PART-I

UNIT - 1: BASICS OF ELECTROMAGNETIC THEORY **[5 hours]**

Physical significance of Gradient, Divergence & Curl, Relationship between Electric Field & Potential, Maxwell's Equations, Equations of EM waves in free space, velocity of EM waves, Intensity of EM waves, Poynting vector.

UNIT-2: QUANTUM THEORY **[5 hours]**

Origin of Quantum Theory, Wave-Particle Duality, Matter Waves, Phase velocity, Group velocity, Uncertainty Principle, Significance &Normalization of wave function, Eigen Functions & Eigen Values, Time Independent Schrodinger wave equation, Particle in a box (One Dimensional Case).

UNIT-3: SPECIAL THEORY OF RELATIVITY: **[5 hours]**

Einstein's postulates, Lorentz Transformation Equations, Length Contraction, Time Dilation, Addition of Velocity, Variation of mass with velocity, Mass-Energy & Energy-Momentum relations.

UNIT-4: CRYSTALLOGRAPHY **[5 hours]**

Lattice, Basis, Unit Cell, Bravais Lattice, Crystal Systems, Lattice Planes, Miller Indices, Spacing between lattice planes, X ray diffraction, Bragg's Law & its applications in crystallography, Bragg's spectrometer.

PART-II

UNIT-5: RUDIMENTS OF SUPERCONDUCTIVITY: **[5 hours]**
Introduction to Superconductivity, peculiar properties of Superconducting state, Meissner Effect, Type I & Type II Superconductors, London Equations, Introduction to BCS Theory and High Temperature Superconductors.

UNIT-6: NANOPHYSICS **[5 hours]**
Nanoscale, Surface to Volume Ratio, Classification of Nanomaterials, Synthesis & Properties of Nanomaterials, Introduction to Carbon Nanotubes, Applications & Potential Risks of Nanomaterials.

UNIT-7: LASERS **[5 hours]**
Spontaneous & Stimulated Emissions, Einstein's Coefficients, Components of laser, Three level & Four level laser systems, He-Ne laser, CO_2 laser & its industrial applications, Semiconductor laser, Introduction to Holography and Q-switching (qualitative approach).

UNIT-8: FIBRE OPTICS **[5 hours]**
Introduction to Optical Fibres, Acceptance Angle, Numerical Aperture, Normalized Frequency (V-number), SI & GRIN fibres, Single Mode and Multi Mode fibres, Pulse Dispersion, Attenuation through optical fibres, Introduction to Splices, Connectors & Couplers.

Text Books

(1) A Text Book of Engineering Physics, M. N. Avadhanulu, revised edition, 2014, S. Chand Publishers.
(2) Physics for Scientists & Engineers (Vol I & II), Serway & Jewett, 6th edition, Cengage Learning.
(3) Principles of Engineering Physics (Vol I & II), M. N. Khan, S. Panigrahi, 1st edition, 2016, Cambridge University Press.
(4) Engineering Physics, D. R. Joshi, 1st edition, second reprint, 2014, McGraw Hill.

Reference Books

(1) Introduction to Electrodynamics, D. J. Griffiths, 4th edition, 2012, Prentice Hallof India.
(2) Concepts of Modern Physics, A. Beiser, S. Mahajan, S. R. Choudhary, 7th edition, 2015, Tata McGraw Hill.
(3) Introduction to Special Relativity and Space Science, S. P. Singh, 1st edition, 2012, Wiley-India.
(4) A Primer of Special Relativity, P. L. Sardesai, 1st edition, 2004, New Age International Ltd.
(5) Material Science & Engineering, V. Raghvan 6th edition, 2015, Prentice Hallof India.

(6) Material Science & Engineering, W. D. Callister, 7th edition, 2007, John Wiley & Sons.
(7) Solid State Physics, D. Wei, 1st edition, 20008, Cengage Learning.
(8) Introduction to Solids, L. V. Azâroff, new edition, 2017, Tata McGraw Hill.
(9) Introduction to Superconductivity, M. Tinkham, 2nd edition, 1996, Dover Publications.
(10) Nanotechnology, R. Rakesh, 2nd edition, 2014, S. Chand Publishers.
(11) Nanomaterials, A. K. Bandyopadhyay,2nd edition, 2017, New Age International Ltd.
(12) Lasers & Non-Linear Optics, B. B. Laud, 3rd edition, 2015, New Age International Ltd.
(13) Lasers: Fundamentals & Applications, K. Thyagarajan, A. K. Ghatak, 2nd edition, 2010, Springer.
(14) Fibre Optic Communication, J. C. Palais, 5th edition, 2011, Pearson India.

E books and online learning materials

(1) Relativity: The Special and General Theory, A. Einstein, 1st edition, 1916, Methuen & Co Ltd
https://www.marxists.org/reference/archive/einstein/works/1910s/relative/relativity.pdf
[Accessed on: Jul 29, 2017]
(2) Introduction to The Theory of Superconductivity, N. B. Kopnin, Helsinki University of Technology
http://www.freebookcentre.net/physics-books-download/Introduction-to-The-Theory-of-Superconductivity-(PDF-82P).html [Accessed on: Jul 29, 2017]
(3) MIT open courseware on Electromagnetism
https://ocw.mit.edu/courses/physics/8-02t-electricity-and-magnetism-spring-2005/lecture-notes/
[Accessed on: Jul 29, 2017]
(4) MIT open courseware on Quantum Mechanics
https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/lecture-notes/
[Accessed on: Jul 29, 2017]
(5) MIT open courseware on Special theory of Relativity
https://ocw.mit.edu/courses/physics/8-033-relativity-fall-2006/lecture-notes/ [Accessed on: Jul 30, 2017]
(6) Lecture notes on Lasers https://www.physics.ohio-state.edu/~dws/class/780.il/780.il.html
[Accessed on: Jul 30, 2017]
(7) Lecture notes on Optical Communication http://nptel.ac.in/downloads/117101054/ [Accessed on: Jul 30, 2017]
(8) MIT open courseware on Applied Superconductivity
https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-763-applied-superconductivity-fall-2005/lecture-notes/ [Accessed on: Jul 29, 2017]

Online Courses and Video Lectures:

(1) http://nptel.ac.in/courses/122106027/36 [Accessed on: Jul 29, 2017]
(2) http://nptel.ac.in/courses/118104008/ [Accessed on: Jul 29, 2017]
(3) http://nptel.ac.in/courses/122107035/31
(4) http://nptel.ac.in/courses/115104088/ [Accessed on: Jul 29, 2017]
(5) https://www.youtube.com/watch?v=KOfXsQAGGWs [Accessed on: Jul 29, 2017]
(6) https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/lecture-videos/
[Accessed on: Jul 29, 2017]
(7) https://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/laser-fundamentals-i/
[Accessed on: Jul 29, 2017]
(8) https://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/fiberoptics-fundamentals/ [Accessed on: Jul 29, 2017]