Lovely Professional University, Punjab

Course Code	Course Title	Lectures	Tutorials	Practicals	Credits	
PHY110	ENGINEERING PHYSICS	3	0	0	3	
Course Weightage	ATT: 5 CA: 25 MTT: 20 ETT: 50					
Course Focus	SKILL DEVELOPMENT					

Course Outcomes :Through this course students should be able to

CO1 :: understand the basic principles of physics to lay the foundation for various engineering courses.

CO2 :: explain the principle and working of lasers and optical fiber for their wide applications.

CO3 :: employ the principle of quantum mechanics to solve Schrodinger equations for standard systems.

CO4 :: articulate the physics of solids to understand their properties.

CO5 :: determine the properties of engineering materials.

	TextBooks (T)		
Sr No	**Title**	**Author**	**Publisher Name**
T-1	ENGINEERING PHYSICS	B K PANDEY, S. CHATURVEDI	CENGAGE LEARNING

	Reference Books (R)		
Sr No	**Title**	**Author**	**Publisher Name**
R-1	FUNDAMENTAL OF PHYSICS	HALLIDAY D., RESNICK R., WALKER J.	WILEY
R-2	CONCEPT OF MODERN PHYSICS.	BESIER ARTHUR.	MCGRAW HILL EDUCATION
R-3	ENGINEERING PHYSICS	HITENDRA K MALIK, A K SINGH	Tata McGraw Hill, India

Other Reading (OR)	
Sr No	**Journals articles as Compulsary reading (specific articles, complete reference)**
OR-1	https://ocw.mit.edu/search/?q=Physics ,
OR-2	https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype ,
OR-3	https://swayam.gov.in/explorer ,

Relevant Websites (RW)		
Sr No	**(Web address) (only if relevant to the course)**	**Salient Features**
RW-1	https://ocw.mit.edu/courses/8-511-theory-of-solids-i-fall-2004/	Theory of Solids
RW-2	http://ocw.mit.edu/courses/physics/8-05-quantum-physics-ii-fall-2013	Quantum Physics
RW-3	https://www.studysmarter.co.uk/explanations/physics/waves-physics/total-internal-reflection-in-optical-fibre/	Total internal reflection in optical fiber
RW-4	https://ocw.mit.edu/courses/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/	Laser and fiberoptics
RW-5	https://ocw.mit.edu/courses/8-02t-electricity-and-magnetism-spring-2005/	Electricity and Magnetism
RW-6	https://www.birmingham.ac.uk/Documents/college-eps/metallurgy/research/Magnetic-Materials-Background/Magnetic-Materials-Background-4-Classification-of-Magnetic-Materials.pdf	Magnetic materials

Audio Visual Aids (AV)		
Sr No	**(AV aids) (only if relevant to the course)**	**Salient Features**
AV-1	https://www.youtube.com/watch?v=_40dpUzzfhA	Hall Effect
AV-2	https://www.youtube.com/watch?v=Ww9wcs3yNWI	Fermi Energy
AV-3	https://www.youtube.com/watch?v=x3LOTaEVLak	Direct and indirect band gap semiconductor
AV-4	https://www.youtube.com/watch?v=G2zgAs5O7I8	Free electron theory
AV-5	https://www.youtube.com/watch?v=o1gqmrvPHjM	Particle in a box- quantization
AV-6	https://www.youtube.com/watch?v=TQKELOE9eY4	Uncertainty principle
AV-7	https://www.youtube.com/watch?v=jZOg39v73c4	Optical fiber cable
AV-8	https://www.youtube.com/watch?v=N_kA8EpCUQo	Construction and types of fibers
AV-9	https://www.youtube.com/watch?v=0MwMkBET_5I	Total internal reflection
AV-10	https://www.youtube.com/watch?v=XI18Is5Lp9I	Nd YAG laser
AV-11	https://www.youtube.com/watch?v=WJ05XOJiaDY	Pumping and population inversion
AV-12	https://www.youtube.com/watch?v=1LmcUaWuYao	How laser works
AV-13	https://www.youtube.com/watch?v=unTZjYsKs3g	Main component of Laser
AV-14	https://www.youtube.com/watch?v=9FCYGbOWk4w	Electromagnetism
AV-15	https://www.youtube.com/watch?v=WPZLRtyvEqo	Quantum Tunneling
AV-16	https://www.youtube.com/watch?v=KBJl1qiYOgo	Dielectric polarization
AV-17	https://www.youtube.com/watch?v=_XABS0dR15o	Piezoelectric effect
AV-18	https://www.youtube.com/playlist?list=PLyQSN7X0ro2314mKyUiOILaOC2hk6Pc3j	Video lectures on electricity and magnetism by Walter Lewin
AV-19	https://www.youtube.com/watch?v=f3BNHhfTsvk	Magnetic data storage

AV-20	https://www.youtube.com/watch?v=4sHmSF2tJKg	Maxwell's equations for electromagnetic
AV-21	https://www.youtube.com/watch?v=PXHczjOg06w	Superconductivity
AV-22	https://www.youtube.com/watch?v=YHmGNDMV1cY	Stimulated Emission
AV-23	https://www.youtube.com/watch?v=Xmq_FJd1oUQ	Wave-Particle Duality

Virtual Labs (VL)		
Sr No	**(VL) (only if relevant to the course)**	**Salient Features**
VL-1	http://www.falstad.com/dispersion/group.html	Phase and group velocities applet
VL-2	http://phys23p.sl.psu.edu/phys_anim/EM/indexer_EM.html	Electromagnetic waves

LTP week distribution: (LTP Weeks)	
Weeks before MTE	7
Weeks After MTE	7
Spill Over (Lecture)	7

Detailed Plan For Lectures

Week Number	**Lecture Number**	**Broad Topic(Sub Topic)**	**Chapters/Sections of Text/reference books**	**Other Readings, Relevant Websites, Audio Visual Aids, software and Virtual Labs**	**Lecture Description**	**Learning Outcomes**	**Pedagogical Tool Demonstration/ Case Study / Images / animation / ppt etc. Planned**	**Live Examples**
Week 1	Lecture 1	Electromagnetic theory (scalar and vectors fields)	T-1	RW-5 VL-2	Lecture1 will be introduction to the course and Lecture2 will cover basic mathematical quantities like scalar, vector fields and gradient	understand the importance of the course also the importance of scalar and vector fields	Discussion using Video	
		Electromagnetic theory (concept of gradient)	T-1	RW-5 VL-2	Lecture1 will be introduction to the course and Lecture2 will cover basic mathematical quantities like scalar, vector fields and gradient	understand the importance of the course also the importance of scalar and vector fields	Discussion using Video	

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Week 1	Lecture 2	Electromagnetic theory (scalar and vectors fields)	T-1	RW-5 VL-2	Lecture1 will be introduction to the course and Lecture2 will cover basic mathematical quantities like scalar, vector fields and gradient	understand the importance of the course also the importance of scalar and vector fields	Discussion using Video	
		Electromagnetic theory (concept of gradient)	T-1	RW-5 VL-2	Lecture1 will be introduction to the course and Lecture2 will cover basic mathematical quantities like scalar, vector fields and gradient	understand the importance of the course also the importance of scalar and vector fields	Discussion using Video	
	Lecture 3	Electromagnetic theory (divergence and curl)	T-1	RW-5 AV-14 AV-18	Lecture will cover basic divergence and curl concept	Articulate the physical significance of divergence and curl	Elaboration with video	
Week 2	Lecture 4	Electromagnetic theory (Gauss theorem and Stokes theorem (qualitative))	T-1	AV-14 AV-18	Gauss theorem, Stokes theorem (qualitative), Poisson, Laplace and continuity equations	Interpret the Gauss theorem, Stokes theorem (qualitative), Poisson, Laplace and continuity equations	Qualitative discussion	
		Electromagnetic theory (Poisson and Laplace equations)	T-1	AV-14 AV-18	Gauss theorem, Stokes theorem (qualitative), Poisson, Laplace and continuity equations	Interpret the Gauss theorem, Stokes theorem (qualitative), Poisson, Laplace and continuity equations	Qualitative discussion	
		Electromagnetic theory (continuity equation)	T-1	AV-14 AV-18	Gauss theorem, Stokes theorem (qualitative), Poisson, Laplace and continuity equations	Interpret the Gauss theorem, Stokes theorem (qualitative), Poisson, Laplace and continuity equations	Qualitative discussion	
	Lecture 5	Electromagnetic theory (Maxwell electromagnetic equations (differential and integral forms))	T-1	OR-1 RW-5 AV-20	Lecture 5 will be Maxwell electromagnetic equations (differential and integral forms) and their physical significance. Lecture 6 will be physical significance of Maxwell equations	Articulate the physical significance of Maxwell equations	Discussion with derivation	

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Week 2	Lecture 5	Electromagnetic theory (physical significance of Maxwell equations)	T-1	OR-1 RW-5 AV-20	Lecture 5 will be Maxwell electromagnetic equations (differential and integral forms) and their physical significance. Lecture 6 will be physical significance of Maxwell equations	Articulate the physical significance of Maxwell equations	Discussion with derivation	
	Lecture 6	Electromagnetic theory (Maxwell electromagnetic equations (differential and integral forms))	T-1	OR-1 RW-5 AV-20	Lecture 5 will be Maxwell electromagnetic equations (differential and integral forms) and their physical significance. Lecture 6 will be physical significance of Maxwell equations	Articulate the physical significance of Maxwell equations	Discussion with derivation	
		Electromagnetic theory (physical significance of Maxwell equations)	T-1	OR-1 RW-5 AV-20	Lecture 5 will be Maxwell electromagnetic equations (differential and integral forms) and their physical significance. Lecture 6 will be physical significance of Maxwell equations	Articulate the physical significance of Maxwell equations	Discussion with derivation	
Week 3	Lecture 7	Electromagnetic theory (Ampere Circuital Law)	T-1 R-3	RW-5 AV-14	Ampere Circuital Law, Maxwell displacement current and correction in Ampere Circuital Law	Understanding of displacement current and correction in Ampere circuital law	Elaboration with derivation	
		Electromagnetic theory (Maxwell displacement current and correction in Ampere Circuital Law)	T-1 R-3	RW-5 AV-14	Ampere Circuital Law, Maxwell displacement current and correction in Ampere Circuital Law	Understanding of displacement current and correction in Ampere circuital law	Elaboration with derivation	
	Lecture 8	Lasers and applications (fundamentals of laser-energy levels in atoms)	T-1 R-3	OR-3 RW-4 AV-10 AV-12 AV-22	fundamentals of laser-energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light	Interpret the fundamentals of laser- energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light	Discussion with animation	Comparison between Incandescent light bulbs and laser

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Week 3	Lecture 8	Lasers and applications (Radiation matter interaction)	T-1 R-3	OR-3 RW-4 AV-10 AV-12 AV-22	fundamentals of laser-energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light	Interpret the fundamentals of laser- energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light	Discussion with animation	Comparison between Incandescent light bulbs and laser
		Lasers and applications (Absorption of light)	T-1 R-3	OR-3 RW-4 AV-10 AV-12 AV-22	fundamentals of laser-energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light	Interpret the fundamentals of laser- energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light	Discussion with animation	Comparison between Incandescent light bulbs and laser
		Lasers and applications (spontaneous emission of light)	T-1 R-3	OR-3 RW-4 AV-10 AV-12 AV-22	fundamentals of laser-energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light	Interpret the fundamentals of laser- energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light	Discussion with animation	Comparison between Incandescent light bulbs and laser
		Lasers and applications (stimulated emission of light)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	fundamentals of laser-energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light	Interpret the fundamentals of laser- energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light	Discussion with animation	Comparison between Incandescent light bulbs and laser
	Lecture 9	Lasers and applications (population of energy levels)	T-1 R-3	RW-4	population of energy levels,Einstein A and B coefficients	Summarise the significance of Einstein A and B coefficients along with population of energy levels	Discussion with derivation	
		Lasers and applications (Einstein A and B coefficients)	T-1 R-3	RW-4	population of energy levels,Einstein A and B coefficients	Summarise the significance of Einstein A and B coefficients along with population of energy levels	Discussion with derivation	

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Week 4	Lecture 10	Lasers and applications (metastable state)	T-1 R-3	RW-4 AV-11 AV-13	metastable state, population inversion, resonant cavity, excitation mechanisms. Allotment of Academic task 2 (Test 1)	Understand the metastable state, population inversion, resonant cavity, and different excitation mechanisms	Elaboration with video	
		Lasers and applications (population inversion)	T-1 R-3	RW-4 AV-11 AV-13	metastable state, population inversion, resonant cavity, excitation mechanisms. Allotment of Academic task 2 (Test 1)	Understand the metastable state, population inversion, resonant cavity, and different excitation mechanisms	Elaboration with video	
		Lasers and applications (resonant cavity)	T-1 R-3	RW-4 AV-11 AV-13	metastable state, population inversion, resonant cavity, excitation mechanisms. Allotment of Academic task 2 (Test 1)	Understand the metastable state, population inversion, resonant cavity, and different excitation mechanisms	Elaboration with video	
		Lasers and applications (excitation mechanisms)	T-1 R-3	RW-4 AV-11 AV-13	metastable state, population inversion, resonant cavity, excitation mechanisms. Allotment of Academic task 2 (Test 1)	Understand the metastable state, population inversion, resonant cavity, and different excitation mechanisms	Elaboration with video	
	Lecture 11	Lasers and applications(Nd - YAG)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	Lecture 11 will be Nd-YAG laser and He-Ne laser. Lecture 12 will cover semiconductor laser, lasing action and properties of laser	Apply the principle of laser to understand working and construction of Ruby, He Ne Laser, Nd-YAG laser and semiconductor laser	Video with discussion	Applications of different lasers like material processing, biomedical applications, fiber optical communication
		Lasers and applications(He-Ne Laser)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	Lecture 11 will be Nd-YAG laser and He-Ne laser. Lecture 12 will cover semiconductor laser, lasing action and properties of laser	Apply the principle of laser to understand working and construction of Ruby, He Ne Laser, Nd-YAG laser and semiconductor laser	Video with discussion	Applications of different lasers like material processing, biomedical applications, fiber optical communication

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Week 4	Lecture 11	Lasers and applications (Semiconductor Laser)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	Lecture 11 will be Nd-YAG laser and He-Ne laser. Lecture 12 will cover semiconductor laser, lasing action and properties of laser	Apply the principle of laser to understand working and construction of Ruby, He Ne Laser, Nd-YAG laser and semiconductor laser, lasing action and properties of laser.	Video with discussion	Applications of different lasers like material processing, biomedical applications, fiber optical communication
		Lasers and applications (lasing action)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	Lecture 11 will be Nd-YAG laser and He-Ne laser. Lecture 12 will cover semiconductor laser, lasing action and properties of laser	Apply the principle of laser to understand working and construction of Ruby, He Ne Laser, Nd-YAG laser and semiconductor laser, lasing action and properties of laser.	Video with discussion	Applications of different lasers like material processing, biomedical applications, fiber optical communication
		Lasers and applications (properties of laser)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	Lecture 11 will be Nd-YAG laser and He-Ne laser. Lecture 12 will cover semiconductor laser, lasing action and properties of laser	Apply the principle of laser to understand working and construction of Ruby, He Ne Laser, Nd-YAG laser and semiconductor laser, lasing action and properties of laser.	Video with discussion	Applications of different lasers like material processing, biomedical applications, fiber optical communication
	Lecture 12	Lasers and applications(Nd - YAG)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	Lecture 11 will be Nd-YAG laser and He-Ne laser. Lecture 12 will cover semiconductor laser, lasing action and properties of laser	Apply the principle of laser to understand working and construction of Ruby, He Ne Laser, Nd-YAG laser and semiconductor laser	Video with discussion	Applications of different lasers like material processing, biomedical applications, fiber optical communication
		Lasers and applications(He-Ne Laser)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	Lecture 11 will be Nd-YAG laser and He-Ne laser. Lecture 12 will cover semiconductor laser, lasing action and properties of laser	Apply the principle of laser to understand working and construction of Ruby, He Ne Laser, Nd-YAG laser and semiconductor laser	Video with discussion	Applications of different lasers like material processing, biomedical applications, fiber optical communication

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Week 4	Lecture 12	Lasers and applications (Semiconductor Laser)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	Lecture 11 will be Nd-YAG laser and He-Ne laser. Lecture 12 will cover semiconductor laser, lasing action and properties of laser	Apply the principle of laser to understand working and construction of Ruby, He Ne Laser, Nd-YAG laser and semiconductor laser, lasing action and properties of laser.	Video with discussion	Applications of different lasers like material processing, biomedical applications, fiber optical communication
		Lasers and applications (lasing action)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	Lecture 11 will be Nd-YAG laser and He-Ne laser. Lecture 12 will cover semiconductor laser, lasing action and properties of laser	Apply the principle of laser to understand working and construction of Ruby, He Ne Laser, Nd-YAG laser and semiconductor laser, lasing action and properties of laser.	Video with discussion	Applications of different lasers like material processing, biomedical applications, fiber optical communication
		Lasers and applications (properties of laser)	T-1 R-3	OR-3 RW-4 AV-10 AV-12	Lecture 11 will be Nd-YAG laser and He-Ne laser. Lecture 12 will cover semiconductor laser, lasing action and properties of laser	Apply the principle of laser to understand working and construction of Ruby, He Ne Laser, Nd-YAG laser and semiconductor laser, lasing action and properties of laser.	Video with discussion	Applications of different lasers like material processing, biomedical applications, fiber optical communication
Week 5	Lecture 13	Lasers and applications (applications of laser: holography)	T-1 R-1 R-3		Application of laser in holography	Explain the working of holography	Elaboration	Hologram in books and electronic items
	Lecture 14				Test 1			
	Lecture 15	Fiber optics(fiber optics introduction)	T-1 R-3	RW-4 AV-7	Fiber optics introduction, optical fiber as a dielectric wave guide	Outline the propagation of light in optical fiber	Discussion	Total internal reflection
		Fiber optics(optical fiber as a dielectric wave guide)	T-1 R-3	RW-4 AV-7	Fiber optics introduction, optical fiber as a dielectric wave guide	Outline the propagation of light from optical fiber	Discussion	Total internal reflection
Week 6	Lecture 16	Fiber optics(total internal reflection)	T-1 R-3	RW-3 RW-4 AV-9	Total internal reflection, acceptance angle	Develop the concept of total internal reflection and acceptance angle in optical fiber	Discussion and demonstration using video	

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Week 6	Lecture 16	Fiber optics(acceptance angle)	T-1 R-3	RW-3 RW-4 AV-9	Total internal reflection, acceptance angle	Develop the concept of total internal reflection and acceptance angle in optical fiber	Discussion and demonstration using video	
	Lecture 17	Fiber optics(numerical aperture)	T-1 R-3	RW-4	Numerical aperture, relative refractive index	Understand the relation between numerical aperture and relative refractive index	Derivation and discussion	
		Fiber optics(relative refractive index)	T-1 R-3	RW-4	Numerical aperture, relative refractive index	Understand the relation between numerical aperture and relative refractive index	Derivation and discussion	
	Lecture 18	Fiber optics(V-number)	T-1 R-3	RW-4 AV-8	Lecture 18 will be V-number, step index and graded index fibers and Lecture 19 will be losses associated with optical fiber.	Differentiate between step index and graded index fiber, different losses associated with optical fiber and relate the V-number with no of modes	Illustrative videos with discussion	
Week 7	Lecture 19	Fiber optics(V-number)	T-1 R-3	RW-4 AV-8	Lecture 18 will be V-number, step index and graded index fibers and Lecture 19 will be losses associated with optical fiber.	Differentiate between step index and graded index fiber, different losses associated with optical fiber and relate the V-number with no of modes	Illustrative videos with discussion	
		SPILL OVER						
Week 7	Lecture 20				Spill Over			
	Lecture 21				Spill Over			
		MID-TERM						
Week 8	Lecture 22	Quantum mechanics(need of quantum mechanics)	T-1 R-2 R-3	OR-2 RW-2	Need of quantum mechanics, photoelectric effect	Recall the need of quantum mechanics, concept of photoelectric effect	Explanation with simulations	
		Quantum mechanics (photoelectric effect)	T-1 R-2 R-3	OR-2 RW-2	Need of quantum mechanics, photoelectric effect	Recall the need of quantum mechanics, concept of photoelectric effect	Explanation with simulations	

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Week 8	Lecture 23	Quantum mechanics(concept of de Broglie matter waves)	T-1 R-2 R-3	RW-2 AV-23	Concept of de Broglie matter waves, wavelength of matter waves in different forms	Understand the concept of de Broglie matter waves, wavelength of matter waves in different forms	Derivation with discussion	
		Quantum mechanics (wavelength of matter waves in different forms)	T-1 R-2 R-3	RW-2 AV-23	Concept of de Broglie matter waves, wavelength of matter waves in different forms	Understand the concept of de Broglie matter waves, wavelength of matter waves in different forms	Derivation with discussion	
	Lecture 24	Quantum mechanics (Heisenberg uncertainty principle)	T-1 R-2 R-3	RW-2 AV-6 VL-1	Heisenberg uncertainty principle, concept of phase velocity and group velocity (qualitative)	Articulate the Heisenberg uncertainty principle, concept of phase velocity and group velocity (qualitative)	Elaboration with derivation	
		Quantum mechanics(concept of phase velocity and group velocity (qualitative))	T-1 R-2 R-3	RW-2 AV-6 VL-1	Heisenberg uncertainty principle, concept of phase velocity and group velocity (qualitative)	Articulate the Heisenberg uncertainty principle, concept of phase velocity and group velocity (qualitative)	Elaboration with derivation	
Week 9	Lecture 25	Quantum mechanics(wave function and its significance)	T-1 R-2 R-3	RW-2	Wave function and its significance, Schrodinger time dependent and independent equation	Recall wave function and its significance, Schrodinger time dependent and independent equations	Derivation and discussion	
		Quantum mechanics (Schrodinger time dependent and independent equation)	T-1 R-2 R-3	RW-2	Wave function and its significance, Schrodinger time dependent and independent equation	Recall wave function and its significance, Schrodinger time dependent and independent equations	Derivation and discussion	
	Lecture 26	Quantum mechanics(particle in a box)	T-1 R-2 R-3	RW-2 AV-5	Particle in a box	Analyze the energy of the particle in a box	Animation with discussion	
	Lecture 27	Quantum mechanics (tunneling effect (Qualitative idea))	T-1 R-2 R-3	RW-2 AV-15	Tunneling effect (Qualitative idea)	Understand the concept of tunneling effect	Discussion	Scanning Tunneling Microscope
Week 10	Lecture 28				Term paper			

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Week 10	Lecture 29	Solid state physics(free electron theory (Introduction))	T-1 R-2 R-3	RW-1 AV-4	Free electron theory (Introduction), diffusion and drift current (qualitative)	Explain free electron theory, diffusion and drift current (qualitative)	Explanation with derivation	
		Solid state physics(diffusion and drift current (qualitative))	T-1 R-2 R-3	RW-1 AV-4	Free electron theory (Introduction), diffusion and drift current (qualitative)	Explain free electron theory (Introduction), diffusion and drift current (qualitative)	Explanation with derivation	
	Lecture 30	Solid state physics(fermi energy)	T-1 R-2 R-3	RW-1 AV-2	Fermi energy, Fermi-dirac distribution function	Understand the concept of Fermi energy and Fermi-dirac distribution function	Elaboration with video	
		Solid state physics(fermi-dirac distribution function)	T-1 R-2 R-3	RW-1 AV-2	Fermi energy, Fermi-dirac distribution function	Understand the concept of Fermi energy and Fermi-dirac distribution function	Elaboration with video	
Week 11	Lecture 31	Solid state physics(and theory of solids -formation of allowed and forbidden energy bands)	T-1 R-3	RW-1	Theory of solids - formation of allowed and forbidden energy bands, concept of effective mass - electrons and holes. Allotment of Academic task 3 (Test 2)	Explain the formation of allowed and forbidden energy bands, concept of effective mass - electrons and holes	Discussion with derivation	
		Solid state physics(concept of effective mass - electrons and holes)	T-1 R-3	RW-1	Theory of solids - formation of allowed and forbidden energy bands, concept of effective mass - electrons and holes. Allotment of Academic task 3 (Test 2)	Explain the formation of allowed and forbidden energy bands, concept of effective mass - electrons and holes	Discussion with derivation	
	Lecture 32	Solid state physics(Hall effect (with derivation))	T-1 R-3	RW-1 AV-1	Hall effect (with derivation), semiconductors and insulators	Differentiate between n-type and p-type semiconductors based on Hall effect	Qualitative discussion	Hall sensor
		Solid state physics (semiconductors and insulators)	T-1 R-3	RW-1 AV-1	Hall effect (with derivation), semiconductors and insulators	Differentiate between n-type and p-type semiconductors based on Hall effect	Qualitative discussion	

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Week 11	Lecture 33	Solid state physics(fermi level for intrinsic and extrinsic semiconductors)	T-1 R-3	RW-1 AV-3	Fermi level for intrinsic and extrinsic semiconductors, direct and indirect band gap semiconductors	Understand the concept of Fermi energy level for intrinsic, extrinsic semiconductors and direct and indirect band gap semiconductors	Video with Discussion	
		Solid state physics(direct and indirect band gap semiconductors)	T-1 R-3	RW-1 AV-3	Fermi level for intrinsic and extrinsic semiconductors, direct and indirect band gap semiconductors	Understand the concept of Fermi energy level for intrinsic, extrinsic semiconductors and direct and indirect band gap semiconductors	Video with discussion	
Week 12	Lecture 34	Solid state physics(solar cell basics)	T-1 R-2	RW-1	Solar cell basics	Articulate the working of solar cell	Discussion	
	Lecture 35				Test 2			
	Lecture 36	Introduction to engineering materials(dielectric materials definition)	T-1 R-1 R-3	AV-16	Dielectric materials definition, dielectric constant	Explain dielectric materials, dielectric constant	Illustration with video	
		Introduction to engineering materials(dielectric constant)	T-1 R-1 R-3	AV-16	Dielectric materials definition, dielectric constant	Explain dielectric materials, dielectric constant	Illustration with video	
Week 13	Lecture 37	Introduction to engineering materials(magnetic materials: dia, para, ferromagnetic materials)	T-1 R-1 R-3	RW-6 AV-19	Magnetic materials: dia, para, ferromagnetic materials, magnetic data storage	Differentiate between different type of magnetic material and understand their applications	Discussion with video	
		Introduction to engineering materials(magnetic data storage)	T-1 R-1 R-3	RW-6 AV-19	Magnetic materials: dia, para, ferromagnetic materials, magnetic data storage	Differentiate between different type of magnetic material and understand their applications	Discussion with video	
	Lecture 38	Introduction to engineering materials(piezoelectric materials: direct and inverse piezoelectric methods)	T-1 R-1 R-3	AV-17	Piezoelectric materials: direct and inverse piezoelectric methods	Understand the piezoelectric effect: direct and inverse piezoelectric methods.	Discussion with video	Gas lighter

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Week 13	Lecture 39	Introduction to engineering materials(superconducting materials: properties)	T-1 R-2 R-3		Superconducting materials: properties, Meissner effect	Explain the superconductivity phenomena and Meissner effect	Video with explanation	Maglev trains
		Introduction to engineering materials(Meissner effect)	T-1 R-2 R-3	AV-21	Superconducting materials: properties, Meissner effect	Explain the superconductivity phenomena and Meissner effect	Video with explanation	Maglev trains
Week 14	Lecture 40	Introduction to engineering materials(Type I & Type II superconductors)	T-1 R-3	AV-21	Type I and Type II superconductors, applications	Distinguish between Type I and Type II superconductors and their applications	Discussion with video	Permanent and electromagnets
		Introduction to engineering materials(applications)	T-1 R-3	AV-21	Type I and Type II superconductors, applications	Distinguish between Type I and Type II superconductors and their applications	Discussion with video	Permanent and electromagnets
		SPILL OVER						
Week 14	Lecture 41				Spill Over			
	Lecture 42				Spill Over			
Week 15	Lecture 43				Spill Over			
	Lecture 44				Spill Over			
	Lecture 45				Spill Over			

Scheme for CA:

CA Category of this Course Code is:C010102 (Total 3 tasks, 1 compulsory and out of remaining 1 best out of 2 to be considered)

Component	Iscompulsory	Weightage (%)	Mapped CO(s)
Test 1	NO	50	CO1, CO2
Test 2	NO	50	CO3, CO4
Term paper	Yes	50	CO1, CO2, CO3, CO4, CO5

Details of Academic Task(s)

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Academic Task	Objective	Detail of Academic Task	Nature of Academic Task (group/individuals)	Academic Task Mode	Marks	Allottment / submission Week
Term paper	To inculcate the learning of physics at home	A problem based on Lab at Home will be assigned to the individual student. Students are expected to complete the task and submit a handwritten report. Evaluation of the report will be done as given: Written Report-20 Marks (Presenting accurate information, highlighting key principles, supporting facts and details in the report-10 Marks, Observation, conclusion and analysis including learning outcome form the topic (Graphical/circuit/data analysis)-5 Marks, Completeness of the Problem/Task and References cited-5 Marks); Presentation/Viva-10 Marks	Individual	Offline	30	2 / 10
Test 1	To check the understanding of the students	A subjective test will be conducted on the basis of the sub-topics covered from Unit 1 and Unit 2. Test will comprise of questions of marks 5 or multiple of 5.	Individual	Offline	30	4 / 5
Test 2	To check the understanding of the students	A subjective test will be conducted on the basis of the sub-topics covered from Unit 1 and Unit 2. Test will comprise of questions of marks 5 or multiple of 5.	Individual	Offline	30	11 / 12

List of suggested topics for term paper[at least 15] (Student to spend about 15 hrs on any one specified term paper)

Sr. No.	Topic
1	Working and components of CFL and its installation in home, compared the power consumption of it with LED bulb
2	Working principle of TV remote control and AC remote control
3	Principle of cooling mechanism in AC, function of various parts of AC and compared its power consumption with electric fa
4	Working principle of electrical chimney in home
5	Automatic washing machine
6	Concept of antilock breaking system(ABS)
7	Working of Hall sensor and its applications
8	Working mechanism and functions of various parts of water purifier
9	Working of air purifier
10	Types and working principle of inverters
11	Working principle of computer mouse (Wireless and optical)
12	Working of wireless charging and its comparison with wired charging
13	Optical fiber as a sensor
14	Working of capacitive touch screen

15	Working of resistive touch screen