

## *Quantum Material – Optical Applications*

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- 1. Study of optical nonlinearities including saturable absorption and two-photon absorption**
    - Materials include, graphene, carbon nanotubes, metal (Au, Ag) quantum dots, Topological insulators, etc.**
  - 2. Four Wave Mixing studies in semiconductor Quantum Dots for optical networks**
  - 3. Ultrashort optical pulse generation using fiber lasers (rational harmonic mode locking, and passive mode locking) using quantum materials**
  - 4. Applications in optical networks – Logic, transmission, Pattern Detection**
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## *Error Analysis in Quantum Information Systems*

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- 1. Bit –error-rate in classical phase shift keying systems**
  - 2. Error rate in Qbit systems – Basic requirements for any technology for creating Qbit’s e.g. minimum performance requirement per Qbit**
  - 3. How many extra Qbits are needed ( i.e. redundancy) for reducing the error rate to reasonable values**
  - 4. Applications of classical error correction methods for Qbits – e.g. Parity bits, Hamming codes etc. – Is it feasible ?**
  - 5. Are Qbit based systems particularly suitable for certain applications e.g. Password protection or Computing**
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