



Zero Lect - zero lecture

Engineering Physics (Lovely Professional University)



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ZERO LECTURE



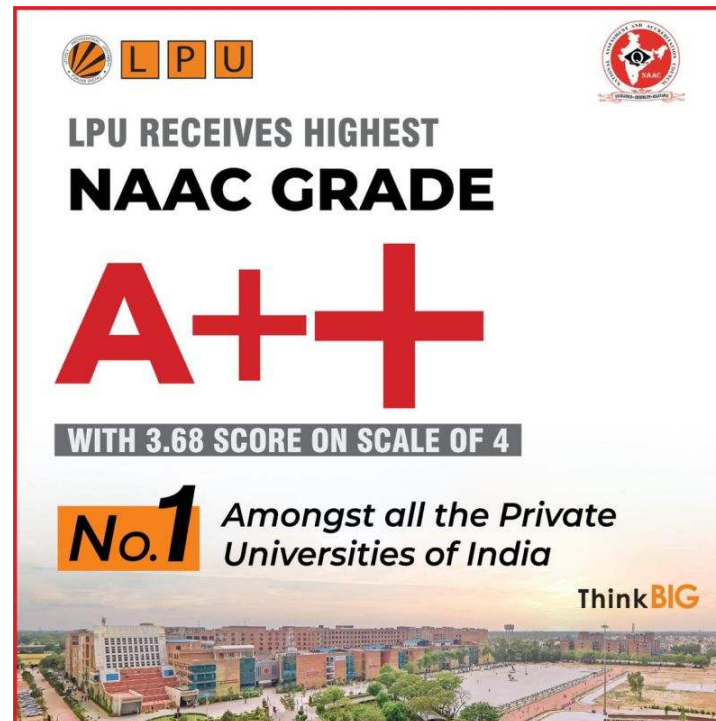
Dr. Goutam Mohanty

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Accreditation



ThinkBIG

Congratulations to all Vertos!!

LPU has been accredited with Highest grade **A++** with a score of 3.68 out of 4.



University Vision and Mission

□ VISION

- ✓ To be a premier academic institution, recognized internationally for its contribution to industry and society through excellence in teaching, learning, research, internationalization, entrepreneurship and leadership.

□ MISSION

- ✓ To transform education through academic rigor, practical orientation, and outcome-based teaching. To develop and implement a relationship of cooperation between industry and academia. To undertake impactful research addressing local, national, and global challenges.
- ✓ To prepare graduates to be lifelong learners with strong analytical and leadership skills. To develop global professionals and entrepreneurs with an innovative spirit, tolerance, and desire to make a difference in society.

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School Vision and Mission

□ **VISION**

- ✓ To become one of the leading Schools globally in Computer Science Engineering recognized for its academics and innovations by nurturing professionals, researchers and entrepreneurs for sustainable growth of industry and society.

□ **MISSION**

- ✓ To provide a learning-based environment on technical concepts applied to real-life situations with measurable outcomes.
- ✓ To establish connections with the industry for curriculum design, and creating internship cum career opportunities.
- ✓ To address societal issues related to regional, national and global challenges through meaningful research.
- ✓ To inspire graduates for pursuing lifelong learning in professional careers.
To develop leadership potential in ethically competent entrepreneurs.



Program Information

Program Name:
B. Tech. CSE/ IT

Program Code:
P132/P133

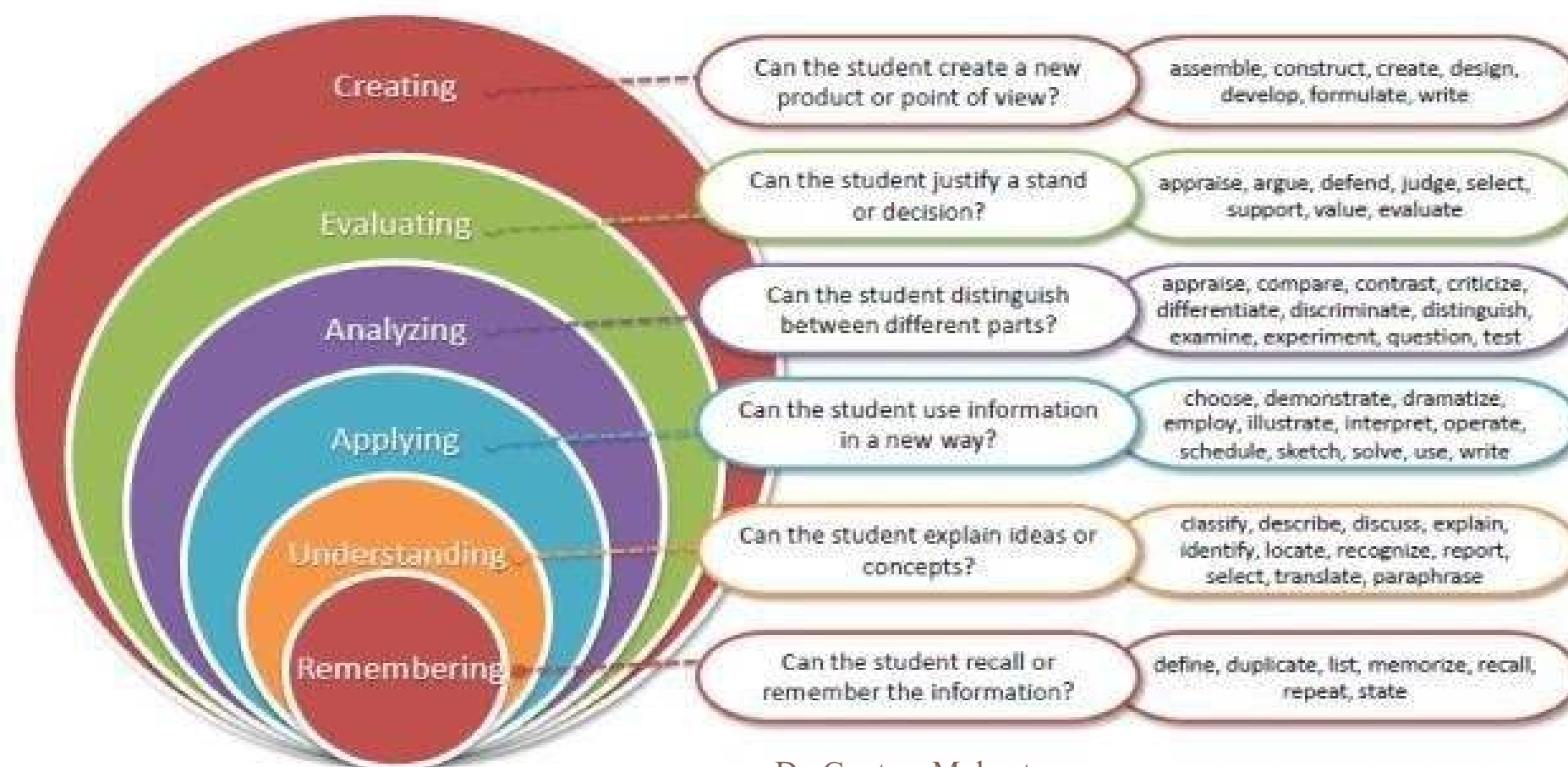
- This Bachelor of Technology program offered by Lovely Professional University has a minimum duration of **4 years** and is offered under the Semester system through **Regular mode**. It is a Standalone program based on the Credit system.
- The medium of Instruction in this program is **English**.

A. Program Educational Objectives

Sr.No.	Objective
1	Become a successful professional demonstrating amalgamation of science and information technology.
2	Those employed in industry will demonstrate professional advancement, based on scientific learnings and experimental aptitude.
3	Those who continue their formal education will achieve a higher degree or other advanced certification.

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Bloom's Taxonomy



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CLASSROOM PROTOCOLS



- **Rule 1:** Listen and follow instructions.
- **Rule 2:** Discipline is the bridge between goal and accomplishment.
- **Rule 3:** Respect the teacher and other Students.
- **Rule 4:** Maintain your work ethic and always try your best.
- **Rule 5:** Safety first: Keep hands, feet, and objects to yourself.

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Course Assessment Model



Attendance

5

Continuous Assessment

25

Mid Term Exam

20

End Term Exam

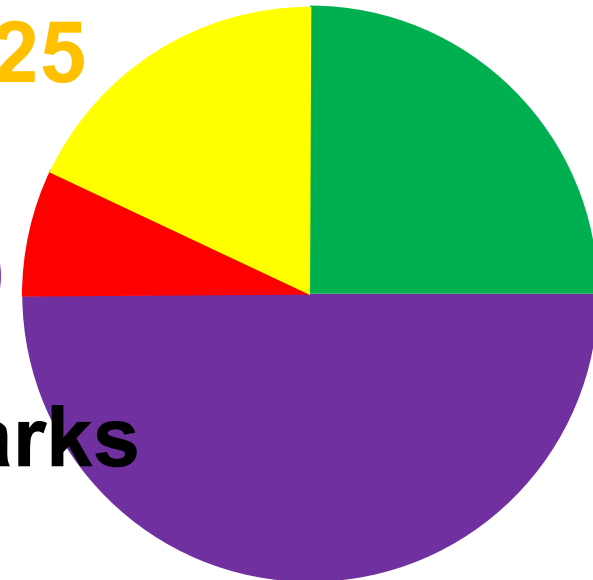
50

Total

100 Marks

MTE: 100% MCQ

ETE: 100% MCQ



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Continuous Assessment(CA)



- **Two Class Tests**
 - ▣ One pre-MTE (30 Marks)
 - ▣ One post-MTE (30 Marks)
- **One assignment Labs @ Home (Compulsory) 30 marks**

**Total 3 tasks, 1 compulsory(Lab @ home) and
1 best out of remaining 2 Test.**

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One assignment Labs @ Home (Compulsory) 30 marks

❑ Marks split up of Written report [20 Marks]

- ✓ Presenting accurate information, highlighting key principles, supporting facts and details in the report. [10 marks]
- ✓ Observation, conclusion and analysis including learning outcome form the topic (Graphical/circuit/data analysis) [05Marks]
- ✓ Completeness of the Problem/Task and References cited. [05Marks]

❑ Power point presentation [10Marks]

- ✓ Presentation skill [04 marks]
- ✓ Quality of PPT [03 marks]
- ✓ Response to queries [03 marks]

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□ Brief Introduction To The Course

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What is Engineering Physics ??

- ❖ **Physics** is the most basic science that models and understands the real world – its the root of why other sciences actually work.
- ❖ **Engineering Physics** is an approach to engineering that seeks understand the common underlying rules of all engineering disciplines.
- ❖ Engineering Physics isn't Engineering for Physics, but **Engineering with a Physics approach**.
- ❖ Study and understand the root of why all Engineering fields work – So you can design anything

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Why study Engineering Physics ???

- ❖ Engineering Physics teaches the **skills to see problems from all angles at once**, allowing you to **find solutions** where the whole is more than the sum of the parts.
- ❖ No matter what discipline you study, **you'll still have times** where you need to know aspects of the other ones.
- ❖ Engineering Physics gives you the **basic literacy in all disciplines**.

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Tower building strategy



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Objective of Course

- ❖ Review of some things which you learned in Intermediate levels.
- ❖ Thorough understanding of some fundamental laws of Physics, their basic principles and applications.
- ❖ Ability to use them in Engineering Applications.

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Outcome Of The Course

- CO1: : Understand the basic principles of physics to lay the foundation for various engineering courses.
- CO2: Explain the principle and working of lasers and optical fiber for their wide applications.
- CO3: Employ the principle of quantum mechanics to solve Schrodinger equations for standard systems.
- CO4: Articulate the physics of solids to understand their properties.
- CO5: Determine the properties of engineering materials.

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Detail Course Overview

❖ This syllabus contains **SIX units**.

- ✓ Unit-I : Electromagnetic theory
- ✓ Unit-II : Lasers and applications
- ✓ Unit-III : Fiber optics
- ✓ Unit-IV : Quantum mechanics
- ✓ Unit-V : Solid state physics
- ✓ Unit-VI : Introduction to engineering materials

UMS log in >>UMS navigation>>Learning Management
System>>Academic course syllabus>>syllabus files>>select the session
>>PHY110

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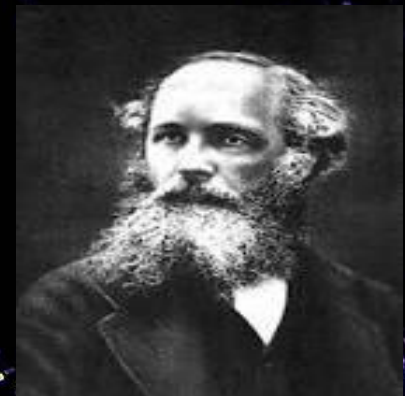
Unit-1: Electromagnetic Theory

- ✓ Concepts of scalar and vectors fields
- ✓ Concepts of Gradient, Divergence and Curl
- ✓ Gauss-Divergence Theorem and Stokes Theorem
- ✓ Laplace and Poisson Equations
- ✓ Maxwell's Electromagnetic Equations
- ✓ Application of EM-theory



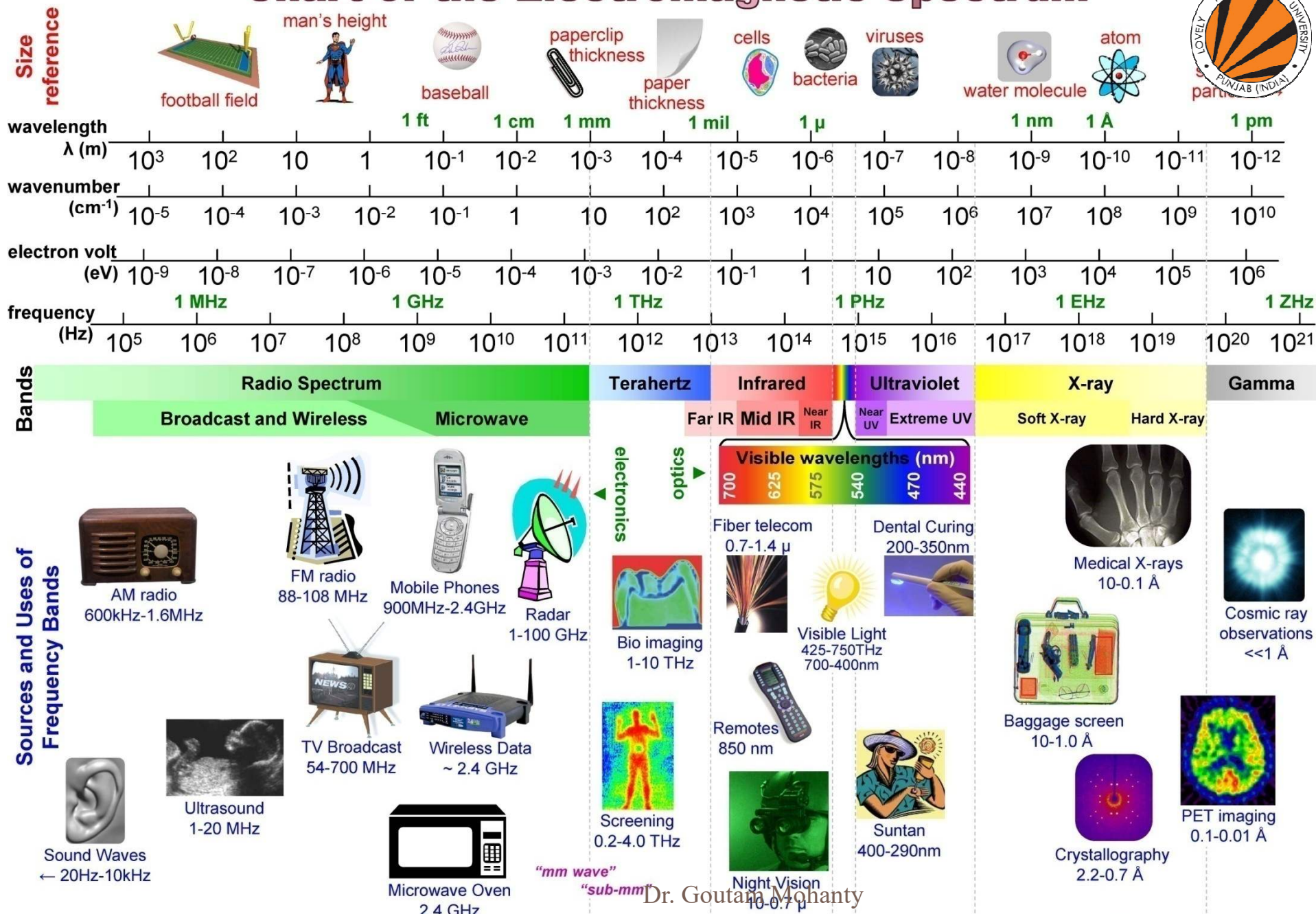
Michael Faraday

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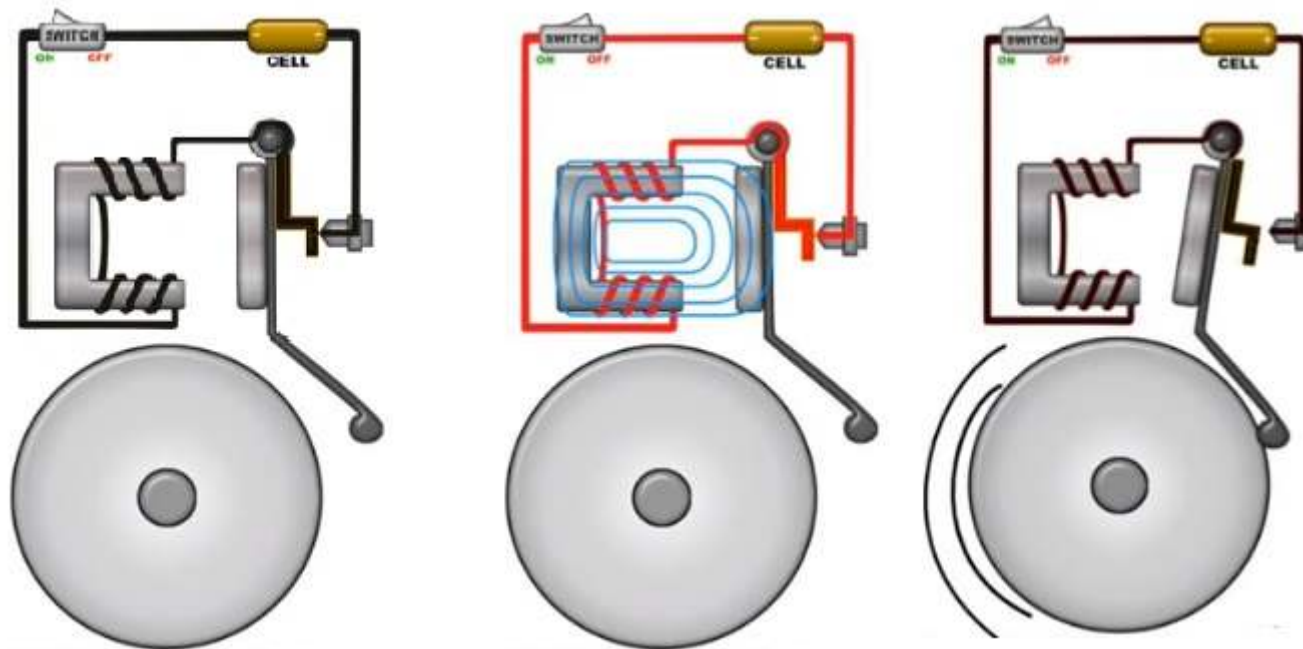


James Clerk Maxwell

Chart of the Electromagnetic Spectrum



Electric Bell using Electromagnetism

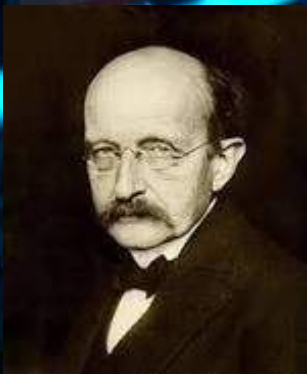


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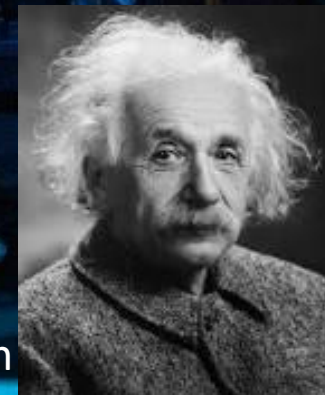
Unit-2: LASERS and Applications



- ✓ Fundamentals of LASER and Energy level diagram
- ✓ Concepts of different radiation process
- ✓ Concept of population inversion
- ✓ Working of different Laser devices and its applications
- ✓ Holography



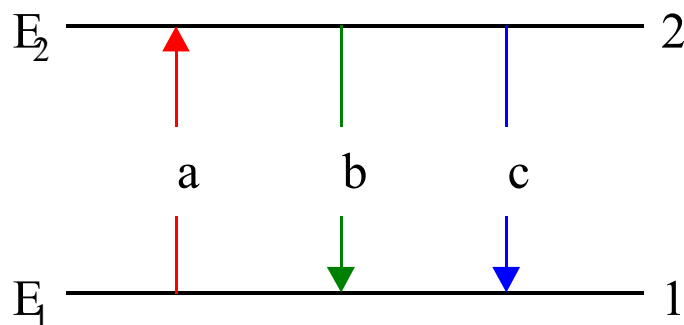
Max Planck



Albert Einstein



Absorption and emission processes



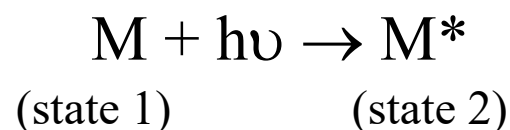
a **absorption**

b **spontaneous emission**

c **stimulated emission**

Absorption

Molecule absorbs a quantum of radiation (a photon) and is excited from 1 to 2.



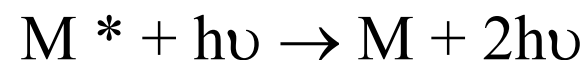
Spontaneous emission

M* (in state 2) spontaneously emits a photon of radiation.



Stimulated emission

A quantum of radiation is required to stimulate M* to go from 2 to 1.



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Laser in Computer



Optical Disks:

- ✓ Optical disks include CDs, videodisks, DVDs, and other types of data storage for computers that are read optically using lasers.
- ✓ They are collectively characterized by a high density of information storage and non-contact reading and writing.
- ✓ A CD can hold about 700 million bits (Mb) of digital information.
- ✓ A DVD (Digital-Video-Disk) about 4.7 billion bits (Gb), while a double-sided DVD can hold about 17 Gb, enough for about 4 full-length videos, or about 4 million pages of text.



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Unit-3: FIBER OPTICS



Narinder Singh Kapany

- ✓ Introduction to fiber optics
- ✓ Classification and Working of light propagation in fiber cable
- ✓ Losses associated with optical fiber
- ✓ Applications in computer networking and broadcasting

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Unit-4: QUANTUM MECHANICS

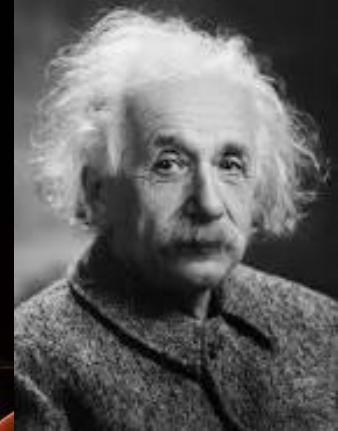
Louis de Broglie



Erwin Schrodinger



Albert Einstein



- ✓ Introduction to QM
- ✓ Photoelectric Effect
- ✓ Concept of de Broglie matter waves
- ✓ Heisenberg uncertainty principle
- ✓ Phase velocity and group velocity
- ✓ wave function and Schrodinger Concept
- ✓ Tunneling Effect and a few applications



Niels Bohr



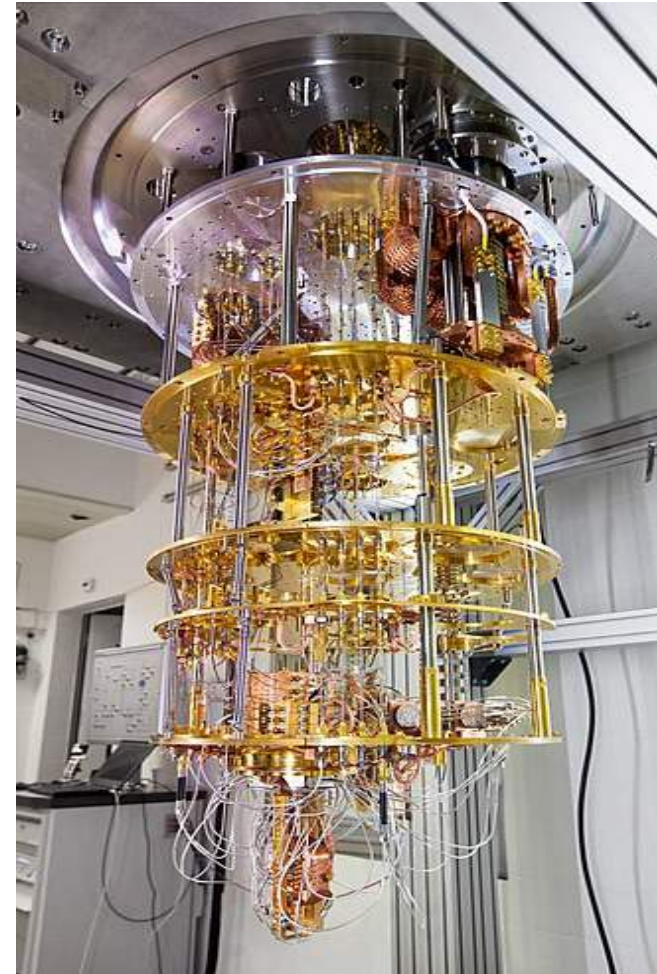
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Quantum Computers



- Quantum Computers does not use Binary bits to store the information, but it uses something called **Qubits**.
- It is a computing technology based on the laws of **Quantum Physics**, which deals with the behavior of energy and matter (At atomic level).
- A 30-qubit quantum computer would equal the processing power of a conventional computer that could run at **10 teraflops** (trillions of floating-point operations per second).
- AI, Cybersecurity, Healthcare etc.

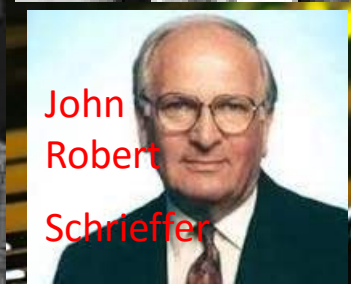
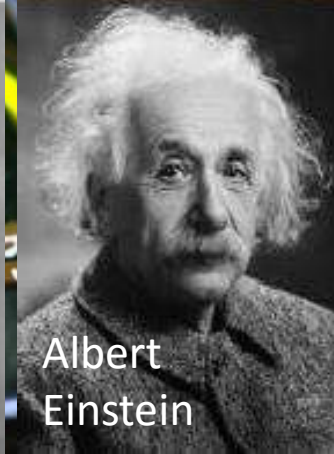
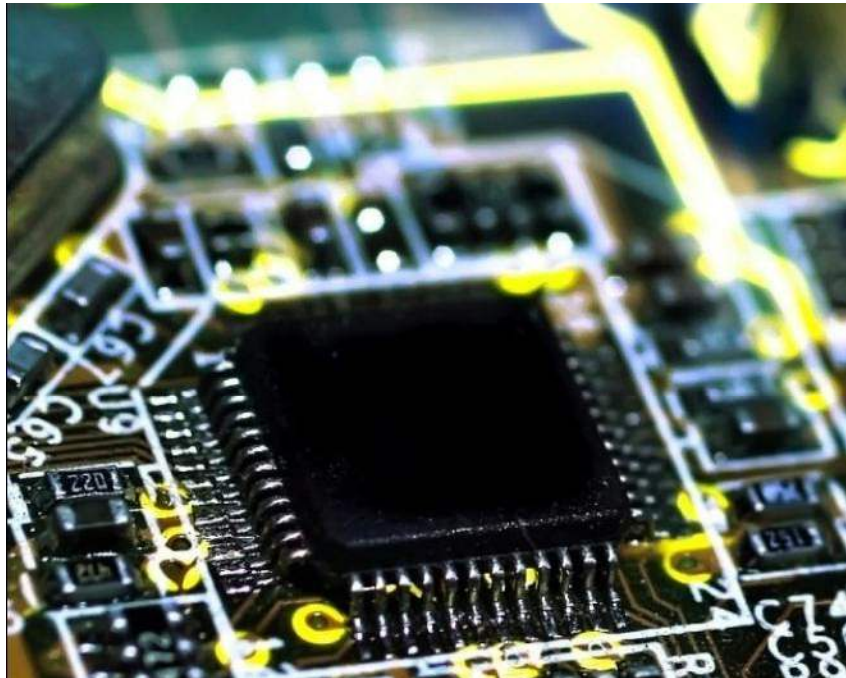


Quantum computer based on superconducting **qubits** developed by IBM Research in Zürich, Switzerland.

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Unit-5

SOLID STATE PHYSICS



- Introduction to free electron theory
- Fermi-Dirac distribution function
- Energy band diagram
- Hall Effect
- Semiconductor
- Application- solar cell basics

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Semiconductors, Insulators and Metals



The electrical properties of metals and insulators are well known to all of us.

Everyday experience has already taught us a lot about the electrical properties of metals and insulators.

But the same cannot be said about “**semiconductors**”.

What happens when we connect a battery to a piece of a silicon;

*would it conduct well ? or
would it act like an insulator ?*



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The name “**semiconductor**” implies that it conducts somewhere between the two cases (conductors or insulators)

Conductivity : σ

$\left(\begin{array}{l} \sigma_{\text{metals}} \sim 10^{10} \text{ /}\Omega\text{-cm} \\ \updownarrow \text{ S/C} \\ \sigma_{\text{insulators}} \sim 10^{-22} \text{ /}\Omega\text{-cm} \end{array} \right)$

The conductivity (σ) of a semiconductor (S/C) lies between these two extreme cases.

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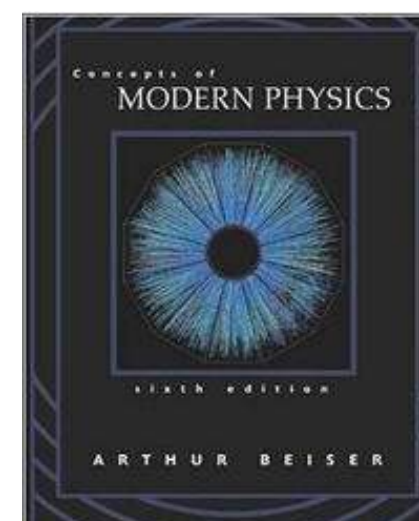
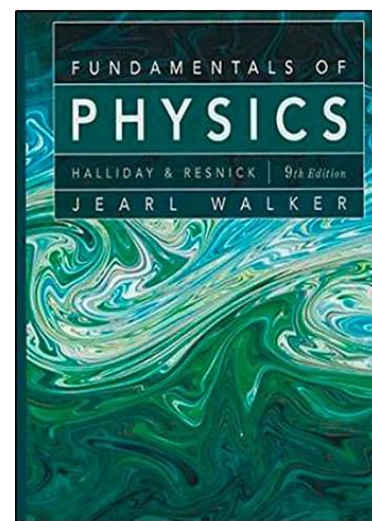
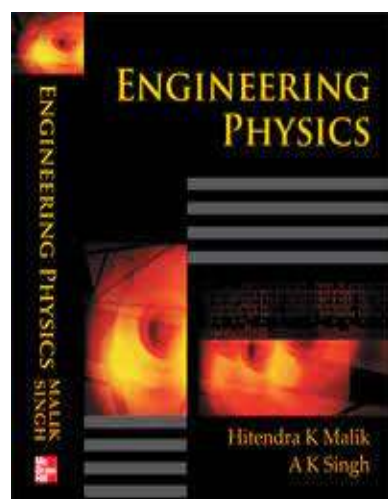
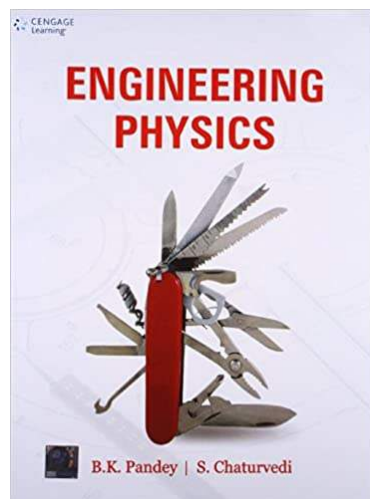
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Unit-7: Introduction to engineering materials

- Dielectric
- Magnetic materials
- Piezoelectric materials
- Superconductors
- Nanomaterial

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REFERENCE BOOKS



- **Text Books:** ENGINEERING PHYSICS by B K PANDEY AND S CHATURVEDI, CENGAGE LEARNING, 1st Edition, (2009).

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- CONCEPT OF MODERN PHYSICS by ARTHUR BESIER, MCGRAW HILL EDUCATION.
- FUNDAMENTALS OF PHYSICS by HALLIDAY D., RESNICK R AND WALKER J, WILEY, 9th Edition, (2011)

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Hard work

Dedication & Sincerity...
Are the ingredients needed,
to cook the meal of success
All you have to do is put them together
in the right manner
And with a little salt of luck,
You will surely taste the
delights of Achievement

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BEST OF LUCK



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