Institute/School Name :	School of Applied Sciences		
Program Name	BE		
Course Code	PYL5101		
Course Name	Engineering Physics		
Lecture / Tutorial (per week)	L-4 ; T-1	**Course Credits**	5
Course Coordinator Name	Mr. Jagmohan Rana		

1. Scope and Objectives of the Course

1. To provide an overview of the study of the basic principle of working of laser, different types of lasers and their applications, basic principle of optical fibres, their uses in communication, electrodynamics and in-depth idea of theory of relativity.
2. To understand the need of quantum mechanics and related phenomenon, electronic behavior of solids, different types of magnetic materials, role of superconductor magnets in engineering. The course instructions are useful in understanding engineering problems for its physical interpretation and viability.
3. The above mentioned topics will help the students to develop sufficient depth in both engineering and physics, after the course they will be able to co-relate fundamental key concept of physics to engineering problems e.g., role of electrodynamics in communication engineering, electrical engineering and quantum mechanics in development of future quantum computer, etc .

2. Textbook

TB: "The Engineering Physics" second edition by Chitkara University Publication, 2014.

3. Reference Books

RB1- Engineering Physics by H. K. Malik and A. K. Singh, Tata McGraw Hill Publishing Company.

RB2- "Concepts of Modern Physics" Arthur Beiser by McGraw-Hill Publications.

RB3- Engineering Physics by D.K. Bhattacharya and P. Tandon, Oxford University Press.

4. Other readings and relevant websites:

S.No.	Link of Journals, Magazines, websites and Research Papers
Link 1	http://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/fiberoptics-fundamentals
Link 2	http://www.irm.umn.edu/hg2m/hg2m_b/hg2m_b.html
Link 3	http://www.phys.vt.edu/~takeuchi/relativity
Link 4	http://ocw.mit.edu/courses/physics/8-033-relativity-fall-2006/lecture-notes
Link 5	http://www.phys.ufl.edu/~pjh/teaching/phz7427/7427notes/ch5.pdf

5. Course Plan

Lect. No.	Topics	Ref. Text Book (TB)	Page no.
1	Laser: Introduction, characteristics laser action, stimulated absorption, spontaneous emission, stimulated emission.	TB	4.1- 4.10
2-3	Population inversion and pumping, Einstein's coefficient (no derivation), various level lasers, two level, three level, four level.	TB	4.14-4.16, 4.10,4.18-4.20
4-5	Ruby laser, Helium-Neon laser, Carbon dioxide laser.	TB	4.30-4.38
6	Semiconductor laser, concepts of Holography	TB	4.40, 4.49
7-8	Basic principle of optical fibre, step index and graded index fibers	TB	3.1- 3.6
9-10	parameters of optical fibers, acceptance angle, acceptance cone,	TB	3.7-3.11

	numerical aperture, normalized frequency, No. of modes,		
11-12	Attenuation in optical fibers, intermodal and intramodal dispersion (no derivation), optical fibers in communication	TB	3.12-3.14
13	Vector and scalar fields	TB	1.1
14-15	Gradient, divergence, curl and their physical interpretation	TB	1.2-1.5
16	Gauss's theorem and Stoke's theorem (Statement only), Equation of continuity	TB	1.6-1.7,1.10
17	Maxwell's equations in free space	TB	1.12
18	Propagation of electromagnetic waves in free space	TB	1.17
19-20	Frames of reference, postulates of special theory of relativity, Galilean transformation equations.	TB	2.1-2.2, 2.7
	ST-I		
21-22	Lorentz's transformation equations, inverse Lorentz's transformation equations (no derivation), length contraction, time dilation	TB	2.8-2.10
23	Relativistic velocity addition formula, Variation of mass with velocities (concept only)	TB	2.14-2.15
24	Mass energy relation	TB	2.19
25-26	Introduction to Quantum Mechanics, Group velocity and phase velocity (No relation)	TB	5.1,5.5
27	de-Broglie waves, Uncertainty principle (statement only), Wave function and its significance, Normalized wave function	TB	5.2,5.9,5.12-5.13
28-29	Schrodinger wave equations (Time dependent and Time Independent)	TB	5.14-5.18
30	Particle in a one dimensional box	TB	5.20
31-32	Free electron theory (quantum theory) density of states, Fermi energy, Fermi Dirac function	TB	6.3-6.8
33	Band theory of solids (introduction): metals, semiconductors, insulator, doping	TB	6.10-6.14
34-35	Intrinsic and extrinsic semiconductors, carrier concentration of semiconductors (no derivation)	TB	6.14-6.16
36	Hall effect (Quantitative idea)	TB	6.24
37	Magnetic materials, terminology and classification	TB	7.2-7.4
38-39	Magnetic moments of an atom; orbital, spin and total, Lande's g-factor, Ferromagnetism and related phenomena,	TB	7.5-7.9
40	The domain structure	TB	
	ST-II		
41	The hysteresis loop	TB	7.10,7.13
42	Types of magnetic materials, soft magnetic materials, hard magnetic materials	TB	7.8,7.15
43	Superconductivity, introduction	TB	8.1-8.4
44-45	Meissner effect, critical field, critical current and Isotope effect	TB	8.5-8.8
46-47	Types of superconductors: type i superconductors, type ii superconductors, London equations, penetration depth,	TB	8.9-8.12
48	Cooper pair and BCS theory, high temperature superconductors.	TB	8.14-8.16
	ST-III		

7. Evaluation Scheme:

Component 1*	Sessional Tests (STs)*	40
Component 2**	End Term Examination**	60
	Total	**100**

***** There are three Sessional Tests (STs) for all theory papers. Average of best two will be considered.
****** The End Term Comprehensive examination will be held at the end of semester. The mandatory requirement of 75% attendance in all theory classes is to be met for being eligible to appear in this component.

SYLLABUS

Contents	Lectures	Weightage
Laser: Introduction, characteristics laser action, stimulated absorption, spontaneous emission, stimulated emission, Population inversion and pumping, Einstein's coefficient (no derivation), various level lasers, two level, three level, four level, Ruby laser, Helium-Neon laser, Carbon dioxide laser, Semiconductor laser, concepts of Holography.	6	12.5%
Fiber Optics: Basic principle of optical fibre, step index and graded index fibers, parameters of optical fibers, acceptance angle, acceptance cone, numerical aperture, Normalized Frequency, No. of modes, Attenuation in optical fibers, intermodal and intramodal dispersion (no derivation), optical fibers in communication.	6	12.5%
Electrodynamics: Vector and scalar fields, Gradient, divergence, curl and their physical interpretation, Gauss's theorem and Stoke's theorem (Statement only), Equation of continuity, Maxwell's equations in free space, Propagation of electromagnetic waves in free space	6	12.5%
Special theory of relativity: Frames of reference, postulates of special theory of relativity, Galilean transformation equations. Lorentz's transformation equations, inverse Lorentz's transformation equations (no derivation), length contraction, time dilation Relativistic velocity addition formula, Variation of mass with velocities (concept only), Mass energy relation.	6	12.5%
Quantum Mechanics: Introduction to Quantum Mechanics, Group velocity and phase velocity (No relation), De-broglie waves, Uncertainty principle (statement only), Wave function and its significance, Normalised wave function, Schrodinger wave equations (Time dependent and Time Independent), Particle in a one dimensional box.	6	12.5%
Electronic Properties of Solids: Free electron theory (quantum theory) density of states, Fermi energy, Fermi Dirac function, Band theory of solids (introduction): metals, semiconductors, insulator, doping Intrinsic and extrinsic semiconductors, carrier concentration of semiconductors (no derivation), Hall effect (Quantitative idea).	6	12.5%
Magnetic Materials: Magnetic materials, terminology and classification, Magnetic moments of an atom; orbital, spin and total, Lande's g-factor, Ferromagnetism and related phenomena, the domain structure, the hysteresis loop,Types of magnetic materials: soft magnetic materials, hard magnetic materials.	6	12.5%
Superconductivity: Superconductivity, introduction, Meissner effect, critical field, Critical current and Isotope effect, Types of superconductors: type-I superconductors, type II superconductors, London equations, penetration depth, Cooper pair and BCS theory, high temperature superconductors.	6	**12.5%**

This Document is approved by:

Designation	Name	Signature
Course Coordinator	Jagmohan Rana	
HoD	Dr. Kuljeet Singh	
Dy.Dean	Dr. Jyotsana Kaushal	
Date	18.08.2015	