

# Nonlinear optics

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*Y.B. Band, Light and Matter, Wiley*

*R. W. Boyd, Nonlinear Optics, Academic Press, Latest Edition. In addition, course notes will be distributed.*

*G. P. Agrawal, Nonlinear Fiber Optics, Academic Press, 1995*

*Y. R. Shen, Principals of Nonlinear Optics, John Wiley and Sons, 1984*

1. **Nonlinear optical media**  
Nonlinear/Linear optical media  
Harmonic oscillator  
Nonlinear Polarization  
Wave equation in a NL media

2. **Second-order nonlinearities**  
Second harmonic generation  
The electro-optic effect  
Three wave mixing  
Phase matching – TWM

3. **Coupled wave theory**  
SHG  
Frequency conversion  
Parametric amplification

4. **Third-order nonlinearities**  
Third-harmonic generation  
The optical Kerr effect  
Self-phase modulation  
Self focusing  
Spatial solitons  
Cross-phase modulation  
Four-wave mixing  
Phase matching – FWM

5. **Solitons**

6. **Stimulated inelastic scattering**  
Raman  
Brillouin