

Engineering physics

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Engineering physics or Engineering Science refers to the study of the combined disciplines of physics, mathematics and combined with engineering studies in computer, electrical, materials or mechanical engineering. By focusing on the scientific method as a rigorous basis, it seeks ways to apply and develop new solutions in engineering. Engineering physics or engineering science degrees are respected academic degrees awarded in many countries. It can be taught at the undergraduate level and is often designed as an honors program at some universities due to the rigorous nature of the academic curriculum which covers a wide spectrum of scientific disciplines.^{[1][2][3][4]}

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Overview

Unlike traditional engineering disciplines, engineering science/physics is not necessarily confined to a particular branch of science or physics. Instead, engineering science/physics is meant to provide a more thorough grounding in applied physics for a selected specialty such as optics, quantum physics, materials science, applied mechanics, nanotechnology, microfabrication, mechanical engineering, electrical engineering, biophysics, control theory, aerodynamics, energy, solid-state physics, etc. It is the discipline devoted to creating and optimizing engineering solutions through enhanced understanding and integrated application of mathematical, scientific, statistical, and engineering principles. The discipline is also meant for cross-functionality and bridges the gap between theoretical science and practical engineering with emphasis in research and development, design, and analysis.

It is notable that in many languages the term for "engineering physics" would be directly translated into English as "technical physics". In some countries, both what would be translated as "engineering physics" and what would be translated as "technical physics" are disciplines leading to academic degrees, with the former specializing in nuclear power research, and the latter closer to engineering physics.^[5] In some institutions, engineering (or applied) physics major is a discipline or specialization within the scope of engineering science, or applied science.^{[6][7][8]}

In many universities, engineering science programs may be offered at the levels of B.Tech, B.Sc., M.Sc. and Ph.D. Usually, a core of basic and advanced courses in mathematics, physics, chemistry, and biology forms the foundation of the curriculum, while typical elective areas may include fluid dynamics,

quantum physics, economics, plasma physics, relativity, solid mechanics, operations research, quantitative finance, information technology and engineering, dynamical systems, bioengineering, environmental engineering, computational engineering, engineering mathematics and statistics, solid-state devices, materials science, electromagnetism, nanoscience, nanotechnology, energy, and optics. While typical undergraduate engineering programs generally focus on the application of established methods to the design and analysis of engineering solutions, undergraduate program in engineering science focuses on the creation and use of more advanced experimental or computational techniques where standard approaches are inadequate (i.e., development of engineering solutions to contemporary problems in the physical and life sciences by applying fundamental principles).

Branches

- Accelerator physics
- Acoustics
- Aerodynamics
- Agrophysics
- Analog electronics
- Applied physics
- Applied mathematics
- Applied mechanics
- Astrodynamics
- Atomic Force microscopy and imaging
- Ballistics
- Biomechanics
- Biosensors and bioelectronics
- Biophysics
- Bionanotechnology
- Chemical physics
- Communication physics
- Computational physics
- Composite materials
- Control theory
- Data mining
- Digital electronics
- Electrochemistry
- Electromagnetism
- Energy Systems
- Fiber optics
- Fluid dynamics
- Geophysics
- Information theory
- Instrumentation and control
- Laser physics
- Materials science and processing
- Metallurgy
- Metamaterials
- Metrological physics
- Microelectronics
- Microfluidics, MEMS, and MOEMS
- Microfabrication
- Microwave Engineering
- Nanotechnology
- Neural engineering
- Nondestructive testing
- Nuclear engineering
- Nuclear technology
- Photonics and Plasmonics
- Plasma physics
- Polymer science
- Power electronics^[9]
- Quantitative finance
- Quantum electronics
- Quantum information
- Radio-Frequency Engineering
- Renewable Energy
- Semiconductor physics and devices
- Soil physics
- Solid-state physics
- Space physics
- Spintronics, Spin engineering
- Statistical mechanics
- Systems biology
- Superconductors
- Thin films and nanostructured materials
- Vehicle dynamics

- Medical physics

Professional Societies and Organizations

- Society of Engineering Science Inc. (<http://ses.egr.uh.edu/>).

See also

- Applied Physics
- Engineering
- Engineering mechanics
- Engineering science and mechanics
- Environmental Engineering Science
- Index of engineering science and mechanics articles
- Mathematics
- Science
- List of Universities with Engineering Physics program

Notes and references

1. "Major: Engineering sciences". *The Princeton Review*. 2011. p. 01. Retrieved June 26, 2011.
2. "Introduction". Princeton University. Archived from the original (online) on February 26, 2012. Retrieved June 26, 2011.
3. Khare, P. .; A. Swarup (January 2009 and 2010). *Engineering Physics: Fundamentals & Modern Applications* (13th ed.). Jones & Bartlett Learning. pp. xiii – Preface. ISBN 978-0-7637-7374-8. Check date values in: |date= (help)
4. *Engineering Physics* (online). Google books. Retrieved June 26, 2011.
5. "2002 Applications for graduate study open in Shanghai Research Institute of Technical Physics (上海技术物理研究所2002年招生)". Chinese Academy of Sciences (中国科学院). 2001-10-07. Archived from the original on 2008-06-07. Retrieved 2008-09-16.
6. Division of Engineering and Applied Science, California Institute of Technology (<http://www.eas.caltech.edu/>)
7. Engineering Physics, Division of Engineering Science, University of Toronto (http://engsci.utoronto.ca/explore_our_program/majors/engineering_physics.htm)
8. Engineering Science and Mechanics program at Virginia Tech (<http://www.esm.vt.edu>)
9. Program of Engineering physics, Laval University, Quebec (https://capsuleweb.ulaval.ca/pls/etprod7/y_bwckprog.p_afficher_fiche?p_type_index=4&p_code_prog=B-GPH&p_code_majr=GPH&p_code_camp=)

External links

- "US News Ranking of Undergraduate Programs in Engineering Science/Engineering Physics" (<http://colleges.usnews.rankingsandreviews.com/best-colleges/rankings/engineering-doctorate-science-physics>)

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