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ENGINEERING PHYSICS

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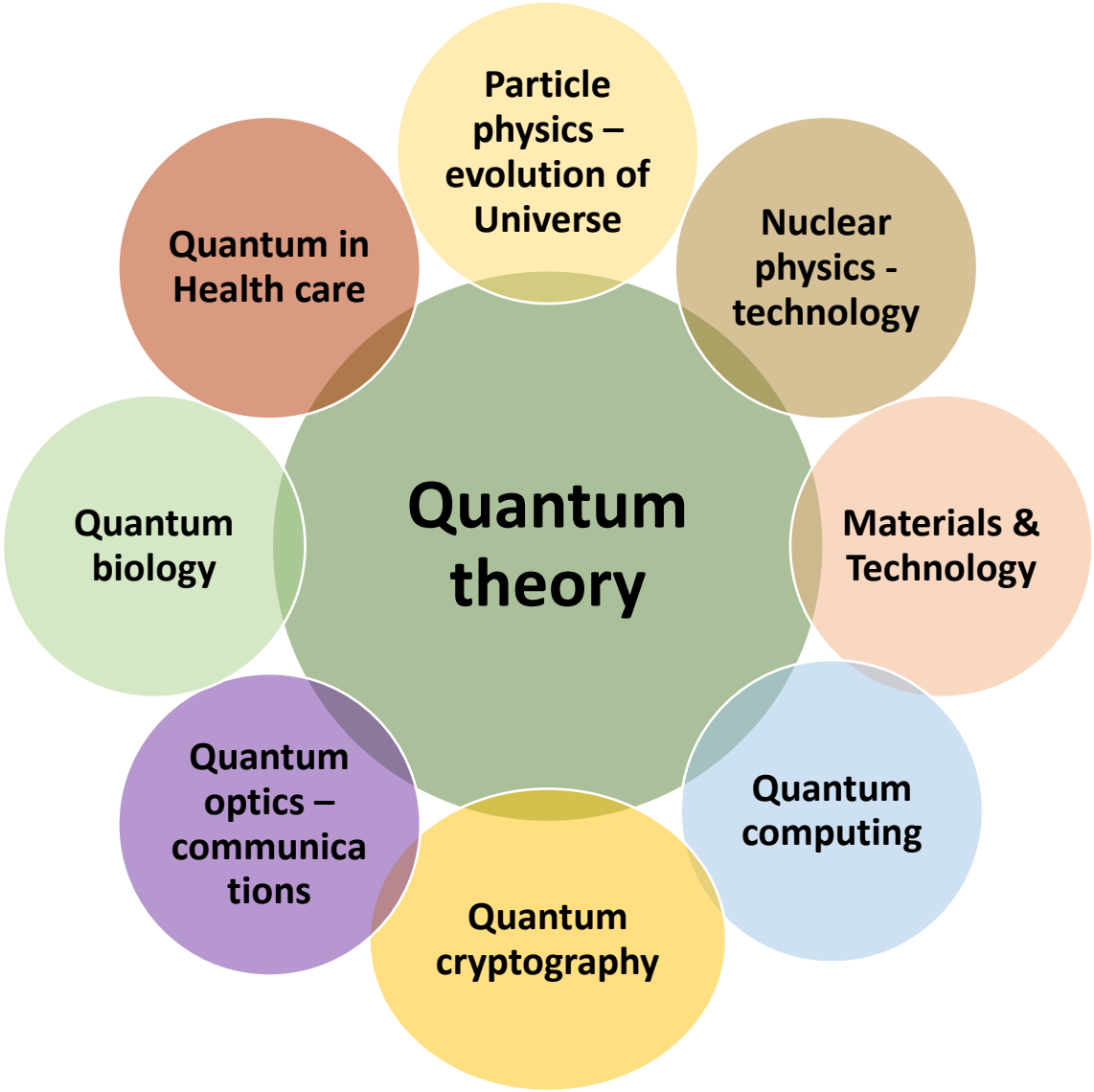
Department of Science and Humanities

ENGINEERING PHYSICS

Quantum theory impacts …….



The universe is quantum by nature…..

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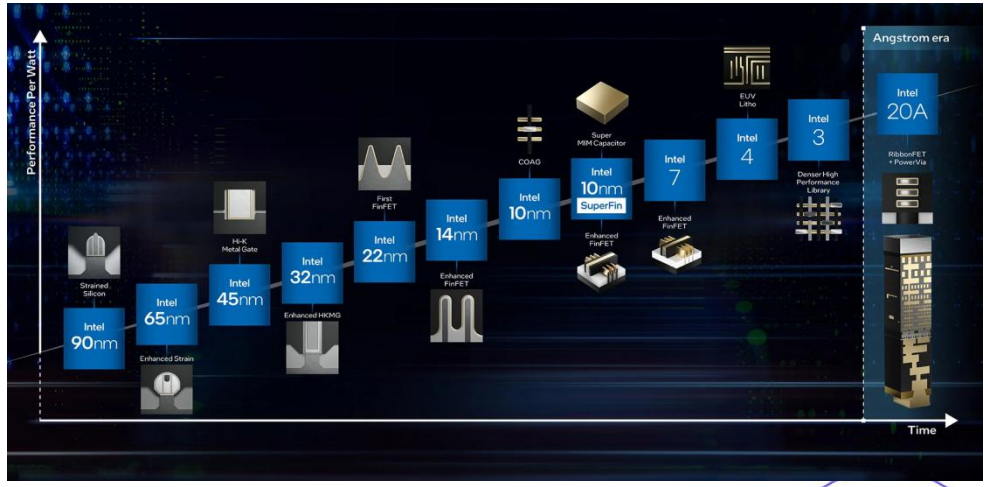
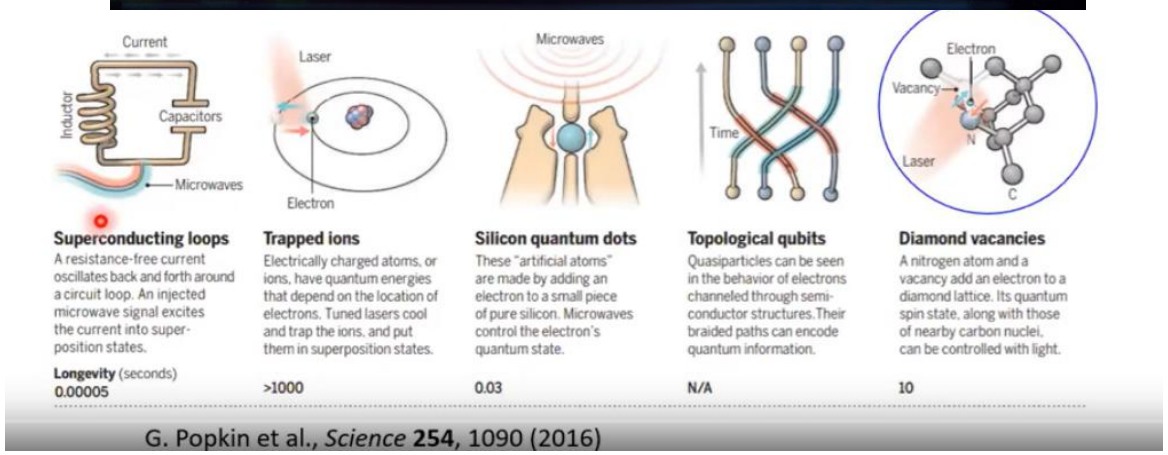
Relevance of this course to engineering and technology

- **Rapidly evolving technology solutions in small sizes**
  - 3 – 5nm VLSI chips
  - Quantum dot lasers
  - High resolution GPS
  - Medical imaging devices
  - High density storage devices ……..
- **Quantum computing**
  - Quantum entanglement
  - QUBITS
  - Quantum computing





G. Popkin et al., *Science* **254**, 1090 (2016)

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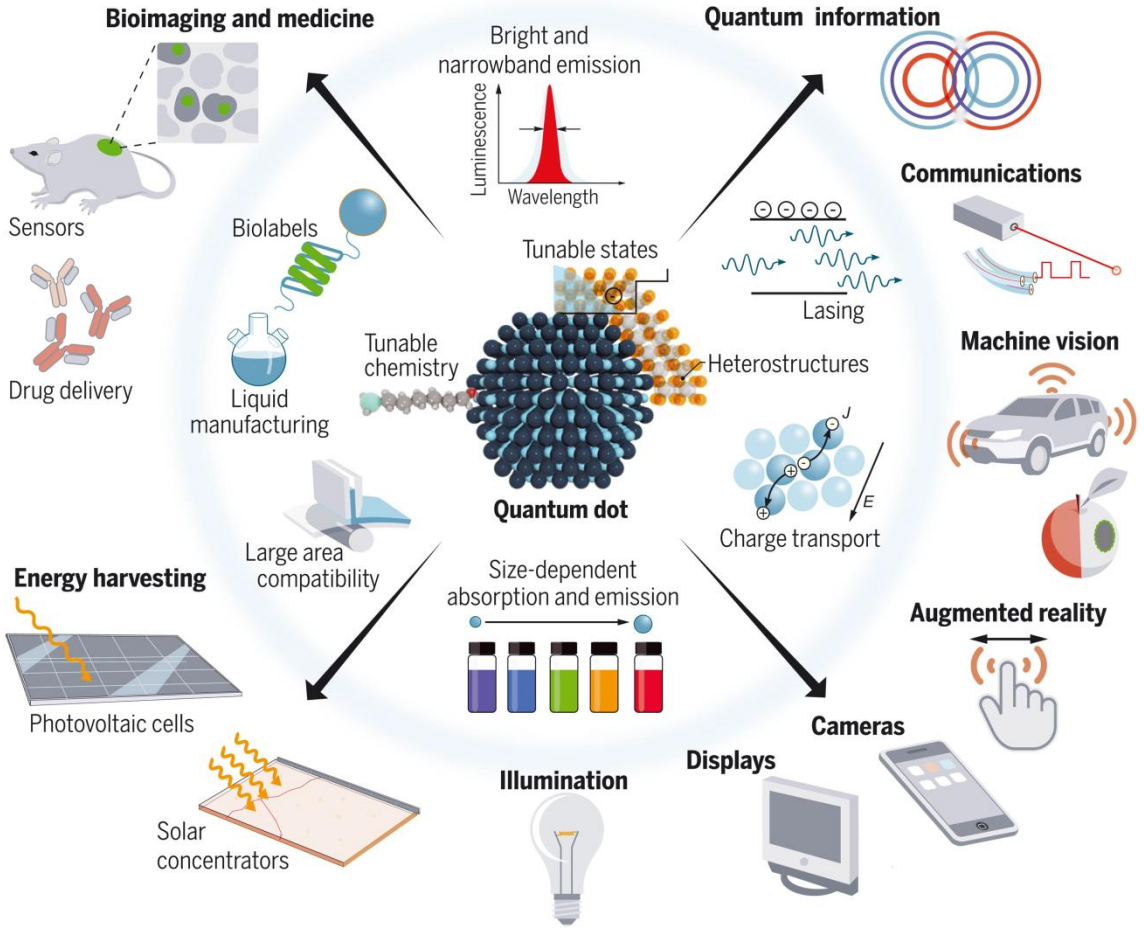
Relevance of this course to engineering and technology



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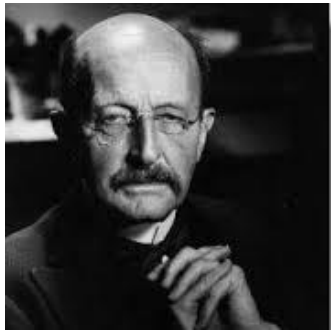
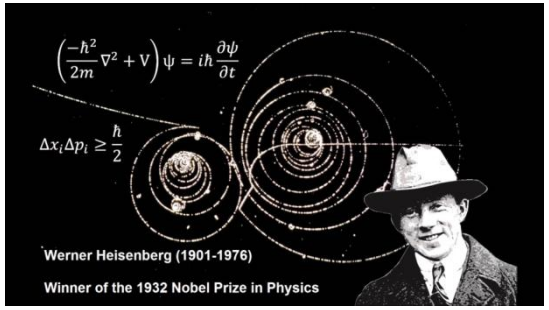
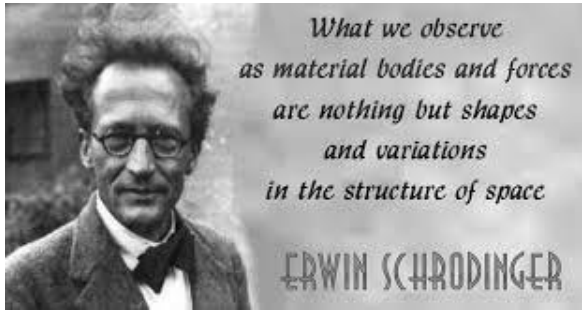
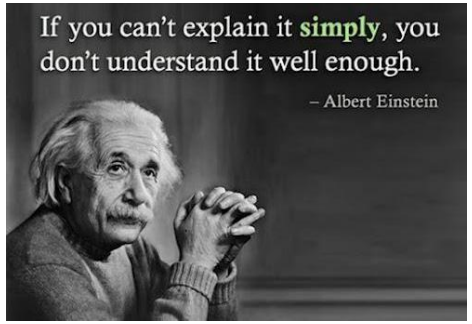
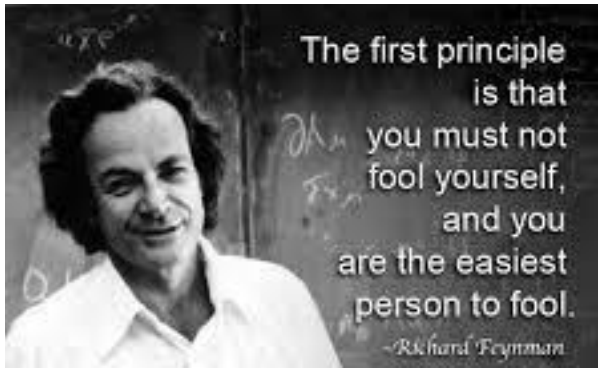
The galaxy of scientists ……











.. and many more

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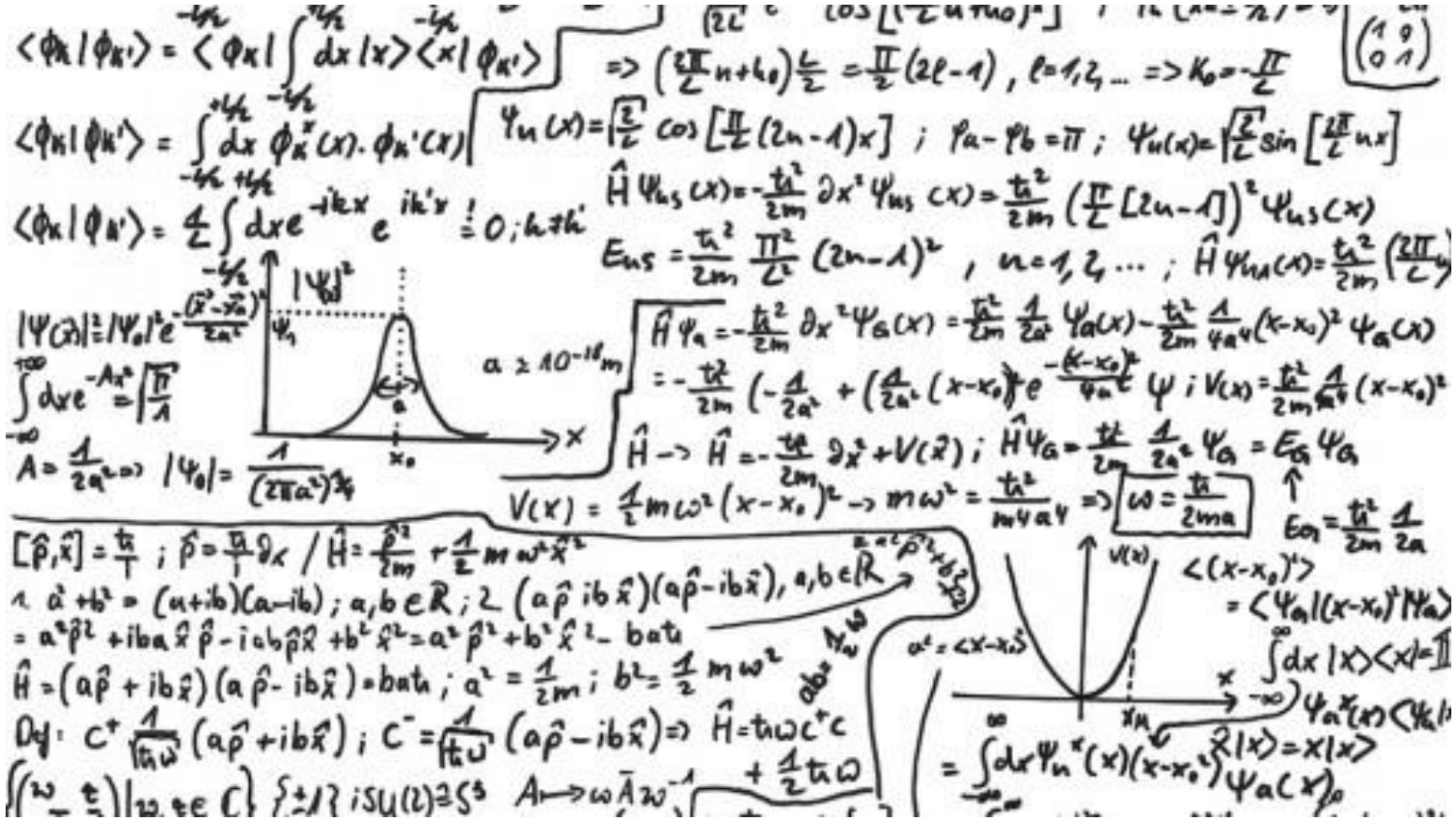
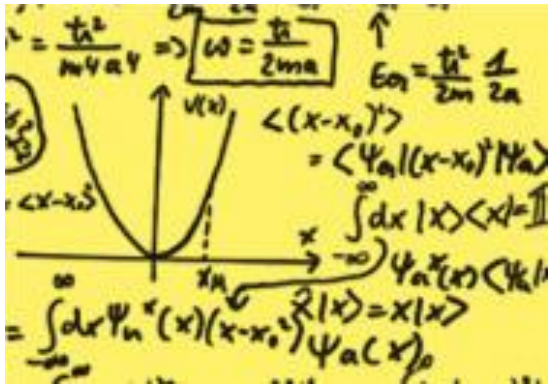
The simple mathematics…..





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What you need to know….

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Prerequisites:

1. C grade in the Physics course at the 11^{th} and 12^{th} grade
2. A good understanding of EM waves and Modern Physics topics in the 11^{th} and 12^{th} grade
3. Basics ideas of Mathematics - differential equations and their solutions, concepts of integration, exponential functions, series expansions, fundamental concepts of Probability (11^{th} and 12^{th} grade)

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Course content .....

Unit I: Review of concepts leading to Quantum Mechanics

Unit II: Quantum Mechanics and Simple Quantum Mechanical Systems

Unit III: Application of Quantum Mechanics to electrical transport in Solids and treatment of Magnetics

Unit IV: Application of Quantum Mechanics to Optical waves;

Concepts of polarisation and Dielectrics / ferroelectrics

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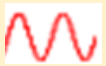
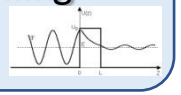
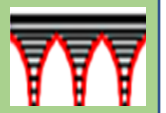
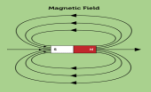
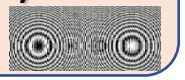
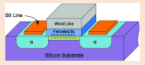
The flow ……..

Concepts leading to matter waves → Schrodinger's wave equations → **Free particle**  → Particle interaction with fields

Step Potentials & Barrier tunnelling  → Infinite potential well  → **Finite potential well**  → **Harmonic oscillator** 

Solids Band theory  → Magnetics  → **Superconductivity** 

Quantum Optics  → Lasers & Holography  → Dielectrics Ferroelectrics 

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What will help you ….

- ***Suggested Textbook:***
  1. ***Concepts of Modern Physics, Arthur Beiser, Chapters 1,2,3,5 and 10***

- ***Additional reference:***
  1. ***Learning materials prepared by the Department of Physics***
  2. ***"Quantum Physics of Atoms Nuclei and Molecules", Robert Eisberg, Robert Resnick, Wiley, 2006.***
  3. ***"Quantum Physics", S Gasiorowicz, 3rd Edition, Wiley Publications, 2007***
  4. ***"Lectures on Physics", Feynman, Leighton and Sands, Vol. 1-3, 13th Reprint,*** **Narosa Publications, 2012**

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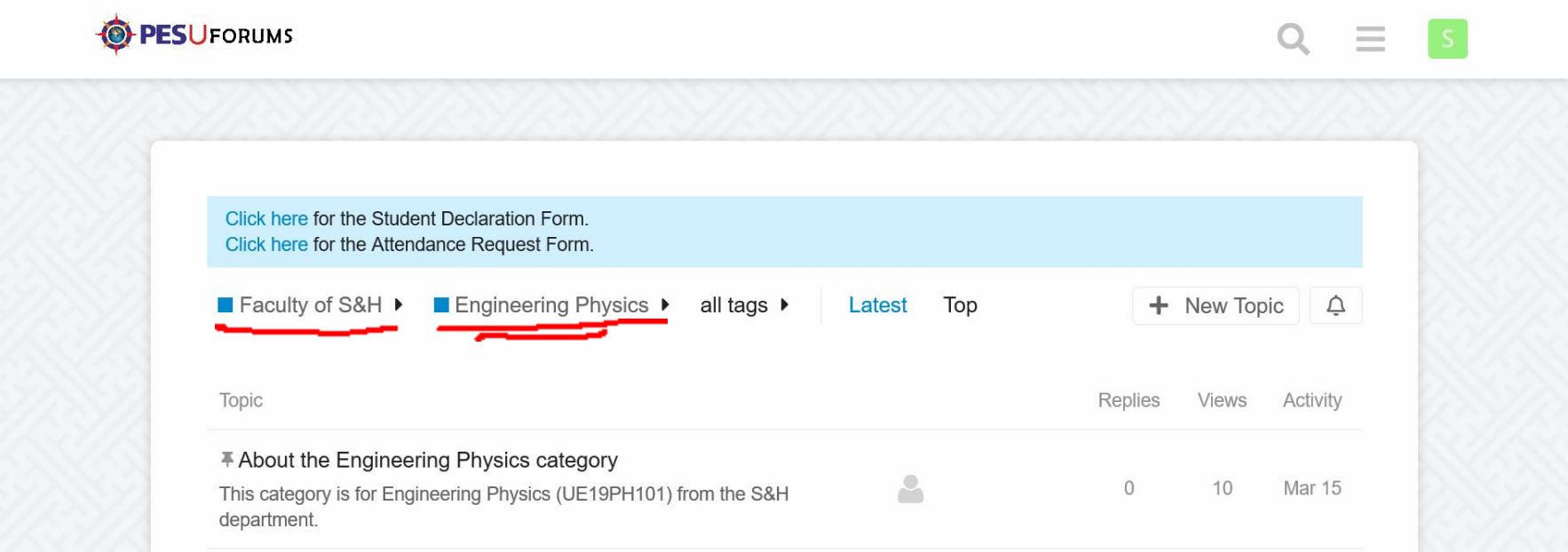
Discussion forum ……

➢ ***https://forum.pesu.io/***



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The grading mechanism …….

In Semester Assessment :

Assignments

- **at the end of every week with deadlines (10m)**
- **Open Book Tests, Numericals, Short answers / Seminars**

Internal Assessment tests

- **Computer Based / Hybrid Tests duration 60 minutes at the end of**
  - **Unit I & Unit II and**
  - **Unit III & Unit IV**
- **Each Unit has a weightage of 20 Marks –**
  - **8 MCQs, 2 short answers 2M each, 2 long answers 4M each**
- **No retest for Missing tests**

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The grading mechanism …….

In Semester Assessments

- **Computer Based Tests - 40 marks**
- **Assignments - 10 marks**
- **Total for ISA - 50 marks**

Experiential Learning - 20 marks

End Semester Assessments

- **Pen and paper examination of 3hrs duration (100m)**

Final Grading for 100 marks =>

(50 marks from ISA + 50%ESA + 20 marks for experiential learning) normalised to 100 marks

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Best Wishes & THANK YOU

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