

COURSE INFORMATION SHEET

Program	: Diploma in Engineering	Course Title	: Engineering Physics 2
Course Code	: 2003	Credits	: 3
Semester	: 2		
Course Category	: F		
Hours per week	: 3	Hours per semester	: 45

Course Objectives:

1	Provide an understanding of Newton's law of gravitation, acceleration due to gravity and gravitational potential
2	Explain uniform circular motion and analyse the motion of artificial satellites and its classification
3	Explain the rotational motion of a rigid body about a fixed axis
4	Provide an understanding of the basic laws of electricity and magnetism and apply these in the analysis of simple circuits and in the designing of various measuring devices
5	Provide an understanding of the concept of quantization and explain photoelectric effect and working of Lasers
6	Provide an understanding of various energy sources and different energy producing mechanisms and applications of nuclear energy

Course Outcome:

C O No	Description
CO1	State Newton's law of gravitation and explain acceleration due to gravity and escape velocity of a planet
CO2	Describe circular motion and explain banking of roads and rails, satellite motion and classification of artificial satellites
CO3	Explain rotation motion of simple rigid body systems about constant axes of rotation
CO4	Explain basic laws in electricity and magnetism and use them to analyse simple circuits, to design different measuring devices and solve related problems
CO5	Describe the quantization concept in modern physics and use this to explain photoelectric effect and working of Lasers
CO6	Distinguish various energy sources and explain different energy producing mechanisms and applications of nuclear energy

Learning Outcomes :

- 1 State Newton's law of gravitation
- 2 List factors on which gravitational force between two masses depends
- 3 Write mathematical expression for Newton's law of gravitation
- 4 Solve numerical problems using Newton's law of gravitation
- 5 Define gravitational constant G

- 6 Write the value of G
- 7 Explain acceleration due to gravity
- 8 Distinguish between g and G
- 9 Deduce expression for acceleration due to gravity on the surface of a planet
- 10 List factors on which the acceleration due to gravity on the surface of the planet depends
- 11 Calculate the mass of the planet using the value of g on its surface
- 12 Explain the weight of a body
- 13 List the factors on which the value of g depends
- 14 Deduce the expression for g at an altitude h
- 15 Explain the variation of g with altitude
- 16 Deduce the expression for g at a depth d
- 17 Explain the variation of g with depth
- 18 Deduce the expression for g at a latitude on the surface of the earth
- 19 Explain the variation of g with latitude on the surface of the earth
- 20 Explain the variation of g due to non spherical shape of the earth
- 21 Solve numerical problems related to acceleration due to gravity
- 22 Define gravitational potential and potential energy
- 23 Distinguish between gravitational potential and potential energy
- 24 Write expression for gravitational potential and gravitational potential energy
- 25 List factors on which gravitational potential depends
- 26 Solve numerical problems related to gravitational potential
- 27 Deduce expression for escape velocity from the surface of a planet
- 28 List factors on which escape velocity from the surface of the planet depends
- 29 Calculate the escape velocity from the surface of various planets and moon
- 30 Distinguish between rotational motion and translatory motion
- 31 Analyse circular motion as a special case of rotation
- 32 Define angular displacement, angular velocity, angular acceleration
- 33 Write the unit of angular displacement, angular velocity, angular acceleration
- 34 Identify equations of motion of a particle in angular motion
- 35 Define uniform circular motion
- 36 List examples for uniform circular motion
- 37 Deduce the relation between linear velocity and angular velocity of a particle in uniform circular motion
- 38 Solve numerical problems related to circular motion
- 39 Define centripetal acceleration
- 40 Deduce expression for centripetal acceleration
- 41 Define centripetal force
- 42 List examples for centripetal force
- 43 Deduce expression for centripetal force
- 44 Solve numerical problems related to centripetal acceleration and centripetal force
- 45 Explain banking of roads and rails
- 46 Deduce expression for Banking angle
- 47 Solve numerical problems related to banking of roads and rails
- 48 Define a satellite
- 49 Distinguish between artificial and natural satellite
- 50 Classify satellites

- 51 Explain satellite motion
- 52 Deduce expression for orbital velocity of satellite
- 53 Define first cosmic velocity
- 54 Deduce expression for first cosmic velocity
- 55 Deduce time period of a satellite
- 56 Solve numerical problems related to satellite motion
- 57 Define geostationary satellite
- 58 Calculate the altitude of the orbit of a geostationary satellite
- 59 List applications of geostationary satellite
- 60 Define polar satellite
- 61 List applications of a polar satellite
- 62 Distinguish between geostationary and polar satellites
- 63 Explain the working of GPS
- 64 Define a rigid body
- 65 Explain the centre of mass
- 66 Define axis of rotation
- 67 Explain rotational motion of a rigid body
- 68 Define moment of inertia
- 69 Calculate moment of inertia of discrete mass systems
- 70 Identify the importance of moment of inertia in rotational motion
- 71 Define radius of gyration
- 72 write expression for radius of gyration
- 73 Write unit of radius of gyration
- 74 deduce moment of inertia of a thin ring about an axis passing through its center and perpendicular to its plane
- 75 deduce expression for moment of inertia of a disc passing through its centre and perpendicular to its plane
- 76 State perpendicular axes theorem
- 77 Calculate moment of inertia of a ring about a diameter
- 78 Calculate moment of inertia of a disc about a diameter
- 79 State parallel axes theorem
- 80 Calculate moment of inertial of a ring about a tangent
- 81 Calculate moment of inertial of a disc about a tangent
- 82 Define angular momentum
- 83 Define torque
- 84 Deduce the relation between angular momentum and torque
- 85 Define rotational kinetic energy
- 86 Write expression for rotational kinetic energy
- 87 Deduce relation between angular momentum and rotational kinetic energy
- 88 Calculate kinetic energy of a rolling disc
- 89 Solve numerical problems related to rotational motion
- 90 State unit of charge
- 91 Define electric current
- 92 Define potential difference
- 93 Define the unit of electric current
- 94 State Ohm's law

- 95 Explain the experimental verification of Ohm's law
- 96 Define resistance
- 97 Define the unit of resistance
- 98 Draw diagrams of series and parallel resistance combination
- 99 Distinguish between series and parallel combination of resistances
- 100 Deduce the expression for effective resistance when resistances are connected in parallel
- 101 Deduce expression for effective resistance when resistances are connected in series
- 102 Deduce expression for branch current
- 103 List factors on which resistance of a wire depends
- 104 Write the expression for resistance of a wire
- 105 Define resistivity of a material
- 106 Write the unit of resistivity
- 107 Define conductivity
- 108 State and explain Kirchhoff's first law
- 109 State and explain Kirchhoff's second law
- 110 Analyse simple electrical circuit using Kirchhoff's laws
- 111 Draw Wheatstone's bridge
- 112 Deduce balancing condition of Wheatstone's bridge using Kirchhoff's laws
- 113 Explain the measurement of unknown resistance using Wheatstone's bridge
- 114 Draw the diagram of a meter bridge
- 115 Explain how a Wheatstone's bridge is converted into a meter bridge
- 116 Draw the circuit diagram for measuring unknown resistance using meter bridge
- 117 Explain how unknown resistance is measured using meter bridge
- 118 Write the expression used to find unknown resistance using meter bridge
- 119 List factors on which magnetic field produced by a small current carrying conductor depends
- 120 State Biot-Savart's law
- 121 Write the unit of magnetic field
- 122 State right hand grip rule
- 123 Deduce expression for the magnetic field at the centre of a circular coil
- 124 Write expression for the magnetic field at a point on the axis of a circular coil
- 125 Solve numerical problems related to circular coil
- 126 Write the expression for magnetic field produced by a straight finite conductor
- 127 Deduce the expression for magnetic field produced by an infinite straight current carrying conductor
- 128 Solve numerical problems related to magnetic field produced by a current carrying conductor
- 129 List factors on which force experienced by a current carrying conductor placed in a magnetic field depends
- 130 Write expression for force experienced by a current carrying conductor placed in a magnetic field
- 131 State Fleming's left hand rule
- 132 Solve numerical problems related to force experienced by a current carrying conductor placed in a magnetic field
- 133 Draw the diagram of a Moving coil galvanometer explain its principle and working
- 134 Define shunt
- 135 Design and construct an ammeter of required range by converting a galvanometer
- 136 Design and construct an voltmeter of required range by converting a galvanometer
- 137 Explain Planck's quantum theory

- 138 Write the value of h
- 139 Define Photoelectric effect
- 140 Define photo electron
- 141 Define electron volt
- 142 Define photoelectric work function
- 143 Define threshold wavelength and threshold frequency
- 144 Write the relation between threshold wavelength and frequency
- 145 Explain photoelectric experiment
- 146 Calculate work function of materials
- 147 Calculate energy of a photon in electron volt
- 148 State the laws of photoelectric effect
- 149 Explain quantisation of light energy
- 150 Deduce Einstein's photoelectric equation
- 151 Explain laws of photoelectric effect using Einstein's equation
- 152 List applications of photoelectric effect
- 153 Explain the working of a photo emissive cell
- 154 Deduce expression for maximum velocity of a photoelectron
- 155 Solve numerical problems related to quantisation of light energy
- 156 Solve numerical problems related to Einstein's photo electric equation
- 157 Distinguish between ordinary light and LASER light
- 158 Explain quantisation of atomic energy
- 159 Distinguish between ground state excited state
- 160 Distinguish between meta stable and ordinary atomic energy states
- 161 Explain spontaneous emission
- 162 Distinguish between stimulated emission and stimulated absorption
- 163 Define population inversion
- 164 Explain how population inversion is achieved
- 165 Explain the principle of laser action
- 166 List the characteristics of Laser radiation
- 167 List components of a laser
- 168 Define monochromatic light radiation
- 169 Define coherent light radiation
- 170 Draw the diagram of a ruby laser
- 171 Explain the principle of a ruby laser
- 172 Explain the working of a ruby laser
- 173 Draw the diagram of He-Ne laser
- 174 Explain the principle of a He-Ne laser
- 175 Explain the working of a He-Ne laser
- 176 List the advantages of He-Ne laser over ruby laser
- 177 Explain the working of a semiconductor laser
- 178 List applications of laser
- 179 List merits of semiconductor laser
- 180 List demerits of semiconductor Laser
- 181 List nucleons
- 182 Explain structure of nucleus
- 183 write mass of nucleons in amu

- 184 write Einstein's mass energy relation
- 185 Write unit of nuclear energy
- 186 Calculate energy equivalent of a given mass in Mev
- 187 Explain nuclear fission
- 188 List examples for nuclear fission
- 189 Define mass defect
- 190 Explain nuclear fusion
- 191 List examples for nuclear fusion
- 192 Distinguish between nuclear fission and nuclear fusion
- 193 Explain chain reaction
- 194 Define neutron multiplication factor
- 195 Classify chain reactions
- 196 Distinguish between controlled and uncontrolled chain reaction
- 197 List nuclear fuels
- 198 Distinguish between slow neutrons and fast neutrons
- 199 Explain the working of control rods in a nuclear reactor
- 200 Explain the working of moderator in a nuclear reactor
- 201 List important parts of a nuclear reactor
- 202 Explain the purpose of coolant in a nuclear reactor
- 203 List moderators used in a nuclear reactor
- 204 List control rods used in a nuclear reactor
- 205 List coolants used in a nuclear fission reactor
- 206 Draw block diagram of a nuclear fission reactor
- 207 Explain the working of a nuclear reactor
- 208 Explain energy production in stars
- 209 List the uses of a nuclear reactor
- 210 Identify need of energy in daily life
- 211 Identify the importance of clean energy production
- 212 List different energy sources
- 213 Explain merits and demerits of solar energy
- 214 Explain merits and demerits of wind energy
- 215 Explain merits and demerits of hydro electric energy
- 216 Explain merits and demerits of fuel energy
- 217 Explain merits and demerits of tidal energy
- 218 Explain merits and demerits of nuclear energy

Course Content:

Module	Topics	Hours
1	Angular displacement, angular velocity, angular acceleration, relation between linear velocity and angular velocity in circular motion, centripetal acceleration, centripetal force, banking of roads and rails, problems. Rigid body, centre of mass, moment of inertia, radius of gyration, statement of parallel and perpendicular axes theorems, derivation of moment of inertia of a disc about an axis passing through the centre and perpendicular to its plane, angular momentum and torque, relation between torque and angular momentum (only expression), rotational kinetic energy, kinetic energy of a disc rolling on a horizontal surface, problems.	13
2	Newton's law of gravitation, Expression for acceleration due to gravity, Factors affecting the value of g- variation of acceleration due to gravity, satellites, Artificial satellites, orbital velocity and period of a satellite, gravitational potential, escape velocity, geostationary satellites and its uses, polar satellites and its uses, uses of artificial satellites	9
3	Electric charge, potential difference, Ohm's law, verification of Ohm's law, resistivity, conductivity, law of resistances, Kirchhoff's laws, Wheatstone's Bridge, Metre Bridge Magnetic effect of electric current, Biot-savart law, magnetic field due to a current carrying conductor, force on a current carrying conductor placed in a magnetic field, Moving Coil Galvanometer and its working, shunt, conversion of a galvanometer into an ammeter, conversion of a galvanometer into a voltmeter, problems.	13
4	Quantum theory, photoelectric effect, experiment to illustrate photoelectric effect, laws of photoelectric effect, Einstein's photoelectric equation, applications of photoelectric effect, problems. Laser, principle of laser, characteristics, Ruby laser and its working, gas laser, Helium Neon gas laser and its working, advantages of gas laser over solid state laser, applications of laser. Nuclear fission, chain reaction, nuclear reactor and its working, uses, nuclear fusion, alternative forms of energy sources.	10
Total Hours		45

Course reference:

Text / Reference Books:

T/R	Book Title/Author
R	Physics / Resnick and Halliday
R	Mechanics /D S Mathur
R	Mechanics / Narayana Kurup
R	Modern Physics / Murukesan
R	Engineering Physics / A Marikani
R	An Introduction to Lasers- Theory and Applications / M N Avadhanulu
R	University Physics / H D Young
R	NCERT Physics Text Books for Class XI and XII

Web Source Reference:

SI No	Website Link
1	https://ocw.mit.edu/courses/physics
2	http://www.physicstoday.org/
3	http://physicsworld.com/cws/home
4	http://www.loc.gov/rr/scitech/mysteries/archive.html#physics
5	http://www.nature.com/physics/

Course Pre-requisites:

Topic	Course code	Course name	Semester	Description
Basic Physics				Entry Level
Basic Mathematics				Entry Level

Assessment Methodologies:

Learning Outcome		Course Outcome	
No	Description	No	Description
1	Participation in class room activities	1	Course Survey
2	Assignments	2	Student feedback
3	Series Tests		
4	End Semester Exam		

Student Learning Outcome and Development of Course Outcomes:

On completion of the course student will be able to:

		Expected Outcome			Suggested Learning Method			
Course		Learning						
No	Description	No	Description	Level	Lesson	Topic	Learning Activities	Duration (Minutes)
CO1	State Newton's law of gravitation and explain acceleration due to gravity and escape velocity of a planet	SLO1	State Newton's law of gravitation	Remember	1	Newton's law of gravitation	Interactive lecture, Practice exercise	55
		SLO2	List factors on which gravitational force between two masses depends	Remember				
		SLO3	Write mathematical expression for Newton's law of gravitation	Remember				
		SLO4	Solve numerical problems using Newton's law of gravitation	Understand				
		SLO5	Define gravitational constant G	Remember				
		SLO6	Write the value of G	Remember				
		SLO7	Explain acceleration due to gravity	Understand	2	Expression for acceleration due to gravity	Interactive lecture, Practice exercise	55
		SLO8	Distinguish between g and G	Understand				
		SLO9	Deduce expression for acceleration due to gravity on the surface of a planet	Understand				
		SLO10	List factors on which the acceleration due to gravity on the surface of the planet depends	Remember				
		SLO11	Calculate the mass of the planet using the value of g on its surface	Understand				
		SLO12	Explain the weight of a body	Understand				
		SLO13	List the factors on which the value of g depends	Remember				

CO2 banking of roads and rails, satellite motion and	SLO14	Deduce the expression for g at an altitude h	Understand		the value of g , variation of acceleration due to gravity	lecture, Group Discussion	
	SLO15	Explain the variation of g with altitude	Understand				
	SLO16	Deduce the expression for g at a depth d	Understand				
	SLO17	Explain the variation of g with depth	Understand				
	SLO18	Deduce the expression for g at a latitude on the surface of the earth	Understand	4	variation of acceleration due to gravity, Numerical problems	Interactive lecture, Practice exercise	55
	SLO19	Explain the variation of g with latitude on the surface of the earth	Understand				
	SLO20	Explain the variation of g due to non spherical shape of the earth	Understand				
	SLO21	Solve numerical problems related to acceleration due to gravity	Understand				
	SLO22	Define gravitational potential	Remember	5	gravitational potential, escape velocity	Interactive lecture, Practice exercise	55
	SLO23	Define gravitational potential energy	Remember				
	SLO24	Distinguish between gravitational potential and potential energy	Understand				
	SLO25	Write expression for gravitational potential	Remember				
	SLO26	Write expression for gravitational potential energy	Remember				
	SLO27	List factors on which gravitational potential depends	Remember				
	SLO28	Solve numerical problems related to gravitational potential	Understand				
	SLO29	Deduce expression for escape velocity from the surface of a planet	Understand				
	SLO30	List factors on which escape velocity from the surface of the planet depends	Remember				
	SLO31	Calculate the escape velocity from the surface of various planets and moon	Understand				
	SLO32	Distinguish between rotational motion and translatory motion	Understand	6	Angular displacement, angular velocity, angular acceleration	Interactive lecture	55
	SLO33	Analyse circular motion as a special case of rotation	Understand				
	SLO34	Define angular displacement	Remember				
	SLO35	Define angular velocity	Remember				

SLO36	Define angular acceleration	Remember				
SLO37	Write the unit of angular displacement	Remember				
SLO38	Write the unit of angular velocity	Remember				
SLO39	Write the unit of angular acceleration	Remember				
SLO40	Identify equations of motion of a particle in angular motion	Understand				
SLO41	Define uniform circular motion	Remember	7	relation between linear velocity and angular velocity in circular motion	Interactive lecture	55
SLO42	List examples for uniform circular motion	Remember				
SLO43	Deduce the relation between linear velocity and angular velocity of a particle in uniform circular motion	Understand				
SLO44	Solve numerical problems related to circular motion	Understand				
SLO45	Define centripetal acceleration	Remember	8	centripetal acceleration	Interactive lecture	55
SLO46	Deduce expression for centripetal acceleration	Understand				
SLO47	Define centripetal force	Remember	9	Centripetal force, Numerical Problems	Interactive lecture	55
SLO48	List examples for centripetal force	Remember				
SLO49	Deduce expression for centripetal force	Understand				
SLO50	Solve numerical problems related to centripetal acceleration and centripetal force	Apply				
SLO51	Explain banking of roads and rails	Understand	10	banking of roads and rails, Numerical problems	Interactive lecture	55
SLO52	Deduce expression for Banking angle	Understand				
SLO53	Solve numerical problems related to banking of roads and rails	Apply				
SLO54	Define a satellite	Remember	11	satellites, Artificial satellites	Interactive lecture, Practice exercise	55
SLO55	Distinguish between artificial and natural satellite	Understand				
SLO56	Classify satellites	Understand				
SLO57	Explain satellite motion	Understand				
SLO58	Deduce expression for orbital velocity of satellite	Understand	12	orbital velocity and period of a satellite, Numerical	Interactive lecture	55
SLO59	Define first cosmic velocity	Remember				
SLO60	Deduce expression for first cosmic velocity	Understand				
SLO61	Deduce time period of a satellite	Understand				

CO3	Explain rotation motion of simple rigid body systems about constant axes of rotation	SLO62	Solve numerical problems related to satellite motion	Apply	13	problems geostationary satellites and it's uses, polar satellites and it's uses, uses of artificial satellites	Interactive lecture	55		
		SLO63	Define geostationary satellite	Remember						
		SLO64	Calculate the altitude of the orbit of a geostationary satellite	Apply						
		SLO65	List applications of geostationary satellite	Remember						
		SLO66	Define polar satellite	Remember						
		SLO67	List applications of a polar satellite	Remember						
		SLO68	Distinguish between geostationary and polar satellites	Understand						
		SLO69	Explain the working of GPS	Understand						
	Explain rotation motion of simple rigid body systems about constant axes of rotation	Explain rotation motion of simple rigid body systems about constant axes of rotation	SLO70	Define a rigid body	Remember	14	Rigid body, centre of mass	Interactive lecture	55	
			SLO71	Explain the centre of mass	Understand					
			SLO72	Define axis of rotation	Remember					
			SLO73	Explain rotational motion of a rigid body	Understand					
		Explain rotation motion of simple rigid body systems about constant axes of rotation	Explain rotation motion of simple rigid body systems about constant axes of rotation	SLO74	Define moment of inertia	Remember	15	moment of inertia, radius of gyration	Interactive lecture, Practice exercise	55
				SLO75	Calculate moment of inertia of discrete mass systems	Apply				
				SLO76	Identify the importance of moment of inertia in rotational motion	Understand				
				SLO77	Define radius of gyration	Remember				
				SLO78	write expression for radius of gyration	Remember				
SLO79				Write unit of radius of gyration	Remember					
Explain rotation motion of simple rigid body systems about constant axes of rotation	Explain rotation motion of simple rigid body systems about constant axes of rotation	SLO80	deduce moment of inertia of a thin ring about an axis passing through its center and perpendicular to its plane	Understand	16	derivation of moment of inertia of a disc about an axis passing through the centre and perpendicular to its plane	Interactive lecture, Demonstrate	55		
		SLO81	deduce expression for moment of inertia of a disc passing through its centre and perpendicular to its plane	Understand						
	Explain rotation motion of simple rigid body systems about constant axes of rotation	Explain rotation motion of simple rigid body systems about constant axes of rotation	SLO82	State perpendicular axes theorem	Remember	17	Statement of perpendicular axes theorem	Interactive lecture, Practice exercise	55	
			SLO83	Calculate moment of inertia of a ring about a diameter	Understand					
			SLO84	Calculate moment of inertia of a disc about a diameter	Understand					

		SLO85	State parallel axes theorem	Remember	18	statement of parallel axes theorem	Interactive lecture	55
		SLO86	Calculate moment of inertial of a ring about a tangent	Understand				
		SLO87	Calculate moment of inertial of a disc about a tangent	Understand				
		SLO88	Define angular momentum	Remember	19	angular momentum and torque, relation between torque and angular momentum , rotational kinetic energy	Interactive lecture, Practice exercise	55
		SLO89	Define torque	Remember				
		SLO90	Deduce the relation between angular momentum and torque	Remember				
		SLO91	Define rotational kinetic energy	Remember				
		SLO92	Write expression for rotational kinetic energy	Remember				
		SLO93	Deduce relation between angular momentum and rotational kinetic energy	Understand	20	kinetic energy of a disc rolling on a horizontal surface, Numerical problems	Interactive lecture	55
		SLO94	Calculate kinetic energy of a rolling disc	Understand				
SLO95	Solve numerical problems related to rotational motion	Understand						
CO4	Explain basic laws in electricity and magnetism and use them to analyse simple circuits, to design different measuring devices and solve related problems	SLO96	State unit of charge	Remember	21	Electric charge, potential difference	Interactive lecture	55
		SLO97	Define electric current	Remember				
		SLO98	Define potential difference	Remember				
		SLO99	Define the unit of electric current	Remember	22	Ohm's law, verification of Ohm's law	Interactive lecture	55
		SLO100	State Ohm's law	Remember				
		SLO101	Explain the experimental verification of Ohm's law	Understand				
		SLO102	Define resistance	Remember				
		SLO103	Define the unit of resistance	Remember	23	resistivity, conductivity, law of resistances	Interactive lecture	55
		SLO104	Draw diagrams of series and parallel resistance combination	Remember				
		SLO105	Distinguish between series and parallel combination of resistances	Understand				
SLO106	Deduce the expression for effective resistance when resistances are connected in parallel	Understand						

SLO107	Deduce expression for effective resistance when resistances are connected in series	Understand				
SLO108	Deduce expression for branch current	Understand				
SLO109	List factors on which resistance of a wire depends	Remember				
SLO110	Write the expression for resistance of a wire	Remember				
SLO111	Define resistivity of a material	Remember				
SLO112	Write the unit of resistivity	Remember				
SLO113	Define conductivity	Remember				
SLO114	State Kirchhoff's first law	Remember	24	Kirchhoff's laws	Interactive lecture, Demonstrate	55
SLO115	Explain Kirchhoff's first law	Understand				
SLO116	State Kirchhoff's second law	Remember				
SLO117	Explain Kirchhoff's second law	Understand				
SLO118	Analyse simple electrical circuit using Kirchhoff's laws	Understand	25	Wheatstone's Bridge	Interactive lecture, Group Discussion, Practice exercise	55
SLO119	Draw Wheatstone's bridge	Remember				
SLO120	Deduce balancing condition of Wheatstone's bridge using Kirchhoff's laws	Understand				
SLO121	Explain the measurement of unknown resistance using Wheatstone's bridge	Understand	26	Metre Bridge	Interactive lecture	55
SLO122	Draw the diagram of a meter bridge	Remember				
SLO123	Explain how a Wheatstone's bridge is converted into a meter bridge	Understand				
SLO124	Draw the circuit diagram for measuring unknown resistance using meter bridge	Understand				
SLO125	Explain how unknown resistance is measured using meter bridge	Understand				
SLO126	Write the expression used to find unknown resistance using meter bridge	Remember	27	magnetic effect of electric	Interactive lecture	55
SLO127	List factors on which magnetic field produced by a small current carrying conductor depends	Remember				

SLO128	State Biot-Savart's law	Remember		current, Biot-savart law		
SLO129	Write the unit of magnetic field	Remember				
SLO130	State right hand grip rule	Remember				
SLO131	Deduce expression for the magnetic field at the centre of a circular coil	Understand	28	magnetic field due to a current carrying conductor	Interactive lecture, Practice exercise	55
SLO132	Write expression for the magnetic field at a point on the axis of a circular coil	Remember				
SLO133	Solve numerical problems related to circular coil	Understand				
SLO134	Write the expression for magnetic field produced by a straight finite conductor	Remember	29	magnetic field due to a current carrying conductor	Interactive lecture	55
SLO135	Deduce the expression for magnetic field produced by an infinite straight current carrying conductor	Understand				
SLO136	Solve numerical problems related to magnetic field produced by a current carrying conductor	Understand				
SLO137	List factors on which force experienced by a current carrying conductor placed in a magnetic field depends	Remember	30	force on a current carrying conductor placed in a magnetic field	Interactive lecture	55
SLO138	Write expression for force experience by a current carrying conductor placed in a magnetic field	Remember				
SLO139	State Fleming's left hand rule	Remember				
SLO140	Solve numerical problems related to force experienced by a current carrying conductor placed in a magnetic field	Apply				
SLO141	Draw the diagram of a Moving coil galvanometer	Remember	31	Moving Coil Galvanometer and its working	Interactive lecture	55
SLO142	Explain the principle of a moving coil galvanometer	Understand				
SLO143	Explain the working of a moving coil galvanometer	Understand				
SLO144	Define shunt	Remember	32	shunt, conversion of a galvanometer into an ammeter, conversion of a galvanometer	Interactive lecture, Practice exercise	55
SLO145	Design and construct an ammeter of required range by converting a galvanometer	Apply				
SLO146	Design and construct an voltmeter of required range by converting a galvanometer	Apply				

						into a voltmeter, Numerical problems		
CO5	Describe the quantization concept in modern physics and use this to explain photoelectric effect and working of Lasers	SLO147	Explain Plank's quantum theory	Understand	33	Quantum theory, photoelectric effect, experiment to illustrate photoelectric effect	Interactive lecture, Practice exercise	55
		SLO148	Write the value of h	Remember				
		SLO149	Define Photoelectric effect	Remember				
		SLO150	Define photo electron	Remember				
		SLO151	Define electron volt	Remember				
		SLO152	Define photoelectric work function	Remember				
		SLO153	Define threshold wavelength	Remember				
		SLO154	Define threshold frequency	Remember				
		SLO155	Write the relation between threshold wavelength and frequency	Remember				
		SLO156	Explain photoelectric experiment	Understand				
		SLO157	Calculate work function of materials	Understand				
		SLO158	Calculate energy of a photon in electron volt	Understand				
		SLO159	State the laws of photoelectric effect	Remember	34	laws of photoelectric effect, Einstein's photoelectric equation	Interactive lecture	55
		SLO160	Explain quantisation of light energy	Understand				
		SLO161	Deduce Einstein's photoelectric equation	Understand				
		SLO162	Explain laws of photoelectric effect using Einstein's equation	Understand				
		SLO163	List applications of photoelectric effect	Remember	35	applications of photoelectric effect, problems	Interactive lecture, Practice exercise	55
		SLO164	Explain the working of a photo emissive cell	Understand				
		SLO165	Deduce expression for maximum velocity of a photoelectron	Understand				
SLO166	Solve numerical problems related to quantisation of light energy	Understand						
SLO167	Solve numerical problems related to Einstein's photo electric equation	Apply						
SLO168	Distinguish between ordinary light and LASER light	Understand	36	Laser, principle of laser,	Interactive lecture,	55		
SLO169	Explain quantisation of atomic energy	Understand						

		SLO170	Distinguish between ground state excited state	Understand		characteristics	Demonstrate					
		SLO171	Distinguish between meta stable and ordinary atomic energy states	Understand								
		SLO172	Explain spontaneous emission	Understand								
		SLO173	Distinguish between stimulated emission and stimulated absorption	Understand								
		SLO174	Define population inversion	Remember								
		SLO175	Explain how population inversion is achieved	Understand								
		SLO176	Explain the principle of laser action	Understand								
		SLO177	List the characteristics of Laser radiation	Remember								
		SLO178	List components of a laser	Remember								
		SLO179	Define monochromatic light radiation	Remember								
		SLO180	Define coherent light radiation	Remember								
		SLO181	Draw the diagram of a ruby laser	Remember					37	Ruby laser and its working	Interactive lecture	55
		SLO182	Explain the principle of a ruby laser	Understand								
		SLO183	Explain the working of a ruby laser	Understand								
		SLO184	Draw the diagram of He-Ne laser	Remember					38	gas laser, Helium Neon gas laser and its working	Interactive lecture	55
		SLO185	Explain the principle of a He-Ne laser	Understand								
		SLO186	Explain the working of a He-Ne laser	Understand								
		SLO187	List the advantages of He-Ne laser over ruby laser	Remember					39	advantages of gas laser over solid state laser, applications of laser	Interactive lecture, Group discussion	55
		SLO188	Explain the working of a semiconductor laser	Understand								
SLO189	List applications of laser	Remember										
SLO190	List merits of semiconductor laser	Remember										
CO6	explain different energy producing mechanisms and	SLO191	List demerits of semiconductor Laser	Remember	40	Nuclear fission, chain reaction, nuclear fusion	Interactive lecture, Practice exercise	55				
		SLO192	List nucleons	Remember								
		SLO193	Explain structure of nucleus	Understand								
		SLO194	write mass of nucleons in amu	Remember								
		SLO195	write Einstein's mass energy relation	Remember								
		SLO196	Write unit of nuclear energy	Remember								
SLO197	Calculate energy equivalent of a given mass in Mev	Understand										

SLO198	Explain nuclear fission	Understand			
SLO199	List examples for nuclear fission	Remember			
SLO200	Define mass defect	Remember			
SLO201	Explain nuclear fusion	understand			
SLO202	List examples for nuclear fusion	Remember			
SLO203	Distinguish between nuclear fission and nuclear fusion	Understand			
SLO204	Explain chain reaction	Understand			
SLO205	Define neutron multiplication factor	Remember			
SLO206	Classify chain reactions	Understand			
SLO207	Distinguish between controlled and uncontrolled chain reaction	Understand			
SLO208	List nuclear fuels	Remember			
SLO209	Distinguish between slow neutrons and fast neutrons	Understand			
SLO210	Explain the working of control rods in a nuclear reactor	Understand			
SLO211	Explain the working of moderator in a nuclear reactor	Understand			
SLO212	List important parts of a nuclear reactor	Remember			
SLO213	Explain the purpose of coolant in a nuclear reactor	Understand			
SLO214	List moderators used in a nuclear reactor	Remember	41	nuclear reactor and its working, uses	Interactive lecture, Group Discussion
SLO215	List control rods used in a nuclear reactor	Remember			
SLO216	List coolants used in a nuclear fission reactor	Remember			
SLO217	Draw block diagram of a nuclear fission reactor	Understand			
SLO218	Explain the working of a nuclear reactor	Understand			
SLO219	Explain energy production in stars	Understand			
SLO220	List the uses of a nuclear reactor	Remember			
SLO221	Identify need of energy in daily life	Understand			
SLO222	Identify the importance of clean energy production	Understand			
SLO223	List different energy sources	Remember	42	alternative forms of energy sources	Interactive lecture, Group Discussion, Practice
SLO224	Explain merits and demerits of solar energy	Understand			
SLO225	Explain merits and demerits of wind energy	Understand			

	SLO226	Explain merits and demerits of hydro electric energy	Understand		exercise	
	SLO227	Explain merits and demerits of fuel energy	Understand			
	SLO228	Explain merits and demerits of tidal energy	Understand			
	SLO229	Explain merits and demerits of nuclear energy	Understand			

Mapping of CO to PO and PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3											
CO2	3			2								
CO3	3											
CO4	3		2									
CO5	3			2								
CO6	3					2						

3-Strongly mapped

2-Moderately mapped

1-Weakly mapped

Justification for CO-PO and CO-PSO mapping

CO	Description	Cognitive levels	Mapped POs	Level of mapping	Justification
CO1	State Newton's law of gravitation and explain acceleration due to gravity and escape velocity of a planet	Understand	PO 1	3	Gravitational force is one of the fundamental forces of nature and experienced by all massive objects. The knowledge of which helps in the design and analysis of various engineering structures and systems.
CO2	Describe circular motion and explain banking of roads and rails, satellite motion and classification of artificial satellites	Apply	PO 1	3	Circular motion is common in almost all engineering systems. The knowledge of which helps in their effective designing and implementation.
			PO4	2	Knowledge of centripetal acceleration and banking will ensure safety during

					travelling through curves and will help to construct perfect roads and rails
CO3	Explain rotation motion of simple rigid body systems about constant axes of rotation	Apply	PO 1	3	The knowledge of moment of inertia and related concepts in rotational motion is essential for the understanding of the working of various machines and systems in all branches of engineering
CO4	Explain basic laws in electricity and magnetism and use them to analyse simple circuits, to design different measuring devices and solve related problems	Apply	PO 1	3	Fundamental knowledge of electricity and magnetism will help to solve various engineering problems.
			PO3	2	Able to design and construct measuring devices and circuits for the measurement of physical quantities.
CO5	Describe the quantization concept in modern physics and use this to explain photoelectric effect and working of Lasers	Understand	PO 1	3	Introduces to the concepts of quantisation of energy in the atomic level and electromagnetic radiation which is essential for the proper understanding of various equipments and devices.
			PO4	2	Apply laser as an effective tool in engineering.
CO6	Distinguish various energy sources and explain different energy producing mechanisms and applications of nuclear energy	Understand	PO1	3	Helps to design and implement appropriate energy sources in various situation.
			PO6	2	Identify the importance of energy in day to day life and need for clean energy producing systems for sustainable environment.