a multidisciplinary graduate program spanning engineering and physics in which fundamental physical principles are used to address research issues of technological importance at the frontiers of engineering and science that govern the modern day technology. Engineering Physics couples both the pure sciences and engineering, making it possible for students to have a wide interest in the application of modern physics to technology and new product development, without losing close interaction with " Core Subjects".

In Europe and USA, Engineering Physics UG and PG courses are available since long. Engineering Physics at reputed US universities such as Stanford, Princeton, UC Berkeley and Cal Tech etc. is one of the most selective and advanced engineering programs offered and is one of the most sought after academic program among the generations of young and bright students. In India, B.Tech Programme in Engineering Physics is currently available at four IITs - Bombay, Delhi, Madras, Guwahati, IT-BHU and at NIT-Calicut.

The program provides students with a firm foundation in physics and mathematics, together with engineering design and problem-solving skills where creativity and ingenuity knows no bound. This background prepares students to tackle complex problems in multidisciplinary areas that are at the forefront of technology in 21st century, such as solid state devices, quantum optics and photonics, mobile and satellite communication, material science, nanotechnology and other engineering fields like Robotics and Intelligent systems that require a very solid background in physics. Many employers value this unique problem solving approach of Engineering Physicists, especially in industrial research and development areas.

Our students will be well equipped to pursue careers in research and development as well as emerging technologies that cut across traditional engineering and science disciplines, or to enter professional fields



What is Engineering Physics???

Engineering physics blends courses from engineering, physics and mathematics to build an understanding of how these interact and support each other. It enhances the knowledge of the physical environment while discovering how physics is applied to problem-solving in our rapidly changing high-tech world. The engineering physics curriculum is designed to fulfill the educational requirements for professional work in various fields of applied sciences which are based upon a thorough knowledge of physics and foundation of basic scientific principles, as well as the theoretical knowledge and skills required for specific engineering applications. Engineering physicists perform research and development in various industries pertaining to fields of telecommunications, microelectronics, micro devices, lasers, nanotechnology and optoelectronics; and is an important career option.

An engineering physics graduate amalgamates engineering with the theoretical concepts and hence, is well equipped for a range of challenging job opportunities, such as scientific positions as Research and Development ("R&D") Engineer at high-end technology and knowledge based industries. Engineering Physics graduate of DTU will be a highly trained professional for national R&D laboratories and universities, where creativity and intellect are the top priority. Engineering Physics graduates also have wide options of entering into higher degree programs and adopt research as a career and will pave the path of futuristic technologies in and around the established contemporary disciplines:

- Electronics and communication technology
- Micro and nano electronics
- Micro-electro-mechanical systems (MEMS)
- Quantum information systems
- Nano-system engineering
- Nuclear engineering
- Optoelectronics
- Material Science
- Semiconductor and superconducting devices
- Robotics and intelligent systems
- Material Science

Why Engineering Physics?

B.Tech.(Engg. Physics) is for the students having interest and aptitude for both engineering and physics i.e. willing to understand the physical world and aspire to bring about new technological breakthroughs and innovations.

During the duration of the course , students will get opportunities to do projects with faculty with very diverse interests, advanced research labs coupled with sizable funding for research, permits the study of a wide range of subjects, including unconventional electronics, photonics, wave-function engineering, micro & nano fabrication, lasers and optics, superconducting devices, computational condensed matter physics, bio physics, materials physics, microcontrollers, FPGA Design, polymeric materials and so on..

If you have a passion for physics and enjoy solving practical problems, a career in engineering physics offers a great deal of flexibility, and often places you on the frontiers of research and technology design in fields pertaining to telecommunications, microelectronics and microdevices, lasers, nanotechnology, optoelectronics, quantum information systems.

Curriculum

The Engineering Physics curriculum has 240 credits which include the credits of humanities and basic sciences, core physics and allied engineering. The Engineering Physics program provides a balanced curriculum emphasizing 1) physics and engineering principles with design, 2) diverse hands-on experiences to prepare the Engineering Physics graduate for the demands of laboratory and 3) strong communication and team working skills through various seminars and live-projects. The Engineering Physics core covers nearly all the basic areas of physics with a special emphasis on the applications of principles of Physics.

- Classical Mechanics
- Quantum Mechanics
- Computational Methods
- Condensed Matter Physics
- Atomic & Molecular Physics
- BioPhysics
- Solid State Physics
- Photonics
- LASER Physics

The curriculum is designed to offer majors in Electronics and Communication Technology and hence a good number of electronics and communication courses at advanced level have been incorporated.

- Digital Electronics
- Signals & Systems
- Microprocessors & Interfacing
- Electromagnetic, Antennas and Propagation
- Semiconductor Devices
- Instrumentation and Control
- Communication Systems
- Fibre Optics and Advanced Optical Communication
- Microwave Engineering
- VLSI & FPGA Design Synthesis
- Mobile and Satellite Communication

The programme is redesigned in such a way that a student can tailor the programme to suit individual interests by selecting from a list of courses i.e. the electives offered by the department. While students are free to choose the electives, we encourage them to select one of the following preconfigured 'concentrations': NanoScience and Technology, Photonics, Robotics and Intelligent Systems; and Nuclear Engineering so that they can have a sort of dual specialization in terms of Majors and Minors.

MINORS (Electives)

1. Nano Science & Technology

- Material Science: Materials For Engineering Applications
- Nano Material Growth Techniques and Their Applications
- Selected Topics in Nano Science and Technology
- Materials Growth/ Characterization Lab

2. Photonics

- Photonics
- Quantum Electronics/Integrated Optics
- Selected Topics in Photonics
- Photonics Lab

3. Robotics & Intelligent Systems

- Introduction to Automation and Motion Control
- Mechatronic System Modeling
- Selected Topics in Robotics and Intelligent Systems
- Robotics Lab

4. Nuclear Engineering

- Principles of Nuclear Engineering
- Materials science for Nuclear Engineering Applications
- Selected Topics in Nuclear Engineering
- Nuclear Applications Lab

The Engineering Physics curriculum is modeled to give a degree in B.Tech. (Engineering Physics) with Major Specialization in Electronics and Communication Technology and Minor Specialization in any one of the four i.e. NanoScience and Technology, Photonics, Robotics and Intelligent Systems and Nuclear Engineering

Where does Engineering Physics lead to?

In India, Engineering Physics graduates can get employed in the telecommunications, photonics, optoelectronic and electronics, nano technology industry, etc. Central research institutes and leading national labs (DRDO, CSIR, ISRO), high technology institutes, firms and the resource industries find these graduates indispensable in their scientific human resource power. Besides they would be a much sought after resource in the R&D labs of cutting edge technology firms let alone the software industry.

New technologies are emerging rapidly in the areas of VLSI, Holography, Optical Data Storage, Optical Communication, Photonics, Quantum and Nano Electronic Devices, Nanotechnology, MEMS, Spintronics, MRAM, Magnetic Data storage, Optical Computing, Quantum Optics, Fiber Optics, Information Technology, Super lattices, Lasers and their application in Plasma Processing, MHD, Fusion Devices, Neural Networks, Space science & Engineering, Environment Technologies and Biomedical applications. Many of these specified areas have been well received by the industry and a strong urge is being felt for manpower specifically trained in such broad based areas to take-up new design concepts and production. These areas also offer excellent opportunities to entrepreneurs who can apply innovative concepts to future developments.

In the global job market also Engineering Physics graduates have promising opportunities. For instance, in US about half of the Engineering Physics graduates take positions in high-technology industries, at starting salaries at the top end of the salary scale for engineers. The other half of the graduates continue on to either graduate school or to professional programs in engineering, law, and business administration.

Job Avenues

B.Tech. (Engg. Physics) equips students to acquire jobs in various industries based on their interests and specializations acquired during the duration of the course.

Electronics

- BEL
- Intel
- IBM
- Hewlett-Packard
- Texas Instruments
- Motorolla
- Hitachi
- Samsung
- Free Scale Semiconductors

Micro Electronic Mechanical Systems

- General Electric
- Panasonic
- Hewlett Packard
- Texas Instruments
- Schneider Electric
- Omron
- Phillips
- Bosch

Photonics

- Canon
- Nikon
- Moser Baer
- Birla Ericsson Optical ltd
- Finolex
- Sterlite Optical Technologies
- Epson

Higher Studies & Research Opportunities

Photonics

Photonics involves the generation, detection, and manipulation of light for applications in consumer products, telecommunications, medicine and biology, and manufacturing. For example, laser machining and welding are used in manufacturing vehicles and other commodities. Computer LCDs, TVs, DVDs, CDs, cell phone displays, and laser printers use laser light sources. Photonics became big in the late 1990's due to huge growth in the optical communications industry where information is encoded in light pulses propagating along optical fibers. Solar cells for energy production and energy efficiency through LED lighting are a growing part of photonics.Engineering Physicists design and decide how to manufacture these small devices. Like electronic components, photonic devices are being made smaller and smaller. Many companies involved in electronics are also involved in photonics (see the earlier websites for nano- and micro-device companies). It is also likely that photonics will replace microelectronics in many applications.

Micro and Nano electronics

Nano and micro device engineering is dominant in the electronics industry which seeks to miniaturize electronic components and integrated circuits to make computers, cell phones, and other electronic equipment smaller (more portable), faster, and less expensive. This has enabled computer processor speeds to increase from a few kilo Hertz decades ago to several Giga Hertz today, and to shrink cell phones from the size of bricks to practical hand-held devices. Engineering Physicists are involved in the design and fabrication of next generation devices in this exciting and fast-paced field.

Micro Electronic Mechanical Systems (MEMS)

MEMS are tiny moving machines usually made from the element silicon. They are used extensively as sensors in the automobile industry. Some other applications of MEMS include:

- MEMS can include tiny vibrating structures that may be used to generate and detect the electromagnetic waves used in cell phones.
- MEMS are used in optical communications to produce tiny moving mirrors that control where light goes.
- Engineering Physicists are developing MEMS devices as sensitive detectors used in medicine and biology.

- **Nuclear Engineering**
- **Sustainable Energy Systems**
- **Superconductivity and low temperature Physics**
- **Material Science**
- **Quantum Information Systems**

Internships

The Department of Applied Physics at DTU, offers internship opportunity at **TIFAC CORE (Technology Information Forecasting &Assessment Council)** lab in DTU under **MISSION REACH 2020** in the field of **"FIBER OPTICS AND OPTICAL COMMUNICATION"** to top 10 Engineering Physics students after the completion of their 2nd semester. This promotes research and development at the UG level leading to innovative applications of Fiber Optics, fostering institute-industry linkages and entrepreneurial culture encompassing all aspects of interaction of light and matter for the betterment of the society.

After completion of the 4th and 6th Semester students complete 8-10 weeks long Summer Internship at reputed Universities and in industry. This gives the students experience in academic and industrial research and development.

R & D Labs

Department of Applied Physics has following well equipped R&D Labs:

1. **Thin film & Material Science Lab is equipped** with following major equipments:

    a) Furnaces upto 1500 C
    b) Agilent 4284 A Precision LCR meter
    c) Keithley 6517A Electrometer
    d) Retsch Planatory ball Mill PM 100
    e) P-E Loop Tracer
    f) DC Polling Unit
    g) High Vacuum Coating Unit
    h) Brucker Advanced X-ray diffractometer and Hitachi's Scanning Electron Microscope with EDS facility (central facility).

2. **Fiber optics and Communication Lab** with major equipment:
    a) Newport project setup in fiber optics
    b) Advanced set up for single mode fiber characterization
    c) Prism Coupling set up characterization of integrated optical waveguides
    d) Benchmarks Optical Communication experiment setup
    e) Fiber splicing Machine
    f) Vibration free optical benches
    g) Optical Time Doman Reflectometer
    h) Fiber ring laser
    i) WDM Network Analyzer
    j) DWDM optical communication set up with fiber Bragg grating experimental set up
    k) Fiber ring Laser etc.

3. **Advanced Computational and Design Lab** with ultra modern computational facility ton design and simulate nanophotonic devices with state of art software tools:

    a) RSOFT-BPM
    b) OPti-HS
    c) VPI software
    d) RSOFT-OPti simulation tools
    e) RSOFT-Full wave and
    f) Band solve FEM design software packages
    g) Photon Design
    h) OptiFDTD
    i) Laser CAD
    j) Plasmonic Solar Utility CAD

4. **Advanced Optics Lab** with:
    a) Electro-optic
    b) Acousto-optic
    c) Magneto-optic
    d) Non-Linear optic effect based experimental set ups.

5. **Microprocessors and Interfacing Lab** with training kits:
   (a) Based on 8085 Microprocessor
   (b) PIC Microcontrollers-PIC-16F877
   (c) Based on 8086 Microprocessor

6. **Microelectronics Research Center** with Silvaco TCAD OMNI

   Bundle Package:

   (a) MIXED MODE 2-D Circuit Simulator
   (b) ATLAS 2-D and 3-D Device Simulator
   (c) ATHENA 2-D Process Simulator

International Student Chapters

SPIE DCE CHAPTER

SPIE Student Chapter
Delhi Technological University

Established in the 2004, SPIE (The International Society for Optical Engineers) - DCE Chapter has made an impact in the associated communities. The chapter has successfully entered into its seventh year of functioning with a team of newly elected office bearers in place. SPIE DCE Chapter aims at inculcating temperament of research and development among B.Tech students, Research scholars and faculty members in the area of optics and photonics at DCE (Now DTU)

OSA®
Optical Society of America

OSA DCE CHAPTER

OSA DCE Chapter was established in the year 2009. This chapter is established to increase and diffuse the knowledge of optics, pure and applied and is intended to promote Optics and Photonics education and research among UG/PG and research students at DCE (now DTU) Delhi.

Student Undergraduate Society

Engineering Physics students at Delhi Technological University in early 2011 founded **Deltech Engineering Physics Technological Hub (DEPTH)**, an undergraduate society where all sorts of events, including Technical Paper Presentations, guest lectures, seminars, debates etc are organized that are intended at the enhancement in knowledge of and unfolding of various scientific and technological fields before its members, with a strong emphasis on presentation and implementation of innovative ideas. The society organizes various industrial visits to acquaint its members with breathtaking technologies along with their implementation in various industries. General student activities of DEPTH also include monthly quizzes, group discussions on various topics pertaining to both Engineering and Physics.

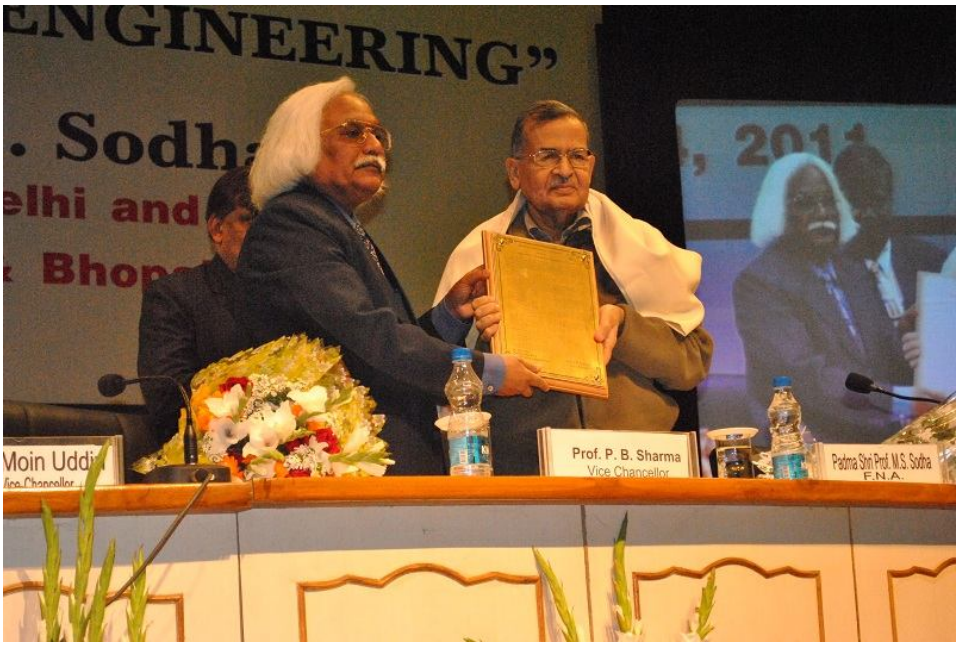
The society plans to launch its very own e-newspaper "THE ENGINEERING PHYSICS TIMES" which is edited and maintained by its council members.

Past DEPTH activities include:

Plenary lecture series with talks from eminent and renowned professors and researchers:

1. A popular lecture on "Nano Science and Technology: Hopes or Hypes" delivered by Padma Shree Professor K.L.Chopra, Former Director-IIT KGP and Member-Board of Management, DTU

2. '**A physicist encounters engineering**' by Padma Shri Prof. M.S. Sodha in January 2011



3. **Measurements in Quantum Theory**' by Professor Ajoy Ghatak in the month of February 2011.

4. **AURORA - The annual Technical Fest of the Department of Applied Physics at DTU.**

FACULTY PROFILE & THEIR SPECIALIZATION

PROFESSOR

PROF.R.K.SINHA-

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