VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN

(AUTONOMOUS) An ISO 9001: 2008 Certified Institution

(Approved by AICTE, Affiliated to Periyar University and Re-accredited with A grade by NAAC, Recognized under section 2(f) and 12(B) of UGC Act,1956) Elayampalayam, Tiruchengode - 637 205



PG AND RESEARCH DEPARTMENT OF PHYSICS

M.Sc., DEGREE - OBE SYLLABUS

2019-2021



() +	WOMEN (AUTONOMOUS)									2008 2008
NOMEN EMPOWERNEN		Elayampalayam, Tir	ucher	ngod	e-63	7 205.				
Programme	M.Sc	Programme Code		PP	H	2018-2019				
Department	Physics Semester 1									
Course Code	Course 1	Name	Per per	riods • Wee	ek D	Credit	Maximum Marks			
18P1PH01	MATHEMAT	ICAL PHYSICS	L 5	1 1	Р 0	5	25	ESE 75	100	
COURSE OBJECTIVE S	1.To acquire kn concepts and to and evaluate me	owledge of non-relativistic perform calculations of sca odern research	and re ttering	elativ g of p	istic oartio	quantum mec	hanics2.T lity to crit	he abilit ically u	y to understand nderstand	1
POs		PROGRAMME OUTCO	OME							
PO 1	Capable of demonstrating the basic concept sand comprehensive knowledge from undergraduate programme of study.									
PO 2	Ability to express thoughts and ideas effectively Communicate with others using appropriate media and interpret the idea in clear and concise manner.									
PO 3	To identify the relevant assumptions to formulate the arguments by following scientific approach to knowledge development									
PO 4	Capacity to solv	ve the different kinds of non	famil	iar p	roble	em and apply i	n real life	situatio	n.	
PO 5	Ability to evalu arguments of ot	ate the reliability and releva hers.	nce of	f evic	lenc	e identify logi	cal flaws a	and hole	es in the	
PO 6	A sense of inqu articulating.	iry and capability for asking	g appro	opria	te qı	uestions, probl	ematising	, synthe	sizing and	
PO 7	Ability to work	effectively and respectfully	with	diver	se te	eams.				
PO 8	Ability to analy Evidence and e	ese, interpret and draw concl xperiences.	usions	s fror	n qu	antitative data	and critic	ally eva	luate ideas,	
PO 9	Critical sensibil	lity to lived experiences with	n self-	awar	enes	s and reflexivi	ity of both	self an	d society.	
PO 10	Capability to us variety of releva	se ICT in a variety of learnin ant information sources.	ıg situ	ation	s, de	emonstrate abi	lity to acc	ess, eva	luate, and use a	ι
PO 11	Ability to work through to com	independently, identify app pletion.	ropria	ite re	sour	ces required fo	or a projec	t and m	anage a project	
PO 12	Possess knowle	dge of the values and belief	s of m	ultip	le cu	ultures and a g	lobal pers	pective.		
PO 13	Ability to embr from multiple p	ace moral values in conduct perspectives.	ing on	ne'	M _S]	ife formulates	a position	about a	n ethical issue	
PO 14	Capability for n	napping out the tasks of a te	am or	an o	rgan	ization.				
PO 15	Ability to acqui objectives	re knowledge and skills, per	rsonal	deve	elopi	nent, meeting	economic	, social	and cultural	

COs	COURSE OUTCOME
CO 1	Understand the complex variables and evaluation of definite integrals
CO 2	To acquire knowledge of vector tensor and matrices. Understand the characteristic equation of matrix and
	evaluate Hamiltonian theorem
CO 3	To acquire knowledge of Fourier and Laplace transform. Understand the Fourier integrals and Apply
	Fourier transformation in interferometer
CO 4	Understand the relation between beta and gamma function and evaluate the gamma function
CO 5	To acquire the knowledge of group theory. Understand Reducible and irreducible representation. Evaluate
	C2V and C3V point groups.
Pre-requisites	To gain knowledge

(2)	0/1 · 1	• , ,	1.	CO/F	PO / KL	Mappi	ing	a 1	• •	1 \						
	2/1 ind	icates t	the strei	$\frac{1 \text{gth of}}{K \text{I}_{\text{S}}}$	correla	tion, 3-	strong,	, 2-med	$\frac{1000}{1000}$	weak)		1	ZI 6			
COS				KLS					2.1			KLS				
GO 1								PC						1		
COT					2			PC)2					2		
								PC) 3					2		
								PC) 4					3		
CO 2					1			PC) 5					5		
								PC)6					1		
								PC)7					6		
CO 3					1			PC	08			4				
												5				
								PO 10					1			
CO 4			5					PC) 11			2				
									12					2		
												3				
CO 5			5					PO 14					3			
								PO 15				6				
				CO	/ PO M	lapping	5									
(3/	'2/1 ind	icates t	the strea	ngth of	correla	tion, 3-	strong,	2-med	ium, 1-	weak)						
60				Progra	mme C	Jutcom	e (POs))								
COs	PO	РО	PO	PO	РО	РО	PO7	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1	
	1	2	3	4	5	6		8	9	0	1	2	3	4	5	
CO1	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO2	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO3	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO4	1	1	1	1	3	1	2	2	3	1	1	1	1	1	2	
CO5	1	1	1	1	3	1	2	2	3	1	1	1	1	1	2	

Direct

1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

1. Course End Delivery

Content of the	e Syllabus									
	Complex Analysis	Periods	10							
TT '4 T	Functions of complex variable - Cauchy-Riemann condition, Differential equation - Cauchy									
Unit - I	integral theorem - Cauchy integral formulas-Taylors Series- Laurent's Series - Residue theorem -									
	Evaluation of definite integrals - Contour integration.									
	Vectors, Tensors and Matrices	Periods	12							
	Linear vector spaces - Subspaces - Linear independents and orthogonali	ty of vectors - Hil	berts space -							
Un:t II	Transformation of coordinates - Summation convention, Contravariant,	Covariant and miz	xed tensors,							
Unit - II	Rank of tensor, Kronecker delta, Symmetric and Antisymmetric tensors	, Contraction of te	ensor -							
	Characteristic equation of a matrix - Eigen values and Eigen vectors - Cayley - Hamilton theorem-									
	Reduction of a matrixto diagonal form - Jacobi method - Sylvester's Th	eorem.								
	Fourier Transforms and Laplace Transforms	Periods	14							
	Fourier Transform: Properties of Fourier transform - Fourier transform of derivative - Fourier's sine									
	and cosine transform of derivative - Complex representation of Fourier series - Fourier's integral -									
Unit III	Different forms of Fourier integrals - Application of Fourier Transforma	ation in Interferon	eter.Laplace							
Onit - III	Transform: Properties of Laplace transform - Laplace transform of deriv	Transform: Properties of Laplace transform - Laplace transform of derivative function - Laplace								
	transform of integrals - Laplace transform of periodic function - Inverse Laplace transform - Properties of									
	inverse Laplace transform-Laplace transform of some special functions- Evaluation of integral using									
	InverseLaplace Transform - Applications of Laplace Transform.									
	Special Functions and Differential Equations	Periods	14							
	Beta function - Symmetry property of beta function - Evaluation of beta	function -Transfo	ormation of beta							
Unit - IV	function - Different forms of beta function - Evaluation of gamma function - Transformation of Gamma									
Child IV	function - Reduction of definite integrals to gamma function - Relation between Beta and Gamma									
	functions - Dirac delta function. Solution for Bessel, Legendre, Lagure and Hermite differential equations									
	-Properties - Generating functions, Rodrigues formula, Orthogonal properties, Recurrence relation.									
	Group Theory	Periods	10							
	Basic Definition - Multiplication Table - Sub groups - Cosets and Classes, Direct Product groups -									
Unit - V	Point group, Space groups, Rotation groups - Symmetry elements and s	ymmetry operation	ns -							
child v	Representation theory - Homomorphism and Isomorphism - Reducible a	and Irreducible rep	presentation -							
	Schurs Lemma- The great Orthogonality theorem - Character Table - Ca	2V and C3V as ex	amples,							
	Treatment ofmolecular structure.									
	Total Periods 60									

Text Books	
1	1. Mathematical Physics, B.D. Gupta, Vikas Publishing House, (2004).
2	2. Mathematical Physics, Satyaprakash, Sultan Chand and Sons, (2004).
References	
1	1. Mathematical Physics, P.K. Chattopadhyay, Wiley Eastern India, (1990).
2	2. Chemical applications of group theory, F.A. Cotton, Wiley Eastern India, (2001).
3	3. Elements of group theory for physicist, A.W Joshi, New age international Publishers, (2002).
E-References	
1	1. https://www.khanacademy.org/math/differential-equations/laplace-transform

2	2. https://www.khanacademy.org/math/linear-algebra#vectors-and-spaces
3	3. https://www.khanacademy.org/math/linear-algebra#matrix-transformations

POLICIAL CARL	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.										
Programme	M.Sc Programme Code PPH Regulations										
Department	Physics Semester 1										
Course Code	Periods Credit Maximum Marks Course Name per Week										
			L T P	С	CA	ESE	Total				
18P1PH02	CLASSICAL MECHA	AND STATISTICAL ANICS	6 0 0	5	25	75	100				
COURSE OBJECTIVE S	1.The main goa and studied rig	al of the course is to introdu orously using advanced mat	ce students to c hematical techr	lassical mecha	anics and it	ts applic	ations in physics				
POs		PROGRAMME OUTC	OME								
PO 1	Capable of dem	nonstrating the basic conceptstudy	ot sand compreh	ensive knowle	edge from	undergra	aduate				
PO 2	Ability to express thoughts and ideas effectively Communicate with others using appropriate media and										
	interpret the idea in clear and concise manner.										
PO 3	To identify the	e relevant assumptions to for	ormulate the arg	guments by fo	llowing sci	ientific	approach to				
PO 4	knowledge development.										
PO 5	Ability to evalu	ate the reliability and relev	ance of evidence	e analyse an	d synthesis	e data fr	om a variety of				
	sources then dr	aw valid conclusions and su points.	apport them wit	h evidence an	d examples	s, and ad	ldressing				
PO 6	To define prob from data, pred experiment	lems, formulate hypothese lict cause-and-effect relation	s, test hypothes aships and ability	es, analyse, in ty to plan, exe	terpret and cute and re	draw port the	conclusions results of an				
PO 7	Ability to work on the part of a	effectively and respectfull group and act together as a	y with diverse to group	eams, facilitat	e cooperati	ve or co	ordinated effort				
PO 8	Ability to analy	yse, interpret and draw conc	lusions from qu	antitative/qua	litative dat	a and cr	itically evaluate				
PO 9	Critical sensibi	lity to lived experiences, wi	th self awarene	ss and reflexiv	vity of both	self and	d society.				
PO 10	Capability to us	se ICT in a variety of learni	ng situations, do	emonstrate ab	ility to acce	ess, eval f data	uate, and use a				
PO 11	Ability to work	independently, identify app	propriate resour	ces required f	for a project	t, and m	anage a project				
PO 12	Capability to eff	ffectively engage in a multid	cultural society	and interact re	espectfully	with div	verse groups				
PO 12	Capable of den	nonstrating the ability to ide	entify ethical iss	ues related to	ones work	, avoid u	inethical				
	behavior such a	as fabrication, falsification of	or misrepresenta	ation of data							
PO 14	Capability for 1	mapping out the tasks of a to	eam or an organ	$x_{ation, and s}$	etting direc	ction, for	rmulating an				
DO 15	inspiring vision	n, building a team who can h	nelp achieve the	vision.		for	i ainatina i-				
PU 15	learning activit	ies throughout life.	cluding now to	iearn, that are	necessary	for part	icipating in				

COs	COURSE OUTCOME
CO 1	To understand the fundamental principles of Lagrange formulation. Apply linear harmonic oscillator in
	Lagrange formulation.
CO 2	To acquire knowledge of Hamiltons canonical equations. Understand the harmonic oscillator problem.
CO 3	Understand the angular momentum of a rigid body.
CO 4	Understand the ideas liouvlies theorem. Synthesis phase space.
CO 5	To understand the equations Fermi Dirac statistics .Apply ideal Bose Einstein gas blackbody radiation
Pre-requisites	To Acquire idea about statistics

				Knov	wledg	e Lev	els									
1.Remembe	ering, 2	2.Und	lersta	nding	, 3. Ap	plyin	g, 4.A	nalyz	ing, 5	.Evalu	ating,	6.Syn	thesiz	ing		
(3	/2/1 ind	licates 1	the stre	CO/F	PO / KI correla	Mapp	ing -strong	. 2-med	lium. 1-	-weak)						
COs	, _,			KLs		, .		P	Os]	KLs			
								PO	D 1					1		
CO 1					2			PO	D 2					2		
								PO	D 3					2		
								PO	D 4					3		
CO 2					1			PO	D 5					5		
								PO 6						1		
CO 3	CO 2		2				PO / PO 8				6					
05	03			2				P() 9) 9			5				
								PO 10					1			
CO 4			6					PO 11					2			
								PO 12					2			
							PO 13				3					
CO 5					3			PO 14				3				
								PO 15						6		
(2	/0/1 :		1	CO	/ PO N	lapping	5	2	P 1							
(3	/2/1 inc	licates	ine stre	ngth of	correla	tion, 3-	-strong,	, 2-mea	ium, 1-	-weak)						
COs		DO	DO	Progra			e (POS)	,	DO	DO 1	DO 1	DO1	DO 1	DO 1	DO 1	
	PO	PO 2	PO 3	PO 4	PO 5	PO 6	PO/	PO 8	PO 9	PO1 0	1 PO1	2 POI	PO1 3	4 PO1	PO1 5	
CO1	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO2	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO3	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO4	1	1	1	1	2	1	1	1	2	1	1	1	1	1	3	
CO5	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1	

1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

Direct

1. Course End Delivery

Content of the	Syllabus								
	Fundamental Principles and Lagrangian Formulation	Periods	12						
	Mechanics of a system of particles - Conservation laws - Constraints, Generalized coordinates - D-								
Unit I	Alemberts principle - Lagranges equation of motion from D-Alen	mberts principle-	Application of						
Unit - I	Lagranges formulation - Linear Harmonic oscillator - Simple per	ndulum - Hamil	tons principle -						
	Derivation of Lagranges equation of motion from Hamiltons princip	ole - Conservatio	n theorems and						
	Symmetry properties.								
	Hamiltons Formulation	Periods	12						
	Hamiltons Canonical equations of motion - Physical Significance of H	- Hamiltons Can	onical equations						
Unit - II	from variation principle - Principle of least action - Canonical trans	sformations - Po	isson brackets -						
	Properties - Hamilton - Jacobi method - Harmonic oscillator problem us	ing Hamiltonian J	lacobi method -						
	Lagrangs brackets - Properties.	1							
	Rigid Body Motion	Periods	12						
	Generalized coordinates for Rigid Body Motion - Euler Angles - Euleria	an theorem - Ang	ular Velocity						
Unit - III	- Angular Momentum of a rigid body - Motion of symmetrical top - Moments and Products of Inertia								
Chint III	- Eulers equation of motion Relativistic Approach Lorentz transform	nation - Kinemat	ic effects of						
	Lorentz transformation - Mass energy equivalence - Lagrangian	formulation of	Relativistic						
	mechanics -Hamiltonian Formulation of Relativistic mechanics.								
	Classical Statistics	Periods	12						
	Phase Space - Ensemble - Definition of Micro Canonical - Canonical and Grand Canonical ensembles -								
Unit - IV	Liouvilles theorem - Microstates and Macro states - Sterlings formula, Entropy in statistical mechanics -								
	Partition function - Doppler broadening of spectral lines - Principle of equipartition of energy -								
	connectionbetween Partition function and thermodynamically quantities.								
	Quantum Statistics	Periods	12						
	Identical particles and Symmetry requirements - Maxwell - Boltzman Statistics, Bose -Einstein								
Unit - V	Statistics and Fermi - Dirac statistics - Ideal Bose Einstein gas and its a	pplication: Black	body radiation						
Chine V	and Planck Radiation Law - Gas degeneracy - Bose - Einstein Con	densation - Rand	lom walk and						
	Brownian motion -								
	Ideal Fermi Dirac gas: Electron gas - Thermionic emission - Paulis theo	ry of Paramagneti	sm.						
	Total Periods		60						

Text Books	
1	Classical Mechanics, Gupta and Kumar, PragatiPrakashnan, Meerut, (2005).
2	Statistical Mechanics, Gupta and Kumar, PragatiPrakashnan, Meerut, (2005).
References	
1	Classical Mechanics, H. Goldstein, Narosa Publishing House, New Delhi, (2005)
2	Classical Mechanics, C.R.Mondal, Prentice - Hall of India, New Delhi, (2008).
E-References	
1	https://www.britannica.com/science/classical-mechanics
2	https://www.chegg.com/homework-help/definitions/classical-Mechanics-II.

Signature of BOS Chairman

0+3

PO 15

learning activities throughout life.



HOMEN EMPOWERNEN											
Programme	M.Sc	Programme Code		PP	Н		Regulations 2018-20		2018-2019		
Department	Phys	ics	Semester						1		
			Per	riods		Credit	Maxim	um Mar	ks		
Course Code	Course	Name	per	Wee	ek						
			L	Т	Р	С	CA	ESE	Total		
18P1PH03	ADVANCED	ELECTRONICS	6	0	0	4	25	75	100		
COURSE OBJECTIVE S	1.The aim of th knowledge of a Devices etc.	1. The aim of the course is to introduce the students to the advanced concepts of electronics. 2. Acquire basic knowledge of advanced electronics such as Operational Amplifier, Memory and Optoelectronic Devices etc.									
POs	PROGRAMMI	E OUTCOME									
PO 1	Capable of den programme of	nonstrating the basic concep study.	t sand	com	preh	ensive knowle	edge from	underg	aduate		
PO 2	Ability to express thoughts and ideas effectively Communicate with others using appropriate media and interpret the idea in clear and concise manner.										
PO 3	To identify the relevant assumptions to formulate the arguments by following scientific approach to knowledge development										
PO 4	Capacity to sol	ve different kinds of non-fai	niliar	prob	lems	and apply to	real life si	ituations	•		
PO 5	Ability to evaluate the reliability and relevance of evidence, analyse and synthesise data from a variety of sources then draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints										
PO 6	To define prob	lems, formulate hypotheses	s, test]	hypo	these	es, analyse, in	terpret and	d draw	conclusions		
	experiment	net cause-and-effect relation	smps	and a	101111	y to plan, exe	cute and r	eport in	e results of an		
PO 7	Ability to work on the part of a	effectively and respectfully group and act together as a	with group	diver	se te	eams, facilitate	e cooperat	tive or co	oordinated effort		
PO 8	Ability to analy ideas, evidence	vse, interpret and draw concl and experiences from an op	usion: en-mi	s froi indec	n qu l and	antitative/qua reasoned per	litative da spective	ta and c	ritically evaluate		
PO 9	Critical sensibi	lity to lived experiences, with	th self	awa	renes	ss and reflexiv	vity of bot	h self an	d society.		
PO 10	Capability to u	se ICT in a variety of learning ant information sources and	ng situ use a	ation	is, de	emonstrate abi	lity to acc	ess, eva of data	luate, and use a		
PO 11	Ability to work through to com	independently, identify app pletion	propria	ite re	sour	ces required for	or a projec	et, and n	nanage a project		
PO 12	Capability to et	ffectively engage in a multic	ultura	l soc	iety a	and interact re	espectfull	y with di	iverse groups.		
PO 13	Capable of den behaviour such	nonstrating the ability to iden as fabrication, falsification	ntify e or mis	thica srepro	l issu esent	ues related to tation of data	ones worl	k, avoid	unethical		
PO 14	Capability for a inspiring visior	napping out the tasks of a te , building a team who can h	am or elp ac	an o	rgan e the	ization, and so vision.	etting dire	ction,for	rmulating an		

Ability to acquire knowledge and skills, including how to learn, that are necessary for participating in

COs	COURSE OUTCOME
CO 1	To get knowledge about the basics informationâ€ [™] s of ideal Op-amp.
CO 2	Apply the sample and hold circuit in simultaneous equations and differential equations
CO 3	Understand the filters, basic DAC and ADC techniques.
CO 4	Synthesis the basic monolithic IC's.
CO 5	To acquire Knowledge the memory devices and apply in opto electronic devices.
Pre-requisites	To Acquire idea about Advanced Electronics

	Knowledge Levels															
1.Remembe	1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing															
				CO / F	PO / KI	_ Mapp	ing									
(3/	(5/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)															
COs				KLs				P	Os]	KLs			
								PC	D 1					1		
CO 1			1					PO	02					2		
								PC) 3					2		
CO 2	CO 2				2				$\frac{1}{2}$					3 5		
CO 2				3				PU 5						J 1		
												6				
CO 3					2			PC	D 8			4				
								PC) 9			5				
								PC	0 10					1		
CO 4			6					PO 11					2			
								PO 12					2			
								PO 13				3				
CO 5					1			PO 14				3				
					(DO)			PC	0 15					6		
(2	/2/1 in d		1	CO to athe of	/ PO N	lapping	5 	2								
(3/	/2/1 1110	licates	ine stre		correla	uion, 3-	-strong	, <i>2-mea</i>	ium, 1-	weak)						
COs				Progra		Juicom	e (POs)								
	PO 1	PO 2	PO 3	PO	PO 5	PO 6	PO/	PO 8	PO 9	POI	1 PO1	PO1 2	PO1 3		PO1 5	
CO1	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO2	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1	
CO3	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO4	- 1	1	1	- 1	2	- 1	1	1	2	- 1	1	1	- 1	- 1	3	
C05	2	2	2	1	1	2	1	1	1	3	2	2	1	1	1	
005	3	2	2	1	1	3	1	1	1	Э	2	2	1	1	1	

1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

Direct

1. Course End Delivery

Content of the	Syllabus											
	Operational Amplifier	Periods	12									
Unit - I	Operational amplifiers: Basic information - Ideal op-amp - Open loop amp- Inverting and Non-inverting amplifier, Voltage Follower, I Characteristics - Input bias current, Input offset current, Input offset v Thermal drift.AC Characteristics - Frequency Response, Stabil Compensation, Slew rate - Electrical Parameters.	operation - Feed Differential ampl oltage, Total outp ity of an Op-	back in ideal op- ifier, CMRR.DC out offset voltage, amp, Frequency									
	Analog Computation and Waveform Generators	Periods	12									
	Basic Op-amp Applications - Sample and hold circuits, Logarith	mic amplifiers,	Antilogarithmic									
Unit - II	amplifiers. Analog multiplier - Analog divider - Differentiator - Integrator - Analog Computation -											
	Solving Simultaneous equation and Differential equation - Sine wave oscillator - RC Phase shift oscillator											
	- Wein - Bridge oscillator, method - Harmonic oscillator problem using	Hamiltonian Con	parator, Schmitt									
	trigger, Astable and Monostablemultivibrators - Triangular wave generator.											
	Filters and Data Converters	Periods	12									
	RC Active filters - First order low pass filter, Second order active filter, Higher order low pass filter,											
Unit - III	High pass active filter, Band pass filters and Band reject filters.Basic DAC techniques - Weighted											
Onit - m	resistor DAC, R-2R Ladder DAC. ADC- Counter type, Successive approximation A/D convertor, Dual -											
	Slope ADC,											
	DAC/ADC Specifications: Resolution, Accuracy, Linearity and Stability											
	IC Fabrication	Periods	12									
	Basic monolithic ICs - Thin film fabrication - Epitaxial growth - Masking - Etching - Impurity											
Unit - IV	diffusion, Fabricating monolithic resistors, Diodes, Transistors, Inductor	rs and Capacitors	IC 555 timer -									
	Description of the functional diagram, Mono stable multivibrator - A	Astablemultivibra	tor - Bi-Stable									
	multivibrator -Schmitt trigger.											
	Memory and Optoelectronic Devices	Periods	12									
Unit V	Architecture of ROM - PROM, EPROM, EEPROM, EAROM. RAM - S	Static RAM - Dyn	amic RAM and									
Unit - v	Integrated RAM - Compact Disk. Solar cells - LED - Photo diode - Pin	Diode - LCD - LI	DR.									
	Total Periods		60									

Text Books	
1	1. Handbook of Electronics, Gupta and Kumar, PragatiPrakashnan, Meerut, (2003).
2	2. Linear Integrated Circuits, D. Roy choudry, New Age Publications, (2015).
References	
1	1. Electronic Measurement and Instrumentation, WilliamCooper, TMG Hill, (2001).
2	2. Operational Amplifier, Robert F, Pearson Hill, (2015).
E-References	
1	1. www.khanacademy.org/science/physics/electronics/operational amplifier.
2	2. www.khanacademy.org/science/physics/electronics/memory and optoelectronic devices.



SW EMPOWER														
Programme	M.Sc.,	Programme Code	РРН		Regulati	ons	201	18-2019						
Department	Phys	sics	Ser	nester				1						
			Periods	Credit	Maximum Marks									
Course Code	Course	Name	per Week											
Course Cours	Course			C	CA	ECE	CE Total							
		<u>CE</u>		C 1	CA	ESE 75		100						
18P1PHE01	NANUSCIEN	CE	4 0 0	4	25	/5		100						
COURSE	1.To provide th	ne basic skills required to	understand, devel	op. and desig	n Nanomate	erials.2	.To er	hance the						
OBJECTIVE	research interes	st in Nanotechnology		op, and avoig	,									
S														
POs		PROGRAMME OUT	COME											
PO 1	Capable of demonstrating the basic concept sand comprehensive knowledge from undergraduate													
	programme of study.													
PO 2	Ability to express thoughts and ideas effectively Communicate with others using appropriate media and interpret the idea in clear and concise manner.													
DO 2	Interpret the idea in clear and concise manner.													
PO 3	to identify the relevant assumptions to formulate the arguments by following scientific approach to knowledge development													
	knowledge development													
PO 4	Capacity to solve different kinds of non-familiar problems and apply to real file situations.													
FO J	Ability to evaluate the reliability and relevance of evidence, analyse and synthesise data from a variety													
	opposing view	nointe	nd support mem		and examp	ies, and	auur	essing						
PO 6	To define prob	lems formulate hypothe	ses_test_hypothes	es analyse i	nterpret and	draw	con	clusions						
	from data, pred	lict cause-and-effect relati	onships and abili	ty to plan, exe	ecute and re	port the	e resu'	lts of an						
	experiment		ionsinps and usin	cy to plan, en		portun		its of un						
PO 7	Ability to work	effectively and respectfu	lly with diverse t	eams, facilita	te cooperativ	ve or co	oordin	nated effort						
	on the part of a	group and act together as	s a group	,	1									
PO 8	Ability to analy	yse, interpret and draw con	nclusions from qu	antitative/qu	alitative data	a and c	ritical	ly evaluate						
	ideas, evidence	and experiences from an	open-minded and	d reasoned pe	rspective			-						
PO 9	Critical sensibi	lity to lived experiences,	with self awarene	ss and reflexi	vity of both	self an	d soci	iety.						
PO 10	Capability to u	se ICT in a variety of lear	ning situations, d	emonstrate at	oility to acce	ss, eva	luate,	and use a						
	variety of relev	ant information sources a	nd use appropriat	e software for	r analysis of	data								
PO 11	Ability to work	independently, identify a	ppropriate resour	ces required	for a project	, and n	nanage	e a project						
	through to com	pletion												
PO 12	Capability to et	ffectively engage in a mul	ticultural society	and interact 1	respectfully	with di	verse	groups.						
PO 13	Capable of den	nonstrating the ability to i	dentify ethical iss	sues related to	ones work,	avoid	unethi	ical						
	behaviour such	as fabrication, falsification	on or misrepresen	tation of data										
PO 14	Capability for 1	mapping out the tasks of a	team or an organ	nization, and s	setting direc	tion,for	rmula	ting an						
	inspiring visior	n, building a team who car	n help achieve the	e vision.										
PO 15	Ability to acqu	ire knowledge and skills,	including how to	learn, that are	e necessary	for part	ticipat	ting in						
	learning activit	ies throughout life.												

COs	COURSE OUTCOME
CO 1	To acquire more knowledge about mechanical, electrical, optical properties of nano particles.
CO 2	Analyze the nano fabrication and nano patterning
CO 3	Understand characterization techniques of nano particles Analyze the SEM and TEM equipments.
CO 4	Acquire knowledge about working principle of photo loumninescene spectroscopy. Understand the workingprinciple of XRD and UV.
CO 5	Apply carbon nano tubes for electronics applications.
Pre-requisites	To Acquire idea about Nano Science

				CO/F	PO/KL	. Mapp	ing			• `						
(3	/2/1 ind	licates t	the strei	ngth of	correla	tion, 3-	-strong,	, 2-med	ium, I-	weak)						
COs			KLs					P	Os			KLs				
								PO	D 1					1		
CO 1			1					PO	02					2		
								PO) 3					2		
			4					PO	D 4					3		
CO 2								PO) 5					5		
								PO	06					1		
							PO	D 7					6			
CO 3			2					PO 8						4		
								PO 9					5			
								PC	0 10			1				
CO 4			2					PC) 11			2				
) 12			2				
			3					PO 13				3				
CO 5								PO 14				3				
								PO 15				6				
				CO	/ PO M	lapping	5									
(3	/2/1 ind	licates t	the stream	ngth of	correla	tion, 3-	-strong,	2-med	ium, 1-	weak)						
COs				Progra	ımme C	Outcom	e (POs))								
COS	PO	PO	PO	PO	PO	PO	PO7	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1	
	1	2	3	4	5	6		8	9	0	1	2	3	4	5	
CO1	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO2	1	1	1	2	2	1	1	3	2	1	1	1	2	2	1	
CO3	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO4	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO5	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1	

Direct

1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

1. Course End Delivery

Content of the	Syllabus											
	Basic Properties of Nanoparticles	Periods	12									
	Particle Size: Top down and bottom up ideas - particles shape - Size effect and properties of nano-											
Unit - I	particles; Particle density; Melting point; Surface tension; Wettability; Specific surface area and pore;											
	Composite structure; Crystal structure; Surface characteristics; M	Iechanical prope	rties; Electrical									
	properties; Magnetic											
	properties; Optical properties; Concept of vacuum technology											
	Nanofabrication and Nan patterning	Periods	8									
Unit II	Sol - gel Synthesis - Hydrothermal Synthesis - CVD method - Optical, X-ray, and electron beam											
Omt - II	lithography - Self - assembled organic layers - Microwave techniques											
	Characterization Techniques	Periods	11									
	Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - Atomic Force											
Unit - III	Microscope (AFM) - Scanning Tunneling Microscope (STM), XRD - Working Principle,											
	Instrumentation and applications - Photoluminescence (PL) Spectroscopy - UV Spectroscopy analysis -											
	Elemental											
	dispersive EDAX analysis.											
	Nano Systems	Periods	8									
Unit - IV	Quantum dot - Quantum wire - Quantum Hall effect - C60- Basics of fullerences - Carbon nano - tubes and											
Chit IV	its applications - Tunnel diode - Molecular transistor - Single electron transistor - Spin polarized transistor											
	- Thin film self assembly											
	Applications of Nanomaterial	Periods	9									
Unit V	Optoelectronic properties of molecular materials - Nanotechnology devi	ces: OLEDs, OTH	FTs.									
Unit - V	Bioelectronics and biosensors: Charge Transport - DNA and Protein	functional system	ns, Electronic									
	noses and biosensors											
	Total Periods		48									

Text Books	
1	. Roland Wiesendanger – Scanning Probe Microscopy and Spectroscopy – Methods and
	Applications – Cambidge University Press, (1994).
2	Joel I. Gersten, Frederick W. Smith – The Physics and Chemistry of Materials; John Wiley and Sons,
	(2001).
3	John C. Vickerman; Surface Analysis (The principal Techniques); John Wiley and Sons, (2003).
References	
1	D. Briggs, M.P. Seah; Practical Surface Analysis-Auger and X-ray Photoelectron Spectroscopy, Wiley
	Interscience, (1990).
2	Sergei N. Magonov, Myung-Hwan Whangbo; Surface Analysis with STM and AFM: Experimental and
	Theoretical Aspects of Image Analysis, VCH Publishers, (1996).
3	Nanoscale materials in chemistry, Kenneth, John Wiley and Sons, (2003).
E-References	
1	https://www.google.com/search?q=Basic%20Properties%20of%20Nanoparticle+filetype%3Adoc
2	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=5&cad=rja&uact=8&ved=2ahUKE
	$wiO_cDVnvvcAhXJqY8KHTN2D_YQFjAEegQIBhAC\&url=http\%3A\%2F\%2Fwww.lehigh.edu\%2F~inmwicespressional and the second straight $
	atpac%2Fsyllabus%2Fs2004mat398.doc&usg=AOvVaw18OmcUT7mNM2qfDrdLTkkG



I EMPOWER														
Programme	M.Sc	Programme Code	1	oph		Regulat	ions	2018-2019						
Department	Phys	sics		Ser	nester			2						
			Credit	Maxim	um Mar	ks								
Course Code	Course	Name	per W	'eek										
Course Cours	Course	i (unite	J J		С	CA	ECE	Tetal						
			L		C r		ESE	100						
18P2PH05	QUANTUMIN	MECHANICS - I	6	0 0	5	25	75	100						
COURSE	1. To acquire k	nowledge of non-relativist	ic and rela	tivisti	c quantum me	chanics.2.	The abi	lity to understand						
OBJECTIVE	concepts and to	perform calculations of so	cattering of	of par	ticles.			-						
S														
POs	PROGRAMME OUTCOME													
PO 1	Capable of demonstrating the basic concepts and comprehensive knowledge from undergraduate													
	programme of study.													
PO 2	Ability to expr	ess thoughts and ideas effe	ctively Co	mmui	nicate with oth	ers using a	ıppropri	ate media.						
PO 3	To identify the relevant assumptions to formulate the arguments by following scientific approach to													
	knowledge development.													
PO 4	Capacity to solve different kinds of non-familiar problems and apply to real life situations													
PO 5	Ability to evaluate the reliability and relevance of evidence , analyse and synthesise data from a variety of													
	sources.													
PO 6	To define prob	lems, formulate hypothes	es, test hyp	othes	ses, analyse, in	terpret and	l draw	conclusions						
	from data.													
PO 7	Ability to work	c effectively and respectful	ly with div	erse t	eams, facilitat	e cooperat	ive or co	oordinated effort						
	on the part of a	group.												
PO 8	Ability to analy	yse, interpret and draw con	clusions fr	om qu	uantitative/qua	litative dat	ta and c	ritically evaluate						
	ideas, evidence	e and experiences from an o	open-mind	ed an	d reasoned per	spective.								
PO 9	Critical sensibi	lity to lived experiences, w	ith self aw	varene	ess and reflexi	vity of botl	1 self ar	id society						
PO 10	Capability to u	se ICT in a variety of learn	ing situati	ons, d	emonstrate ab	ility to acc	ess, eva	luate, and use a						
	variety of relev	ant information sources.	•					<u> </u>						
POTI	Ability to work	independently, identify ap	ppropriate	resou	rces required f	or a projec	t, and n	nanage a project						
DO 12	through to com	ipletion.	• • •	• .	1	. 6 . 11	• 1 1							
PO 12	Capability to e	ffectively engage in a mult	icultural se	bciety	and interact r	espectfully	with di	verse groups						
PO 13	Capable of den	nonstrating the ability to id	entify ethi	cal 1s	sues related to	ones work	., avoid	unethical						
	Conchiliter fr	as labrication.	toom or co	0.00	instion and -	atting dire	ation f.							
PO 14	Capability for	mapping out the tasks of a	team or an	orga	nization, and s	etting dire	2tion, ic	ormulating an						
	mombarato and	i, building a leam who can	neip achie	ve the	e vision, motiv	aung and	mspirin	g team						
DO 15	A hilitar ta an	gage with that VISION.		4	1		former	tining in						
PO 15	Additive to acqu	ire knowledge and skills, in	nciuding h	ow to	learn, that are	e necessary	for par	ucipating in						
	learning activit	ties throughout life, through	n self-pace	d and	self-directed	learning.								

COs	COURSE OUTCOME
CO 1	To get the knowledge about Ehrenfest theorem .Understand the Expectation values of dynamical quantities
CO 2	Able to understand spin angular momentum. To analyze the eigen values spectrum. Evaluate the properties.
CO 3	Understand the characteristic equation of a matrix. To analyze the Hibert space.
CO 4	Apply the time independent perturbation theory in non degenerate cases. Analyze the fundamental concepts Variation method and its uses.
CO 5	Apply the selection rule for dipole radiation. Evaluate adiabatic and sudden approximation.
Pre-requisites	GET KNOWLEDGE

				CO/E		Mann	ina									
(3	/2/1 ind	icates t	the stree	1 voth of	correla	tion. 3-	strong.	2-med	ium. 1-	weak)						
COs				KLs		,		P	Os]	KLs			
								PC	D 1			1				
CO 1					1			PC	0 2			2				
								PC) 3			2				
								PC) 4					3		
CO 2			2					PC) 5					5		
								PC) 6					1		
							PC)7					6			
CO 3			4					PC	08					4		
							PO 9						5			
			3					PO 10					1			
CO 4								PC) 11			2				
								PC	0 12			2				
GO 5			5					PO 13				3				
CO 5								PO 14					3			
						f o		PU	15			6				
(3	/2/1 ind	icates (he stre	orth of	/ PO M	tion 3.	strong	2-med	ium 1.	weak)						
(3)		ileates	ine su ei	Progra	mme ()utcom	e (POs)		10111, 1	weak)						
COs	DO	DO	DO	DO		DO	DO7	DO	DO	DO1	DO1	DO1	DO1	DO1	DO1	
	1	2	3	4	5	FU 6	FO/	8	PO 9	0	1	2	3	4	5	
CO1	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO2	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO3	1	1	1	2	2	1	1	3	2	1	1	1	2	2	1	
CO4	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1	
CO5	1	1	1	1	3	1	2	2	3	1	1	1	1	1	2	

1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

Direct

1. Course End Delivery

Content of the S	yllabus									
	General Formalism of Quantum Mechanics Periods 12									
	Expectation values of dynamical quantities - Probability of current density - Ehrenfest theorem -									
Unit - I	Uncertainty principle - Relations - Simultaneous measurability of observa	bles - Diracs nota	tion,							
	Schrodinger, Heisenberg and Dirac representation (Pictures) - Momentum representation.									
	Angular Momentum Periods 12									
	Orbital Angular Momentum - Spin Angular Momentum - Total Angular M	Momentum Opera	tors -							
Unit II	Commutation relations of Total Angular Momentum with Components - 1	Ladder operators -	- Commutation							
Onit - II	Relation of Jz with J+ and J-, Eigen values spectrum of J2, Jx, Jy and Jz, J	Matrix Representa	ation of J2, Jz,							
	J+ and J-, Addition of angular momenta: Clebsch Gordon Coefficients - Properties and its Evaluation.									
	operators									
Unit - III	Eigen values, Eigen vectors: Characteristic equation of a matrix, Schrodinger, Heisenberg and Interaction									
Ont - m	matrix representation. Diracs Bra and Ket vectors: Dual Space, Hibert Space, Projection Operator, and									
	Matrix Theory of Harmonic Oscillator									
	Approximation Methods	Periods	12							
Unit - IV	Time Independent Perturbation Theory in Non - Degenerate Case, Ground State of Helium Atom,									
0111 - 1 V	Degeneracy - Stark Effect in Hydrogen - Spin - Orbit interaction - Variation Method & its application to									
	Hydrogen Molecule - WKB Approximation.									
	Time Dependent Perturbation Theory	Periods	12							
	Time Dependent Perturbation Theory - First and Second Order Transitions - Transition to Continuum of									
Unit - V	States: Fermi Golden Rule - Constant and Harmonic Perturbation - Tran	sition Probabilition	es - Selection							
	Rules for Dipole Radiation - Adiabatic and Sudden Approximation - Charged Particle in an									
	Electromagnetic Field.									
	Total Periods		60							



IN EMPOWEN										
Programme	M.Sc	Programme Code		PPH Regulations						018-2019
Department	Phys	sics		Semester						2
			Peri	ods		Credit	Maxim	ım Mar	ks	
Course Code	Course Name per Week									
			I	т	D	C	CA	ESE		Total
	SPECTROSC									
18P2PH06	SFECTROSC		0	0	0	5	23	15		100
COURSE	To know the B	asic ideas about different ty	pes of s	pect	rosc	copic theories	and to kno	w the p	rinc	iple and
OBJECTIVE	functions of sp	ectroscopic instrumentation	s.			1				1
S	1	1								
POs		PROGRAMME OUTC	OME							
PO 1	Capable of der	nonstrating the basic concep	ots and c	om	preh	ensive knowle	edge from	undergr	adu	ate
	programme of	study.								
PO 2	Ability to expr	ess thoughts and ideas effec	tively C	om	mun	icate with oth	ers using a	ppropri	ate	media.
PO 3	To identify the	relevant assumptions to for	mulate	the a	argu	ments by follo	owing scie	ntific ap	pro	each to
	knowledge dev	knowledge development.								
PO 4	Capacity to solve different kinds of non-familiar problems and apply to real life situations									
PO 5	Ability to evaluate the reliability and relevance of evidence, analyse and synthesise data from a variety of									
	sources .	sources.								
PO 6	To define prob	lems, formulate hypothese	s, test h	ypot	thes	es, analyse, in	terpret and	l draw		conclusions
	from data.									
PO 7	Ability to work	c effectively and respectfull	y with d	iver	se te	eams, facilitate	e cooperati	ive or co	oord	linated effort
	on the part of a	a group.		-						
PO 8	Ability to anal	yse, interpret and draw conc	lusions	fror	n qu	antitative/qua	litative dat	ta and ci	ritic	ally evaluate
	ideas, evidence	e and experiences from an o	pen-min	ded	anc	l reasoned per	spective.	10		
PO 9	Critical sensibi	lity to lived experiences, wi	th self a	war	rene	ss and reflexiv	ity of both	n self an	d so	ociety
PO 10	Capability to u	se ICT in a variety of learni	ng situa	tion	is, de	emonstrate abi	lity to acc	ess, eva	luat	e, and use a
DO 11	variety of relev	ant information sources.	• .			. 10	<u> </u>	. 1		•
PO II	Ability to work	a independently, identify ap	propriat	e res	sour	ces required f	or a projec	t, and n	nana	age a project
DO 12	through to com	ipletion.	1. 1		• .	1	. 6 11	• .1 1•		
PO 12	Capability to e	ffectively engage in a multi-		soci	iety	and interact re	espectfully	with di	vers	se groups
PO 13	Capable of der	nonstrating the ability to ide	entiry eti	nca	.1 188	ues related to	ones work	, avoid	une	tnical
DO 14	Conchility for	as rabrication.				vization and a	atting ding	ation fo		lating on
PO 14	Capability for	mapping out the tasks of a t	eam or a	in o iorra	rgan	ization, and so	etting dired	cuon, io	ormu a ta	nating an
	memberate and	n, outfulling a learn who can l	ierp ach	ieve	e une	vision, motiv	aung and	uspiring	g tea	am
DO 15	Ability to accord	ire knowledge and skille in	aludina	hor	u to	loorn that are	n 000000	for nort	icia	oting in
PU 15	Additional acqui	tion throughout life through	ciuding	nov nov	on d	solf director 1	necessary	tor part	uciț	ating in
	learning activities throughout life, through self-paced and self-directed learning.									

COs	COURSE OUTCOME
CO 1	Understand the techniques of rotation of molecules and their spectra. Analyze the microwave spectrometer.
CO 2	Analyze IR and Raman spectroscopy. Evaluate the Born Oppenheimer approximation.
CO 3	Understand the instrumentation of UV Photo electron spectroscopy. Analyze the frank Condon principle.
CO 4	Understand the Quantum Mechanical and Classical Description. Apply NMR spectroscopy for determining
	the content and purity of samples.
CO 5	Understand the principles of ESR spectrometer and analyze the experimental techniques in hyperfine
	interaction.
Pre-requisites	GET KNOWLEDGE ABOUT SPECTROSCOPY

				CO / F	PO / KL	. Mapp	ing									
(3	/2/1 ind	licates t	the strea	ngth of	correla	tion, 3-	-strong,	2-med	ium, 1-	weak)						
COs				KLs POs								KLs				
									D 1					1		
CO 1					2			PC	0 2					2		
								PC) 3					2		
								PC	D 4					3		
CO 2					4			PC	05					5		
								PC	06					1		
								PC	07					6		
CO 3					2			PC	08					4		
								PC	09					5		
								PO 10				1				
CO 4			3					PC) 11			2				
				PO 12									2			
								PO) 13					3		
CO 5					4			PO	PO 14				3			
				<u> </u>		Ionning		PU	15					0		
(3	/2/1 ind	licates t	the strei	ngth of	correla	tion, 3-	; -strong,	2-med	ium, 1-	weak)						
~~~				Progra	ımme C	Outcom	e (POs)	)								
COs	PO	РО	PO	PO	РО	PO	PO7	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1	
	1	2	3	4	5	6		8	9	0	1	2	3	4	5	
CO1	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO2	1	1	1	2	2	1	1	3	2	1	1	1	2	2	1	
CO3	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO4	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1	
CO5	1	1	1	2	2	1	1	3	2	1	1	1	2	2	1	

#### 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect 1. Course End Delivery

Direct

Content of the Syllabus Microwave Spectroscopy Periods 12 Rotation of molecules and their Spectra - Diatomic molecules, Intensity of line spectra - The effect of Unit - I isotropic substitution - Non - rigid rotator and their spectra - Polyatomic molecules (Linear and Symmetric top molecules)- Classical theory of Raman Effect - Pure Rotational Raman Spectra (Linear and Symmetric top molecules) - Stark effect - Microwave Spectrometer. IR and Raman Spectroscopy Periods 12 Vibrational energy of diatomic molecules - Simple Harmonic Oscillator - Anharmonic oscillator - Diatomic vibrating rotator - Vibration - Rotation spectrum of carbon monoxide, Breakdown of Born - Oppenheimer Unit - II Approximation, Influence of rotation on the spectra of polyatomic molecules (Linear and Symmetric top Molecules). Raman Effect - Quantum Theory of Raman Effect - Selection Rules - Degree ofdepolarization - Rotational Raman Spectrum - Vibrational Raman Spectrum, Structure determination using IR and Raman spectroscopy - Principles and Working of Raman Spectrometer. Electronic Spectroscopy Periods 12 Born - Oppenheimer Approximation, Vibrational Coarse and their progressions - Franck-Condon Principle - Dissociation energy and their products - Rotational fine structure of electronic - Vibration Transition Unit - III Molecular Orbital theory - Spectrum of molecular hydrogen -Change of shape on excitation - Chemical analysis by electronic spectroscopy - Re-emission of energy by excited molecule- Instrumentation of UV Photoelectron Spectroscopy - Zeeman Effect. NMR & NQR Spectroscopy Periods 12 NMR Spectroscopy: Quantum Mechanical and Classical Description - Bloch Equations - Relaxation Processes - Principle and Working of High Resolution - NMR Spectrometer -Chemical Shift Unit - IV Applications of NMR Spectroscopy.NQR Spectroscopy: Fundamental requirements - General Principle -Experimental detection of NQR frequencies - Interpretation and Chemical explanation of NQR Spectroscopy. Periods ESR & Mossbauer Spectroscopy 12 ESR Spectroscopy: Basic Principles, ESR Spectrometer - Reflection Cavity and Microwave bridge - ESR Spectrum - Hyperfine Structure.Mossbauer Spectroscopy: Mossbauer Effect, Recoilless emission and Unit - V absorption- Mossbauer Spectrum: Experimental techniques - Hyperfine interaction - Chemical isomer Shift- Doppler velocity shift - Magnetic hyperfine interaction - electric quadrupole interaction. **Total Periods** 60

Text Books	
1	Vibrational Spectroscopy, Sathyanarayana, New Age International Publications, (2004).
2	Fundamentals of Molecular Spectroscopy, Banwell, TMG Hill, (2009).
References	
1	Spectroscopy II, Straughan and Walkar, Chapman and Hall, (2003).
2	Modern Molecular Spectroscopy, Randhava, Macmillan India, (2003).
E-References	
1	www.khanacademy.org/science/physics/spectroscopy/microwave spectroscopy.
2	www.khanacademy.org/science/physics/spectroscopy/IR/raman spectroscopy.



HOLEN ENPONENTEN	VIVEKAN	IANDHA COLLEGH WOMEN (A Elayampalayam, '	E OF A UTON Tiruche	ARTS IOMC ngode-	AND SCIE DUS) 637 205.	NCES FO	DR	TÜVRiheinland CENTIFIED	
Programme	M.Sc.,	Programme Code		PPH	2018-2019				
Department	Physics Semester								
Course Code	Course	Name	Per per L	iods Week	P C	Maximu CA	m Marl	ks Total	
18P2PHE02	BIO PHYSIC	CS	4	0	0 4	25	75	100	
COURSE OBJECTIVES	To learn abou and its applica	t the basic biophysics and ations.	to know	about	the principle a	nd working o	of bio ir	nstrumentations	
POs		PROGRAMME OUT	COME						
PO 1	Capable of de programme of	monstrating the basic cond	cepts and	l compi	rehensive know	wledge from	underg	raduate	
PO 2	Ability to exp	ress thoughts and ideas eff	ectively	Comm	unicate with o	thers using a	ppropri	iate media .	
PO 3	To identify th knowledge de	e relevant assumptions to the velopment.	formulat	e the ar	guments by fo	llowing scie	ntific a	pproach to	
PO 4	Capacity to so	lve different kinds of non-	familia	proble	ems and apply	to real life si	tuations	s	
PO 5	Ability to evaluate sources .	luate the reliability and rel	evance of	of evide	ence , analyse a	and synthesis	se data i	from a variety of	
PO 6	To define prob from data.	blems, formulate hypothe	eses, test	hypoth	neses, analyse,	interpret and	l draw	conclusions	
PO 7	Ability to wor on the part of	k effectively and respectfu a group .	ılly with	divers	e teams, facilit	ate cooperati	ive or c	oordinated effor	
PO 8	Ability to ana ideas, evidence	lyse, interpret and draw co e and experiences from an	nclusior open-m	is from ainded a	quantitative/quant reasoned p	ualitative dat erspective.	ta and c	ritically evaluate	
PO 9	Critical sensit	pility to lived experiences,	with sel	f aware	eness and reflex	xivity of both	n self ar	nd society	
PO 10	Capability to variety of rele	use ICT in a variety of lean want information sources.	rning sit	uations	, demonstrate a	ability to acc	ess, eva	aluate, and use a	
PO 11	Ability to wor through to cor	k independently, identify	appropri	ate reso	ources required	l for a projec	et, and r	nanage a project	
PO 12	Capability to	effectively engage in a mu	lticultur	al socie	ety and interact	respectfully	with d	iverse groups	
PO 13	Capable of de behaviour suc	monstrating the ability to i has fabrication.	dentify	ethical	issues related	to ones work	, avoid	unethical	
PO 14	Capability for inspiring visio membersto en	mapping out the tasks of a on, building a team who ca gage with that vision.	a team o n help a	r an org chieve	ganization, and the vision, mot	l setting directivating and i	ction, fo inspirin	ormulating an ag team	
PO 15	Ability to acq learning activ	uire knowledge and skills, ities throughout life, throu	includir gh self-p	ng how baced a	to learn, that a nd self-directed	re necessary d learning.	for par	ticipating in	

COs	COURSE OUTCOME
CO 1	To acquire the knowledge about strong and weak bonds.
CO 2	Acquire knowledge about radioactivity. Apply GM counter for the detection of ionizing radiation.
CO 3	Acquire the knowledge about Biomolecules and biological energy. Analyze the DNA and RNA conformation. Synthesis the ATP.
CO 4	To acquire the knowledge about the movement of organisms. To understand the Nerve impulse and nervous system.
CO 5	To get the knowledge about Ballistic control in a simplified visual system. To understand the mental processing.
Pre-requisites	GET KNOWLEDGE ABOUT biophysics

				CO / F	PO / KL	. Mappi	ing			<b>.</b> .					
(3/	$\frac{2}{1}$ ind	icates t	he strei	ngth of	correla	tion, 3-	strong,	2-med	ium, 1-	weak)					
COs				KLs				Р	Os			]	KLs		
								PC	D 1					1	
CO 1					1			PC	) 2					2	
								PO 3				2			
								PC	) 4					3	
CO 2					3			PC	) 5					5	
								PC	)6					1	
								PC	7 (					6	
CO 3					4			PC	8 0					4	
								PC	)9					5	
				-				PO 10				1			
CO 4					2			PC	) 11					2	
				PO 12								2			
								PC	13					3	
CO 5					2			PO 14				3			
								PC	15			6			
				CO	/ PO M	lapping	5								
(3/	/2/1 ind	icates t	he strei	ngth of	correla	tion, 3-	strong,	2-med	ium, 1-	weak)					
COs				Progra	mme C	Outcome	e (POs)								
203	PO	РО	РО	РО	РО	РО	PO7	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1
	1	2	3	4	5	6		8	9	0	1	2	3	4	5
CO1	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1
CO2	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1
CO3	1	1	1	2	2	1	1	3	2	1	1	1	2	2	1
CO4	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1
CO5	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1

#### 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect 1. Course End Delivery

Direct

Content of the Syllabus Bonds Periods Ionization energy electron affinity - chemical bonding - electronegativity - strong bonds secondary Unit - I bonds. Energies-forces-bonds: Interatomic potentials for strong and weak bonds -bond energies. Rates of reaction: reaction kinetics- water, acids, bases and aqueous reactions. Transport process: Diffusion viscosity-thermal conduction Radioactivity Periods Radiation Biology: Radio activity- Natural radiation (Cosmic rays) - Artificial (or) Induced radioactivity -Unit - II Radioactive disintegration - Geiger-muller counter - Crystal counter: Method of detection of disintegration frequency - Biological effects of radiation. **Biological** structure Periods Biomolecules and biological energy Biological polymers: Nucleic acids-DNA-RNA-conformation-Unit - III proteins protein folding. Biological Membranes: Historical background-membrane chemistry and

structure-membrane physics. Biological energy: Energy consumption respiration-photosynthesis-ATP synthesis. Nature of organisms Periods 8

Unit - IV	Movement of organisms Bacterial motion-chemical memory in primitive movement-human performance, nerve signals and memory Excitable m of Ions-resting potential Nerve signals: Passive response-Nerve imp system.	e organisms-musc nembranes: Diffus ulses (action pote	cular ion and mobility entials)- nervous
	Instrumentation	Periods	12
Unit - V	Control of movement Primary of movement-Ballistic control in a sim more sophisticated-mode of control-structure of muscle fibres-centr conditioned reflexes-volition-and Free will-consciousness Passive verses active in m	aplified visual system al pattern genera ental processing.	stem- ators-
	Total Periods		40

Text Books	
1	RodyneyM.J.Cotterill, Biophysics: An introduction, John Wiley and sons Publications, (2014).
2	Roland Glacer, Biophysics, Springer Publications, (2006).
References	
1	P.K.Srivastava, Elementary Biophysics An introduction, Narosa Publishing House, (2005).
2	M.V.Volkenshtein, Biophysics, Mir Publications, Moscow, (2010).
E-References	
1	https://www.google.com/search?q=httt%2Fwww.biophysics&ie=utf-8&oe=utf-8&client=firefox-b-ab
2	https://www.google.com/search?q=http%2F+radiation+physics&ie=utf-8&oe=utf-8&client=firefox-b-ablematical and the second

Signature of BOS Chairman

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A MIP O W			_						
Programme	M.Sc	Programme Code	РРН		Regulat	ions	2018-2	2019	
Department	Phy	sics	Sen	nester				2	
			Periods	Credit	Maximu	ım Mar	ks		
Course Code	Course	Name	per Week						
			L T P	С	CA	ESE	Г	Total	
	ELECTRON	MAGNETIC THEORY	6 0 0	5	25	75		100	
18P2PHE04				-					
COURSE	To provide th	ne basic skills required to un	nderstand, devel	op, and desig	n Electrom	agnetic	material	s and To	
OBJECTIVES	enhance the r	esearch interest in electricit	ty and magnetis	m.					
POs		PROGRAMME OUT	COME						
PO 1	Capable of de	emonstrating the basic conc	cept sand compr	ehensive know	wledge from	n under	graduate	;	
	programme o	f study.							
PO 2	Ability to exp	press thoughts and ideas eff	ectively Comm	unicate with c	others using	g approp	riate me	dia and	
	interpret the i	idea in clear and concise ma	anner.						
PO 3	To identify the	ne relevant assumptions to f	formulate the ar	guments by fo	ollowing sc	ientific	approach	1 to	
	knowledge de	evelopment							
PO 4	Capacity to s	Capacity to solve different kinds of non-familiar problems and apply to real life situations.							
PO 5	Ability to eva	Ability to evaluate the reliability and relevance of evidence ,analyse and synthesise data from a variety							
	of sources the	of sources then draw valid conclusions and support them with evidence and examples, and							
	addressingop	posing viewpoints.			•				
PO 6	To define pro	blems, formulate hypothe	eses, test hypoth	eses, analyse,	interpret a	nd draw	conc	lusions	
	from data, pr	edict cause-and-effect relat	ionships and ab	ility to plan, e	xecute and	report	he result	is of an	
DO 7	A hility to wa	nt offectively and near eath	Il. with divora	tooma facilit	toto ocomon	otivo or	acardine	atad	
PO /	effort	rk enectivery and respectit	iny with diverse	e teams, facint	late cooper	arive or	coordina	lieu	
	on the part of	a group and act together as	s a group						
PO 8	Ability to ana	alyse, interpret and draw co	nclusions from	quantitative/q	ualitative d	lata and	critically	у	
	evaluate								
	ideas, eviden	ce and experiences from an	open-minded a	nd reasoned p	erspective				
PO 9	Critical sensi	bility to lived experiences,	with self aware	ness and refle	xivity of bo	oth self	and socie	ety.	
PO 10	Capability to	use ICT in a variety of lear	ning situations,	demonstrate	ability to a	ccess, e	valuate, a	and use a	
DO 11	variety of rel	evant information sources a	ind use appropri	ate software f	or analysis	of data			
PO 11	Ability to wo projectthroug	the completion	appropriate reso	urces required	1 for a proj	ect, and	manage	а	
PO 12	Capability to	effectively engage in a mu	lticultural socie	ty and interact	t respectful	ly with	diverse g	groups.	
PO 13	Capable of de	emonstrating the ability to i	dentify ethical i	ssues related	to ones wo	rk, avoi	d unethic	cal	
	behavior such	n as fabrication.							
PO 14	Capability fo	r mapping out the tasks of a	a team or an org	anization, and	l setting di	rection,	formulat	ing an	
	inspiring visi	on.				_			
PO 15	Ability to acc	uire knowledge and skills,	including how	to learn, that a	are necessar	ry for p	articipati	ng in	
	learning activ	vities throughout life.							

COs	COURSE OUTCOME
CO 1	To understand the concept of electrostatics. Acquire conceptual knowledge molecular polarisability.
	Analyze the Laplace equation.
CO 2	Understand the techniques biot-savarts and amperes circuital law.
CO 3	Understand the faraday laws of induction and evaluate the Maxwells equation.
CO 4	Understand the propagation of waves in rectangular wave guides. Apply the concept of wave guides in
	homogeneous wave equation.
CO 5	Acquire the knowledge about Plasma physics. Apply the Plasma or welding techniques.
Pre-requisites	To Acquire idea about Electrodynamics

Γ

				Knov	wledg	e Lev	els								
1.Remembe	ering, 2	2.Und	lerstai	nding	, 3.Ap	plying	g, 4.A	nalyz	ing, 5	.Evalu	ating,	6.Syn	thesiz	ing	
				CO/F	PO / KI	. Mapp	ing								
(3	/2/1 ind	licates t	the strei	ngth of	correla	tion, 3-	-strong,	2-med	ium, 1-	-weak)					
COs				KLs				P	Os			l	KLs		
							PO	D 1					1		
CO 1					1			PO	0 2					2	
								PO	) 3					2	
								PO	) 4					3	
CO 2					2			PC	$\frac{0.5}{1}$					5	
									$\frac{16}{17}$					1	
CO 3			2				PO 8								
005							PO 9				5				
								PC	0 10					1	
CO 4			3				PO 11				2				
								PC	12					2	
								PO 13						3	
CO 5					3			PO 14						3	
				<u> </u>		Ionning		PC	15					6	
(3	$\frac{1}{2}/1$ ind	licates t	the stree	noth of	correla	tion 3-	strong	2-med	ium 1-	-weak)					
(5	2/1 1114	incutos		Progra	mme (	Jutcom	e (POs)	<u>2 mea</u>	14111, 1	((oull)					
COs	PO	PO	PO	PO	PO	PO	PO7	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1
	1	2	3	4	5	6	107	8	9	0	1	2	3	4	5
CO1	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1
CO2	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1
CO3	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1
CO4	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1
CO5	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1
	· · · · · · · · · · · · · · · · · · ·									۱					

### 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect
1. Course End Delivery

Direct

Content of the	Syllabus									
	Electrostatics	Periods	14							
	Coulombs law - Field due to point and continuous charges - Gauss Law and its application - Laplace and									
TT. 1 T	Poissons equations - Solution of Laplace equation in spherical Coordinates - Point charge infront of a									
Unit - I	conducting sphere - Multipole expansion - Electrostatic energy - Dielectrics - Polarization and									
	Displacement vectors, Boundary conditions - Dielectric sphere in	n a uniform fie	ld - Molecular							
	polarizabilityand Electrical susceptibility - Electrostatic energy in diele	ectric medium - (	Clausis-Mossotti							
	equation.									
	Magnetostatics	Periods	10							
	Biot-Savarts law - Divergence and curl of magnetic induction - Magneti	c vector potential	- Amperes							
Unit II	circuital law - Magnetic field of a localized current distribution - Magne	tic moment and fo	orce on a							
Unit - II	current distribution in an electric field - Magneto static energy - Magnetic induction and Magnetic field									
	in a macroscopic media - Concept of magnetic dipole - Boundary conditions - Uniformly magnetized									
	sphere - Magnetic Scalar & Vector Potential - Characteristics.									
	Electromagnetics	Periods	10							
	Faradays law of induction - Maxwells equation in free space and isotropic media - Maxwells									
Unit - III	displacements current - Vector and Scalar potential - Boundary conditions on the field at interfaces -									
	Relation between field theory and circuit theory - Gauge transformation, Lorentz Gauge - Coulomb gauge									
	- Conservationlaws for a system of charges - Poynting theorem.									
	Wave Propagation	Periods	14							
	Propagation of an electromagnetic wave in free space - Conducting and Non conducting medium -									
Unit IV	Skin depth, Reflection and Transmission at dielectric boundaries - Polar	ization - Fresnels	Law -							
Unit - I v	Interference, Coherence and Diffraction - Guided waves - Wave guides - Propagation of waves in									
	rectangular wave guide, Inhomogeneous wave Equation and Retarded potentials, Field and Radiation									
	due to an oscillating									
	electric dipole.									
	Plasma Physics	Periods	12							
	Plasma - Debye length - Plasma oscillations - Plasma behaviour in a ma	gnetic field - Bolt	zmann equation							
Unit - V	- Magnetohydrodynamic equations - Electron plasma oscillations - Deby	ve shielding proble	em - Plasma							
	confinement in a magnetic field - Pinch effect - Magneto hydrodynamic	waves - Alfven w	/aves –							
	Dynamicsof charged particle in uniform electromagnetic fields - Plasma	arc welding tech	nique.							
	Total Periods		60							

Text Books	
1	1. Introduction to Electrodynamics, Griffith, Prentice Hall of India, (2015).
2	2. Electromagnetic Waves and Fields, Paul Corson and Dale, CBS Publishers, (2005).
References	
1	1. Basic Electromagnetics with Application, N. Narayana, Prentice Hall of India, (2001).
2	2. Electromagnetic Theory and Applications, Umesh Sinha, Tech India Publications, (2005).
E-References	
1	https://www.google.com/search?q=http%2F+electromagnetic+theory&ie=utf-8&oe=utf-8&client=firefox-
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	-ab
2	. https://www.google.com/search?q=hppt%2F+magnetostatics&ie=utf-8&oe=utf-8&client=firefox-b-ablackersearch.com/search?q=hppt%2F+magnetostatics&ie=utf-8&oe=utf-8&client=firefox-b-ablackersearch.com/search?q=hppt%2F+magnetostatics&ie=utf-8&oe=utf-8&client=firefox-b-ablackersearch.com/search?q=hppt%2F+magnetostatics&ie=utf-8&oe=utf-8&client=firefox-b-ablackersearch.com/search?q=hppt%2F+magnetostatics&ie=utf-8&oe=utf-8&client=firefox-b-ablackersearch.com/search?q=hppt%2F+magnetostatics&ie=utf-8&oe=utf-8&client=firefox-b-ablackersearch.com/search?q=hppt%2F+magnetostatics&ie=utf-8&oe=utf-8&client=firefox-b-ablackersearch.com/search?q=hppt%2F+magnetostatics&ie=utf-8&oe=utf-8&client=firefox-b-ablackersearch.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/search.com/



EMPOWER		5 1 5 /		8								
Programme	M.Sc	Programme Code		PPH		Regulat	ions	2	018-2019			
Department	Phys	sics		Semester					3			
			Per	iods	Credit	Maxim	um Mar	ks				
Course Code	Course	Name	ner	Week								
Course Coue	Course	Tume	J Per	тр	C	CA	ESE		Total			
	CONDENSET	MATTED DIVELCE	L 5		5	25 CA	- ESE - 75		100			
18P3PH07	$\begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \end{array} \\ \end{array} $											
COURSE	1.This subject	provides an advanced intro	duction	to conde	ensed matter p	hysics. 2.T	o challe	enge	e the students			
OBJECTIVE	provide a found	provide a foundation for further advanced studies.										
S												
POs		PROGRAMME OUT	COME									
PO 1	Capable of den	nonstrating the basic conce	pts and	compreh	nensive knowl	edge from	undergi	radu	iate			
	programme of	study.										
PO 2	Ability to expre	ess thoughts and ideas effe	ctively (	Commur	nicate with oth	ers using a	appropri	ate	media and			
	interpret the ide	ea in clear and concise mar	nner.									
PO 3	To identify the	To identify the relevant assumptions to formulate the arguments by following scientific approach to										
	knowledge dev	relopment.				1.1.0						
PO 4	Capacity to solve different kinds of non-familiar problems and apply to real life situations.											
PO 5	Ability to evalu	ate the reliability and relev	vance of	evidenc	e,analyse and	synthesise	e data fr	om	a variety of			
	sources then draw valid conclusions											
PO 6	To define prob	lems, formulate hypotheses	, test hy	potheses	s,analyse, inter	pret and d	raw con	clu	sions from			
	data, predict car	use-and-effect relationships	s and ab	ility to p	olan, execute a	nd report t	he resul	ts o	f an			
 DO 7	Ability to work	offectively and respectfull	wwith .	divorco t	anna facilitata	aconarati	ua or ac	ord	instad affort			
FO /	on the part of a	group and act together as	a group	or a toor	n in the interest	etc of a cor			and			
	work efficiently	v as a member of a team	a group					aus	2 and			
PO 8	Ability to analy	y as a member of a team.	clusions	from a	antitative/aua	litative da	ta and c	ritic	ally evaluate			
100	ideas evidence	and experiences from an o	ppen-mi	nded and	d reasoned per	spective	tu una e	11110	uny evaluate			
PO 9	Critical sensibi	lity to lived experiences, w	vith self	awarene	ess and reflexiv	vity of both	n self an	nd se	ociety.			
PO 10	Capability to u	se ICT in a variety of learn	ing situ	ations, d	emonstrate ab	ility to acc	ess, eva	luat	e, and use a			
	variety of relev	ant information sources an	d use ar	propriat	te software for	analysis o	f data.					
PO 11	Ability to work	independently, identify ap	propria	te resour	rces required f	or a projec	t, and n	nana	age a project			
	through to com	pletion.										
PO 12	Capability to e	ffectively engage in a mult	icultural	l society	and interact r	espectfully	with di	iver	se groups.			
PO 13	Capable of den	nonstrating the ability to id	entify et	hical iss	sues related to	ones work	, avoid	une	thical			
	behaviour such	as fabrication, falsification	n or mis	represen	tation of data	or commit	ting pla	giar	ism,			
	notadhering to	intellectual property rights	•									
PO 14	Capability for a	mapping out the tasks of a	team or	an orgai	nization, and s	etting dired	ction, fo	orm	lating an			
	inspiring visior	n, building a team who can	help acl	hieve the	e vision, motiv	vating and i	inspirin	g te	am			
	membersto eng	gage with that vision.										
PO 15	Ability to acqu	ire knowledge and skills, in	ncluding	g how to	learn, that are	necessary	for par	ticip	oating in			
	learning activit	ies throughout life.										

COs	COURSE OUTCOME
CO 1	Acquire the knowledge about the energy bands. To understand the Kronig penny model
CO 2	To Understand Drudes Lorentz Free electron theory. Analyze Thermionic Emission
CO 3	To Understand the Langevin classical theory of diamagnetism. Apply the Guoys method in diamagnetism.
CO 4	Understand the concept of London equation. Apply the super conductors for commercial applications.
CO 5	To Understand and Apply the qualitative ideas of MEMs spintronics.
Pre-requisites	To Acquire idea about materials science

				Knov	wledg	e Lev	els								
1.Remembe	ring, 2	2.Und	lersta	nding	, <b>3.</b> Ap	plyin	g, 4.A	nalyz	ing, 5	.Evalu	ating,	6.Syn	thesiz	ing	
	/2/1 :		1	CO/F	PO / KI	. Mapp	ing	2	P 1						
	/2/1 1nd	licates	ine stre	NU a	correla	tion, 3-	-strong	, 2-mea	1000000000000000000000000000000000000	-weak)			VI a		
COs				KLS				P	$\frac{0}{2}$				KLS	1	
CO 1					1				$\frac{1}{2}$					$\frac{1}{2}$	
01					1			P(	$\frac{J}{2}$					2	
								P(	$\frac{55}{24}$					3	
CO 2					2			P	) 5					5	
								PO	0.6					1	
								PO	D 7					6	
CO 3	CO 3			2				PO	D 8			4			
								PO	<b>)</b> 9					5	
								PC	0 10					1	
CO 4					3			PC	) 11					2	
								PC	0 12					2	
<u> </u>					~			PO 13						3	
05					5				) 14					3	
					/ PO N	Ianning	r	FC	15					0	
(3)	/2/1 ind	licates t	the stre	ngth of	correla	tion. 3	-strong	2-med	lium. 1.	weak)					
(0)				Progra	mme (	)utcom	e (POs)	)		(i euli)					
COs	PO	PO	PO	PO	PO	PO	P07	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1
	1	2	3	4	5	6	107	8	9	0	1	2	3	4	5
CO1	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1
CO2	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1
CO3	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1
CO4	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1
CO5	1	1	1	1	3	1	2	2	3	1	1	1	1	1	2

### 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

Direct

1. Course End Delivery

Content of the	Syllabus										
	Electron Energy Bands	Periods	14								
	Basic concepts of energy bands - Fermi surface - Density of states - The BlochsTheorm - Kronig Penney										
Unit - I	model - Zone schemes for energy bands - Brillouin zones - Energy band	ls in a general peri	iodic potential -								
	Motion of an electron in one dimensional lattice - Effective mass of an e	electron - Effective	e band gap and								
	band overlapping - Anomalous skin effect - De Hass van Alphen effect.										
	Free Electron Theory of Metals	Periods	12								
Unit - II	Free electron in metals - Drude Lorentz free electron theory - Electrical conductivity- Weidemann Franz law - Sommerfield free electron theory emission - Relaxation time - Collision time - Mean free path -Quantum electrons from metal - Potential energy of an electron outside the metal.	conductivity -The - Mattiessens Ru theory of free elec	ermal le - Thermionic etrons - Escape of								
	Diamagnetism, Paramagnetism and Ferromagnetism	Periods	12								
	Diamagnetism -Langevin classical theory of Diamagnetism -Paramagnetism - Weiss theory of										
Unit - III	paramagnetism - Quantum theory of Paramagnetism - Demagnetization of a paramagnetyic salt -										
Olint - III	Determination of susceptibility of para and diamagnetism using Guoys method - Ferromagnetism -										
	Spontaneous magnetization in ferromagnetic materials - Quantum theory of ferromagnetism - Curie -										
	Weisslaw - Weiss molecular field - Ferromagnetic domains - Antiferrom	omagnetism - Ferrimagnetism									
	Superconductivity	Periods	12								
	Superconductivity and its historical perspective - Critical Temperature - Persistent current - Energy gap										
Unit - IV	and its Temperature dependence - Type I and Type II superconductors - BCS theory - Flux quantization -										
onit Iv	London equation - Josephson tunneling effect - DC and AC Josephson e	effect Power Appl	ications of								
	superconductors - High temperature Superconductors - High temperature	e Ceramic Superc	onductors								
	Semiconductor Devices	Periods	10								
Unit - V	Hall effect in semi conductors - Vacuum level and Work function of metals - Solar cells, Qualitative ideas										
	of MEMs, Spintronics, Quantum Dots (QDs) & Molecular Electronics -	LED and Photodi	ode								
	Total Periods		60								

Text Books	
1	Solid State Physics - S.O. Pillai, New Age Publication, 2nd Edition, 2002.
2	Solid State Physics – Gupta &Saxeena, PragattiPraashan, 9th Edition, 2004
References	
1	Introduction to Solid State Physics - C.Kittel (John Wiley and Sons), 7th Edition, 2005
2	Superconductivity Fundamentals and Applications – Werner Buckel, Reinhold Kleiner -VCH
	Publications, 2nd revised and enlarged edition 2004.
E-References	
1	https://physics.ku.edu/research/condensed-matter-physics
2	https://physics.uiowa.edu/research/condensed-matter-and-materials-physics

Signature of BOS Chairman



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to identify the relevant assumptions to formulate the arguments by following scientific approach to knowledge development										
Capacity to solve different kinds of non-familiar problems and apply to real life situations										
Ability to evaluate the reliability and relevance of evidence analyse and synthesise data from a variety of										
sources then draw valid conclusions										
To define problems formulate hypotheses, test hypotheses analyse, interpret and draw conclusions from										
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COs	COURSE OUTCOME
CO 1	To acquire the knowledge of emission and absorption of radiation.
CO 2	Analyse partial wave analyses, Evaluate scattering amplitude through scattering cross section.
CO 3	To acquire the knowledge of Symmetrical and anti-symmetrical wave function
CO 4	Apply Klein-Gordon equation to find relativistic wave equation.
CO 5	To acquire the knowledge of quantization of the wave field.
Pre-requisites	To Acquire idea about materials science

				Knov	wledg	e Lev	els								
1.Remembe	ring, 2	2.Und	lersta	nding	, <b>3.</b> Ap	plyin	g, 4.A	nalyz	ing, 5	.Evalu	ating,	6.Syn	thesiz	ing	
				CO / F	PO / KI	_ Mapp	ing								
(3,	/2/1 ind	licates	the stre	ngth of	correla	tion, 3	strong,	, 2-med	lium, 1-	weak)					
COs				KLs				Р	Os			]	KLs		
								PO	D 1					1	
CO 1					1			PO	D 2					2	
								PO	03					2	
								PO	<u>)</u> 4					3	
CO 2					4			P	) 5					5	
									$\frac{10}{17}$					1	
CO 3			3					P(	) / ) 8			4			
003					5			P	) 9 ) 9					5	
								PC	) 10					1	
CO 4				5				PO 11				2			
								PC	) 12					2	
								PC	) 13					3	
CO 5					4			PC	<b>)</b> 14					3	
								PC	) 15					6	
				CO	/ PO N	lapping	S								
(3)	/2/1 ind	licates	the stre	ngth of	correla	$\frac{1}{3}$	-strong,	, 2-med	lum, l	weak)					
COs		1	1	Progra	imme C	Jutcom	e (POs)	)	1	1	1	1	1		
	PO 1	PO 2	PO 2	PO 4	PO 5	PO	PO7	PO	PO	PO1	PO1	PO1	PO1 2	PO1	PO1
CO1	3	2	2	4	1	3	1	0	<del>9</del>	3	2	2	1	4	1
CO2	1	1	1	2	2	1	1	3	2	1	- 1	- 1	2	2	1
C03	1	2	2	3		1	1	2	1	1	2	2	3	3	1
CO3	1	1	1	1	2	1	2	2	2	1	1	1	1	1	2
C04	1	1	1	1	3	1	2	2	3	1	1	1	1	1	2
CO5	1	1	1	2	2	1	1	3	2	1	1	1	2	2	1

#### 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

Direct

1. Course End Delivery

Content of the	Syllabus									
	Semi classical Theory of Radiation	Periods	12							
	Emission & Absorption of radiation - Electric dipole approximation -Einstein's Transition probabilities									
Unit I	and A & B Coefficients - Selection rules -Quantization of radiation field - Interaction with matter -									
Unit - I	Spontaneous & Stimulated emissionsQuantum theory of Valence BondV	B method - Hitle	er - London							
	theory of Hydrogenmolecule in VB method - Refinements of Simple M	O and VB approx	imations.							
	Scattering Theory	Periods	12							
	Scattering cross section-Scattering amplitude - Greens function - Partial	wave analysis - F	Phase shifts - The							
Unit - II	scattering amplitude in terms of phase shift -Scattering by Coulomb pote	ential - Low energ	gy							
	scattering: Scattering length and effective range - Scattering by a perfec	tly rigid sphere								
	Many Electron Atoms	Periods	12							
	Indistinguishable particles - Symmetrical and Anti symmetrical wave functions - Paulis Exclusion									
Unit - III	principle- Inclusion of spin - Spin functions for two electrons - Spin functions for three electrons - Helium									
	Equation									
	Relativistic Wave Equation	Periods	12							
Unit IV	Klein - Gordan Equation - Diracs equation for a free particle - Dirac Matrics - Covariant form of dirac									
Unit - I v	equation - Probability density and current density - Plane wave solution - Negative energy states									
	- Hydrogen atom									
	Quantum Field Theory	Periods	12							
	Quantization of the wave fields - Classical Lagrangian equation - Classical Hamiltonian									
Unit - V	equation - Field Quantization of the non relativistic Schrodinger equation	n - Creation, Dest	truction							
	and Number Operators - Anti Commutation Relations - Quantization of	Electromagnetic	Field							
	Total Periods		60							

Text Books	
1	1. Quantum Mechanics – GAruldhas - Prentice Hall of India, (2006).
2	2. Quantum Mechanics – Satyaprakash - Sultan Chand Publishers, (2013).
3	3. Quantum Mechanics – Gupta Kumar Sharma - JaiprakashNath Publications, Meerut, (2013).
References	
1	A text Book of Quantum Mechanics – P. M.Mathews&K.Venkatesan–Tata Mc Graw Hill, (2004).
2	Introduction to Quantum Mechanics – David J.Griffths – Pearson Prentice Hall, 2nd edition,
	(2009).
3	Quantum Mechanics – L. I. Schiff - Tata Mc Graw Hill, (2010).
E-References	
1	https://nptel.ac.in/syllabus/115104045/
2	https://www.ntnu.edu/studies/courses/TFY4205/
3	https://www.ntnu.edu/studies/courses/TFY4205/



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WOMEN EMPOWERNENT		Elayampalayam, Ti	ruche	ngod	le-63	37 205.				
Programme	M.Sc Programme Code PPH Regulations							2	018-2019	
Department	Phys	sics			Sen	nester				3
			Per	iods		Credit	Maxim	um Marl	ks	
Course Code	Course	Name	per	Wee	ek					
			L	Т	Р	С	CA	ESE		Total
	MICROPRO	CESSORS AND						l		
18P3PH09	MICROCON	TROLLERS	5	0	0	5	25	75		100
							1			
COURSE	1.The Basic kr	nowledge and buildings bloc	cks of	comp	outer	rs and its proc	essors.2.T	o operat	e th	e processors
OBJECTIVES	and controllers	s with basic idea.								
POs		PROGRAMME OUTC	OME							
PO 1	Capable of der	monstrating the basic concep	ots and	l con	npre	hensive know	ledge from	underg	rad	uate
	programme of	study.								
PO 2	Ability to exp	Ability to express thoughts and ideas effectively Communicate with others using appropriate media and								
	interpret the id	lea in clearandconcise mann	er.							
PO 3	To identify the	e relevant assumptions to for	rmulat	e the	arg	uments by fol	lowing sci	entific a	ppr	oach to
	knowledge dev	velopment.								
PO 4	Capacity to so	lve different kinds of non-fa	miliar	prot	olem	is and apply to	o real life s	ituation	s.	
PO 5	Ability to eval	uate the reliability and relev	ance o	of evi	den	ce, analyse and	d synthesiz	ze data fi	ron	n a variety of
DO 6	sources then d	raw valid conclusions	toot k		haar	a analyza int	annuat an d	drama	mal	uciona from
PO 0	data predict of	auso and affact relationship	, test i	туро	nese	es, anaryse, mi	erpret and	draw co	mei	usions from
PO 7	Ability to wor	k effectively and respectfull	s v with	dive	rsei	teams facilitat	e cooperat	ive or co	oor	dinated effort
107	on the part of	a group	y with	uive	150	icams,raciina	e cooperat		001	
PO 8	Ability to anal	vse, interpret and draw cond	lusion	s fro	m a	uantitative/au	alitative da	ata and o	criti	cally evaluate
100	ideas, evidence	e and experiences from an o	pen-m	inde	d an	d reasoned pe	rspective.			ioung of andato
PO 9	Critical sensib	ility to lived experiences, w	ith self	f-awa	aren	ess and reflex	ivity of bo	th self a	nd	society.
PO 10	Capability to u	use ICT in a variety of learning	ing situ	atio	ns, c	lemonstrate al	bility to ac	cess, eva	alua	ate, and use a
	variety of relev	vant information sources and	d use a	ppro	pria	te software fo	r analysis	of data.		
PO 11	Ability to wor	k independently, identify ap	propri	ate re	esou	rces required	for a proje	ct, and r	mar	age a project
	through to con	npletion.								
PO 12	Capability to e	effectively engage in a multi	cultura	al soc	ciety	and interact	respectfull	y with d	live	rse groups.
PO 13	Capable of der	monstrating the ability to ide	entify o	ethic	al is	sues related to	ones wor	k, avoid	un	ethical
	behavior as fal	brication.								
PO 14	Capability for	mapping out the tasks of a t	eam o	r an o	orga	nization, and	setting dire	ection, f	orn	nulating an
	inspiring visio	n.								
PO 15	Ability to acqu	uire knowledge and skills, in	cludir	g ho	w to	learn, that ar	e necessar	y for par	rtici	ipating in
	learning activi	ties throughout life.								

COs	COURSE OUTCOME
CO 1	To acquire the knowledge of evolution of microprocessor. Understand the hardware and software interrupts.
CO 2	To get the knowledge about Assembly language. Understand the instruction set of 8085. Apply the 8bit
	addition in 8085.
CO 3	To acquire the knowledge of INTEL 8257. Apply the direct memory access in Data transfer.
CO 4	To get the knowledge about architecture of 8051. Understand the counters and timers.
CO 5	To get the knowledge about instruction set of 8051. Apply the ascending and descending order program in
	8085.
Pre-requisites	To Acquire idea about microprocessor programming

				CO / F	PO / KL	. Mapp	ing									
(3/	/2/1 ind	icates t	he stre	ngth of	correla	tion, 3-	strong,	2-med	ium, 1-	weak)						
COs				KLs				Р	Os			KLs				
								PC	D 1					1		
CO 1					1			PC	D 2					2		
								PO	) 3					2		
								PC	D 4					3		
CO 2					5			PC	D 5					5		
								PC	06					1		
								PC	07					6		
CO 3					1			PC	08			4				
								PC	) 9					5		
									PO 10				1			
CO 4	CO 4		3					PC	) 11			2				
								PO	) 12					2		
CO 5			2					PO 13				3				
05			2					PO 14				5				
				<u> </u>		Ionning		PU	15					0		
(3/	/2/1 ind	icates t	he stre	ngth of	correla	tion, 3-	strong,	2-med	ium, 1-	weak)						
<u> </u>				Progra	mme C	Outcom	e (POs)	)								
COs	PO	РО	PO	PO	РО	PO	PO7	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1	
	1	2	3	4	5	6		8	9	0	1	2	3	4	5	
CO1	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO2	1	1	1	1	3	1	2	2	3	1	1	1	1	1	2	
CO3	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO4	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1	
CO5	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	

1. Course End Delivery

#### 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

Direct

Content of the Syllabus **EVOLUTION AND ARCHITECTURE OF** Periods 12 MICROPROCESSORS8085 Evolution of Microprocessors - INTEL 8085 microprocessor Pin configuration - Pins and their functions -Unit - I Bus system - Control and status signals - Externally initiated signals including interrupts - Architecture -ALU - Flags - Registers. Timing and Sequencing: Insertion cycle, Machine cycle -Halt state and Wait state. Interrupts: Types of interrupts - Hardware and Software interrupts-masking and unmasking interrupts. CROPROCESSORS 8085 INSTRUCTION SETS & PROGRAMMING Periods 12 Assembly language - Instruction sets of 8085 - Stacks - Counters - Subroutines - MACRO - Delay Unit - II Subroutine - Examples of Assembly language Programming - 8bit addition - 8bit subtraction - 16 bit Addition - 16 bit Subtraction - 16 bit Multiplication - 16 bit Division - The Largest and Smallest number in a data array - Sorting - Sum of a series - Factorial of a given number APPLICATIONS OF MICROPROCESSORS Periods 12 Address space - Partitioning - interfacing - Memory and I/O interfacing -I/O ports: Non programmable I/O port INTEL 8212 - Programmable Peripheral Interface (PPI) INTEL 8255 - Programmable Interval Unit - III (Counter) Timer (PIT) INTEL 8253. Data Transfers: Types of parallel and serial data transfer schemes -Direct Memory Access (DMA) controller INTEL 8257. 8085A interrupt system: Software & hardware interrupts - interfacing - Working and Programming of PIC 8259 with 8085. ARCHITECTURE OF MICROCONTROLLER 8051 12 Periods Introduction - Comparison between microcontroller and microprocessors - Architecture of 8051 - Key Unit - IV features of 8051- Memory organization Data memory and program memory - Internal RAM organization - Special function registers - Control registers - I/O ports - Counters and Timers - Interrupt structure. PROGRAMMING THE MICROCONTROLLER 8051 Periods 12 Instruction set of 8051 - Arithmetic, Logical, Data move jump and call instructions - Addressing modes Unit - V - Immediate, register, direct and indirect addressing modes - Assembly language programming - Simple programs to illustrate arithmetic and logical operations (Sum of numbers, biggest and smallest in an array, Ascending and descending order program in an array) - Software time delay Total Periods 60

Text Books	
1	Microprocessor Architecture, Programming and Applications with 8085, Ramesh S. Gaonkar, Penram
	International Publishing, (1997).
2	Fundamentals of Microprocessor and Microcomputers, B. Ram, V Edition, Dhanpat Rai Publications (P)
	Ltd. New Delhi, (2003).
References	
1	M.Gilmore, Microprocessor Principles and Application, TMH, 2nd edition, (1995).
2	Aditya P.Mathur, Introduction to Microprocessors, Tata McGraw Hill Company, III edition, (2006).
E-References	
1	https://onlinecourses.nptel.ac.in/noc18_ec03
2	https://www.elprocus.com/microprocessor-and-microcontroller/



EMPOWER		5 1 5 /	8							
Programme	M.Sc	Programme Code	PPH	<b>PPH</b> Regulations						
Department	Phy	sics	Sei	mester				3		
			Periods	Credit	Maximu	ım Mar	ks			
Course Code	Course Name per Week									
Course Code										
						ESE		100		
18P3PHED1	EDC : SOLA	K ENEKGY	4 0 0	4	25	/5		100		
COURSE	1 Energy reco	reas around us ? Threatonin	a to our opera		Uou to cor	a correction of	nor	<u></u>		
OBIECTIVE	1.Ellergy leso	arces around us.2. Threatenin	ig to our energ	y resources.5.		iseive e	nerş	зу.		
S		PROGRAMME OUTC	OME							
POs PO 1	Canable of der	nonstrating the basic concer	ts and compre	hensive knowl	edge from	undergr	adu	ate		
101	programme of	study	hs and comple	Inclusive Known	euge nom	unuergi	auu	ate		
PO 2	Ability to expr	ress thoughts and ideas effect	tively Commu	nicate with oth	ers using a	ppropri	ate	media.		
PO 3	To identify the	e relevant assumptions to for	mulate the arg	uments by foll	owing scien	ntific an	pro	ach to		
	knowledge dev	knowledge development.								
PO 4	Capacity to so	Capacity to solve different kinds of non-familiar problems and apply to real life situations								
PO 5	Ability to eval	Ability to evaluate the reliability and relevance of evidence, analyse and synthesize data from a variety of								
	sources.									
PO 6	To define prob	lems, formulate hypotheses,	, test hypothese	es, analyse, int	erpret and	draw co	nclu	usions from		
	data.									
PO 7	Ability to wor	k effectively and respectfully	y with diverse	teams, facilitat	e cooperati	ive or co	oord	linated effort		
	on the part of a	a group .								
PO 8	Ability to anal	yse, interpret and draw conc	lusions from q	uantitative/qua	alitative dat	ta and cr	ritic	ally evaluate		
	ideas, evidence	e and experiences from an op	pen-minded an	d reasoned per	spective.					
PO 9	Critical sensib	ility to lived experiences, wi	th self-awaren	ess and reflexi	vity of both	n self an	nd so	ociety		
PO 10	Capability to u	se ICT in a variety of learni	ng situations, c	lemonstrate ab	ility to acco	ess, eva	luat	e, and use a		
	variety of relev	vant information sources.								
PO 11	Ability to wor	k independently, identify app	propriate resou	rces required f	for a projec	t, and m	nana	ige a project		
	through to con	npletion.								
PO 12	Capability to e	effectively engage in a multion	cultural society	and interact r	espectfully	with di	vers	se groups		
PO 13	Capable of der	nonstrating the ability to ide	entify ethical is	sues related to	ones work	, avoid	une	thical		
	behaviour such	n as fabrication.			11			1		
PO 14	Capability for	mapping out the tasks of a to	eam or an orga	nization, and s	etting direc	ction, fo	ormu	ilating an		
	inspiring visio	n, building a team who can h	neip achieve th	e vision, motiv	ating and i	inspiring	g tea	am		
DO 15	members to en	igage with that vision.	aluding barrest	loom that an		for		ating in		
PO 15	Addition to acqu	tire knowledge and skills, in	cluding how to	earn, that are	necessary	for part	licip	bating in		
	learning activi	ties throughout life, through	self-paced and	i self-directed	iearning.					

COs	COURSE OUTCOME
CO 1	Acquire the knowledge of energy sources. Understand the concept of Geothermal and wind energy.
CO 2	Acquire the knowledge of renewable energy sources. Apply solar thermal energy in solar cooker and solar
	pond.
CO 3	To get the knowledge of photovoltaic effect and synthesis the solar cells.
CO 4	To get knowledge of bio mass energy .Understand the biomass conversion technology.
CO 5	To acquire the knowledge of energy storage mechanism and understand the storage devices.
Pre-requisites	GET KNOWLEDGE ABOUT various energy

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CO5

				Knov	wledge	e Lev	els									
1.Remembe	ring, 2	2.Und	erstai	nding	, <b>3.</b> Ap	plyin	g, 4.A	nalyz	ing, 5	.Evalu	ating,	6.Syn	thesiz	ing		
(2	/2/1 ind	iootoo t	ha atra	CO/F	PO / KL	. Mapp	ing	2 mad	lium 1	wools)						
	/ 2/ 1 1110	icates t	ne strei		correla	.001, 5-	strong	, 2-med	$\frac{1000}{100}$	weak)						
COS				KLS					$\frac{0}{2}$				NLS	1		
CO 1					1			P(	$\frac{31}{2}$					2		
001					1			P	) <u>2</u> ) 3					2		
								PO	D 4					3		
CO 2					3			PO	D 5					5		
								PO	D 6					1		
								PO 7					6			
CO 3			6					PO 8				4				
									<u>) 9</u>					5		
CO 4			2					PO 11					2			
04			2					PC	) 12			2				
								PC	) 13					3		
CO 5					2			PO 14				3				
								PC	0 15					6		
				CO	/ PO M	lapping	5									
(3.	/2/1 ind	icates t	he stre	ngth of	correla	tion, 3-	-strong	, 2-med	lium, 1-	weak)						
COs				Progra	imme C	Outcom	e (POs	)	1	1	1					
	PO 1	PO	PO	PO	PO	PO	PO7	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1	
CO1	1	2	2 2	4	<u> </u>	0	1	<u> </u>	9	3	1	2	<u> </u>	4	<u> </u>	
	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1	
C02	1	1	1	1	2	1	1	1	2	1	1	1	1	1	3	
C03	1	1	1	1	ے 1	1	1	1		1		1	1	1	3	
CO4	2	3	3	3 2 1 2 1 2 1 1 1 2 3 3 2 2 1 1							1					

### 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

Direct

1. Course End Delivery

Content of the	Syllabus								
	Introduction to Energy Sources	Periods	9						
Unit - I	Classification of Energy sources - Worlds reserve of commercial energy	gy sources and th	eir availability -						
	Geothermal energy - wind energy - Ocean thermal energy conversion	n - Energy from	waves and tides						
	(basicideas) - Merits and Demerits.								
	Solar Thermal Energy	Periods	9						
Unit II	Renewable energy sources - Solar energy - Solar water heater - Solar space heating and cooling - Solar								
Unit - II	thermal technologies - Solar cooker - Solar Pond - Merits and Demerits of solar energy								
	Solar Cell	Periods	9						
Unit III	Photo voltaic effect - Performance of solar cell - Choice of materials for solar cell - Basic requirements for								
Onit - III	obtaining an effective solar cell - Power generation by using solar cell.								
	Biomass Energy Fundamentals	Periods	9						
Unit IV	Biomass energy - Classification - Photosynthesis - Biomass conversion technology - Advantages and								
Unit - I v	Disadvantages of biomass energy.								
	Energy Storge	Periods	9						
Unit - V	Introduction - Liquid media storage - Solid media storage - Ground colle	ector - Chemical s	storage.						
	Total Periods		45						

Text Books	
1	G.D. Rai, Non Conventional Energy Sources, 4th, 5th Edition, (2011).
2	G.D. Rai, Solar Energy Utilization, 5th Edition, (2011).
3	S.P. Sukhatme, Solar Energy, Tata McGraw Hill Publishing Company, 3rd Edition, (2005).
References	
1	1. D.S. Chauhan, S.K. Srivastava, Non Conventional Energy Sources, Ed.V, first edition, (2004).
2	2. Solar Energy, Fundamentals, Design, Modelling and Applications, G.N.Tiwari, Narosa Publications,
	(2004).
E-References	
1	https://www.renewableenergyworld.com/solar-energy/tech.html
2	https://en.wikipedia.org/wiki/Solar_power

Signature of BOS Chairman



EMPOWE		1	-						
Programme	M.Sc	Programme Code	P	PH		Regulat	ions	20	18-2019
Department	Phys	sics		Sen	nester				4
			Periods	5	Credit	Maxim	um Mar	ks	
Course Code	Course	Name	per We	ek					
	Course		рег не	D	C	CA	ECE		Total
				r O	5	25 CA	E3E		100
18P4PH10	NUCLEAR A	NUCLEAR AND PARTICLE PHYSICS 6 0 0 5 25 75 100							100
COURSE	1.Explain cent	al concepts, laws and model	s in nucle	ar an	d particle phys	sics.2.Use	basic la	iws a	nd relations
OBJECTIVE	to solve simple	problems			1 10				
S									
POs		PROGRAMME OUTCO	OME						
PO 1	Capable of den	nonstrating the basic concept	ts and con	preł	nensive knowle	edge from	undergi	radua	te
	programme of	study.							
PO 2	Ability to expr	ess thoughts and ideas effect	ively Con	nmur	nicate with oth	ers using a	ippropri	iate m	nedia and
	interpret the id	ea in clearandconcise manne	er.						
PO 3	To identify the	To identify the relevant assumptions to formulate the arguments by following scientific approach to							
	knowledge dev	knowledge development.							
PO 4	Capacity to sol	Capacity to solve different kinds of non-familiar problems and apply to real life situations.							
PO 5	Ability to evalu	ate the reliability and relevation	ance of evi	denc	e, analyses an	d synthesi	ze data	from	a variety of
	sources then dr	aw valid conclusions							
PO 6	To define prob	lems,formulate hypotheses,	test hypotl	ieses	s,analyse, inter	pret and d	raw con	ıclusi	ons from
	data, predict ca	use-and-effect relationships							1 00
PO 7	Ability to work	c effectively and respectfully	with dive	rse t	eams,facilitate	cooperati	ve or co	ordir	nated effort
	on the part of a	group						<u> </u>	
PO 8	Ability to analy	yse, interpret and draw concl	usions fro	m qı	iantitative/qua	litative dat	ta and c	ritica	lly evaluate
	ideas, evidence	and experiences from an op	ben-minde	d and	d reasoned per	spective.	10	1	• .
PO 9	Critical sensibi	lity to lived experiences, with	th self awa	rene	ss and reflexiv	vity of both	1 self an	1d soc	ciety.
PO 10	Capability to u	se ICT in a variety of learning	ig situatio	ns, a	emonstrate ab	lifty to acc	ess, eva	iluate	e, and use a
DO 11	A bility to work	ant information sources and	use appro	pria	e sonware for	analysis o	I data.		na a municat
POTI	through to com	unlation	oropriate re	esour	ces required i	or a projec	i, and n	nanag	ge a project
PO 12	Capability to e	ipietion. ffectively engage in a multic	ultural so	viotv	and interact re	epectfully	with di	ivored	aroune
PO 13	Capable of den	constrating the ability to ide	ntify ethic	alico	ues related to	ones work	avoid	uneth	vical
1015	behaviour as fa	brication	intry curic	ai 155	sues related to	Unes work	, avoiu	uncu	lical
PO 14	Canability for	manning out the tasks of a te	am or an	roar	nization and s	etting dire	ction fo	ormul	ating an
1014	inspiring vision	1	un or an	n gai	inzation, and s	cung und		<i>i</i> mul	anns an
PO 15	Ability to acou	ire knowledge and skills ind	cluding ho	w to	learn, that are	necessarv	for par	ticing	nting in
1015	learning activit	ies throughout life		., 10	ieurii, iiui uro	y	Tor bar	aerpu	
		ies anoughout me.							

COs	COURSE OUTCOME
CO 1	To acquire the knowledge of nuclear models. Analyze the collective models bhor and Mottelson.
CO 2	Understand the nuclear reaction and nuclear mechanism and analyze the partial wave of nuclear reaction.
CO 3	To acquire knowledge of nature of nuclear forces. Understand the np scattering .Evaluate Yukawa potential.
CO 4	Understand the Gamows theory of alpha decay. Analyze the comparative half-lives.
CO 5	Acquire the knowledge of elementary particles and understand the weak and strong interactions.
Pre-requisites	To Acquire idea about nuclear and particle physics

				CO / F	PO / KL	. Mapp	ing									
(3/	/2/1 ind	icates t	he stre	ngth of	correla	tion, 3-	strong,	2-med	ium, 1-	weak)						
COs				KLs				Р	Os			KLs				
								PC	D 1					1		
CO 1					1			PC	D 2					2		
								PO	D 3					2		
								PO	D 4					3		
CO 2			2					PO	05					5		
								PO	06					1		
								PO	D 7					6		
CO 3			1					PO	08					4		
							PO 9						5			
			-					PO 10					1			
CO 4					5			PO II					2			
								PO 12 PO 12					2			
<b>CO F</b>			4					PO 13					3			
CO 5								PO 14					3			
				00		PO 15						6				
(3)	/2/1 ind	icates t	he stre	19th of	correla	tion. 3-	strong.	2-med	ium. 1-	weak)						
				Progra	mme C	Jutcom	e (POs)	)	,	,						
COs	PO	PO	PO	PO	PO	PO	PO7	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1	
	1	2	3	4	5	6	107	8	9	0	1	2	3	4	5	
CO1	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO2	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO3	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO4	1	1	1	1	3	1	2	2	3	1	1	1	1	1	2	
CO5	1	1	1	2	2	1	1	3	2	1	1	1	2	2	1	

Direct

#### 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

1. Course End Delivery

Content of the	Syllabus											
	NUCLEAR MODELS	Periods	12									
	Basic nuclear properties: Size, shape and charge distribution-spin and parity-determination of											
Unit - I	nuclear mass-binding energy-semi emprical mass formula-nuclear stability-Liquid drop model-											
	Shell Model-Prediction of Magic numbers and energy levels by shell model-Optical Model -											
	Collective model of Bohrand Mottelson.											
	NUCLEAR REACTIONS	Periods	12									
	Nucler reactions and reaction mechanism, Types of reactions and co	onservation laws	- Energetics of									
Unit - II	nuclear reactions-Q-value equation-Scattering and reaction cross sections- Compound nucleus reactions-											
	Direct reactions Stripping, Pick up reactions-Partial Wave analysis of nuclear reaction cross-section-											
	Breit-Wignerone level formula- continuum theory of nuclear reaction.											
	NUCLEAR INTERACTIONS	Periods	12									
	Nature of Nuclear forces-Exchange forces-Two body problem-groun	d state of deuter	on- Magnetic									
Unit - III	moment-Quardrapole moment-Tensor forces-Nucleon-nucleon interaction-NP scattering, PP scattering											
cint m	at low energy, non- central-Meson theory of nuclear forces -Yukawa potential-Nucleon-Nucleon											
	scattering- form of nucleon-Nucleon potential-Effective range theory-Spin dependence of nuclear											
	forces-Chargeindependence and charge symmetry of nuclear forces - Isospin formalism.											
	NUCLEAR DECAY	Periods	12									
	Gamows theory of alpha decay &Fermis theory of beta dacay -Tot	al decay rate-Ma	iss of the									
Unit - IV	neutrino-Angular momentum and parity selection rules-Allowed and forbidden decays -											
	Comparativehalf-lives-Neutrino physics Neutrino Hypothesis-Helicity-N	Non-conservation	of parity-									
	Multipole transitions in nuclei-Angular momentum and parity selection rules-Internal conversion-											
	ELEMENTARY PARTICLE PHYSICS	Periods	12									
<b>TT 1</b> , <b>TT</b>	Types of interaction between elementary particles -Hadrons-lepton Symmetrics and conservation laws Elementary ideas of CP and C	s-mesons-Baryon	s-hyperons-pions-									
Unit - V	formula-SU(2) and SU(3) multiplets-Gell-Mann-Okubo mass formula formula	or octet and decur	blet-Quark model-									
	color flavor- weak and strong interactions- Basic concepts of relative kin	nematics.										
	Total Periods		60									

Text Books	
1	D. Griffiths, Introduction to Elementary Particle Physics, Harper & Row, New York, (2006).
2	R. R. Roy and B.P. Nigam, Nuclear Physics, New age Intl. New Delhi, (2005).
References	
1	H. A. Enge, Introduction to Nuclear Physics, Addison-Wesley, Tokyo, (2006).
2	Y. R. Waghmare, Introductory Nuclear, Physics, Oxford-IBH, New Delhi, (2006).
E-References	
1	https://onlinecourses.nptel.ac.in/noc18_ph02/course
2	https://en.wikipedia.org/wiki/Particle_physics





Empower			0											
Programme	M.Sc	Programme Code		PPH		Regulat	ions	2	018-2019					
Department	Phys	sics		Ser	nester				4					
			Perio	ds	Credit	Maximum Marks								
Course Code	Course	Name	ner Week											
			I	тр	С	CA	ESE		Total					
	COMMUNIC	ATION SYSTEMS	6		5	25	75		100					
18P4PH11	COMMUNICIAL		0	0 0	5	23	15		100					
COURSE	1. The working	principles of communicatio	n system	s.2.Ho	ow to handle th	ne commur	nication	ele	ments.					
OBJECTIVE		principles of communication	n system				neution							
S POs	PROGRAMME OUTCOME													
PO 1	Capable of der	Capable of demonstrating the basic concepts and comprehensive knowledge from undergraduate												
	programme of	programme of study.												
PO 2	Ability to expr	ess thoughts and ideas effect	tively Co	ommui	nicate with oth	ers using a	ppropri	ate	media .					
PO 3	To identify the	To identify the relevant assumptions to formulate the arguments by following scientific approach to												
	knowledge development.													
PO 4	Capacity to solve different kinds of non-familiar problems and apply to real life situations													
PO 5	Ability to eval	uate the reliability and releva	ance of e	viden	ce , analyses a	nd synthesi	ize data	fro	m a variety of					
	sources .													
PO 6	To define prob	lems, formulate hypotheses,	test hyp	othese	s, analyses, in	terpret and	draw c	onc	lusions from					
	data.													
PO 7	Ability to worl	c effectively and respectfully	with di	verse t	eams, facilitat	e cooperati	ive or co	oor	linated effort					
	on the part of a	a group.												
PO 8	Ability to analyses, interpret and draw conclusions from quantitative/qualitative data and critically evaluate													
	ideas, evidence	e and experiences from an op	pen-mino	ded an	d reasoned per	spective.								
PO 9	Critical sensib	ility to lived experiences, wi	th self-a	warene	ess and reflexi	vity of both	n self ar	$\frac{1d s}{d}$	ociety					
PO 10	Capability to u	se ICT in a variety of learning	ng situat	ions, d	emonstrate ab	ility to acc	ess, eva	luat	te, and use a					
DO 11	variety of relev	vant information sources.	• ,		. 10	•	. 1		· ,					
POTI	Ability to work	a independently, identify app	propriate	resou	rces required f	or a projec	t, and n	nana	age a project					
DO 12	through to com	npletion.	14											
PO 12 PO 12	Capability to e	mention the shility to ide	ntify oth	society	and interact re	espectfully	with di	iver	se groups					
PO 15	behaviour such	nonstrating the addition to file	ntify eth	10al 188	sues related to	ones work	, avoid	une	unical					
PO 14	Canability for	mapping out the tasks of a te	am or a	n orga	nization and s	atting dire	ntion fo	rm	ulating an					
1014	inspiring visio	n building a team who can h	eln achi	eve th	nization, and s	etting uned	nspirin	л III а te	anathing an					
	members to en	oage with that vision	icip acili		· •131011, 1110U1	anng and I	пэрпп	510	u111					
PO 15	Ability to acqu	ire knowledge and skills in	cluding l	now to	learn, that are	necessarv	for par	ticir	pating in					
	learning activit	ties throughout life, through	self-pac	ed and	self-directed l	earning.	-or put	1						
			1			0,								

COs	COURSE OUTCOME
CO 1	Understand the frequency modulation and apply modulation system in BPSK and QPSK
CO 2	Acquire the knowledge of single mode and multi-mode communication. Understand splicing and
	connectors.
CO 3	Analyze the reflex klystron and applying microwave system.
CO 4	Apply satellite communication system in RADAR.
CO 5	Apply mobile communication in digital cellular radios.
Pre-requisites	GET KNOWLEDGE ABOUT Communication Systems

(2)	0/1 : 1		1.	CO/F	PO / KI	. Mapp	ing		• 1	1 \						
(3	/2/1 1nd	licates t	the stre	KI s	correla	tion, 3-	-strong,	, 2-med	$\frac{1000}{1000}$	weak)			KIS			
005									<u>- 1</u>			1	IXL5	1		
CO 1			2					P						1		
COT					2			PO	<u>)</u> 2					2		
								PC	) 3					2		
	CO 2							PC	)4					3		
CO 2			1					PC	05					5		
								PO	)6					1		
								PC	)7					6		
CO 3			4					PO 8						4		
								PO 9						5		
								PC	0 10					1		
CO 4			3					PC	) 11					2		
								PC	) 12					2		
			3					PO 13					3			
CO 5								PO 14					3			
								PO 15					6			
			1	CO	/ PO M	lapping	5									
(3	/2/1 ind	licates t	the stre	ngth of	correla	tion, 3-	-strong,	, 2-med	ium, 1-	weak)						
				Progra	mme (	Outcom	e (POs)	)								
COs	PO	PO	PO	PO	PO	PO	PO7	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1	
	1	2	3	4	5	6		8	9	0	1	2	3	4	5	
CO1	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO2	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO3	1	1	1	2	2	1	1	3	2	1	1	1	2	2	1	
CO4	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1	
CO5	1	2	2	3	1	1	1	2	1	1	2	2	3	3	1	

Course Assessment Methods	
Direct	

### 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

1. Course End Delivery

Content of the S	Syllabus											
	MODULATION SYSTEMS	Periods	12									
	Theory of Amplitude modulation - Theory of frequency modulation-Theory of phase modulation-pulse											
Ilmit I	code modulation-pulse width modulation-Sampling theorem-low pass and band pass signals, PAM,											
Unit - I	Channel BW for a PAM signal, Natural Sampling, Flat top Sampling, Signal recovery through holding,											
	Quantization of signals, Differential PCM delta modulation-Delta modulation-Adaptive Delta modulation-											
	BPSK, QPSK.											
	FIBER OPTICS COMMUNICATION	Periods	12									
	Basics of Fiber Optics-Classification-Single mode and multimode, Step index and Graded index.											
Unit - II	Acceptance angle, Numerical Aperture, Fiber Losses-Attenuation, Absorption, Leaky modes, Bending											
	losses, Transmission losses, and Core and cladding losses. Chromatic and modal dispersion. Splicing											
	andconnectors.											
	MICROWAVE COMMUNICATION SYSTEM	Periods	12									
	Microwave Generation - Multicavity Klystron - Reflex Klystron - Magnetron - Travelling Wave Tubes											
Unit - III	(TWT) - Propagation modes, Microwave communication system. Analog Microwave Communication-											
	LOS microwave system-OTH microwave system-Digital Hierarchies, Digital Microwave Systems,											
	Bandwidth efficiency											
	SATELLITE COMMUNICATIONS	Periods	12									
	Orbital Satellites, Geostationary Satellites, Orbital Patterns, Look angles, Orbital Classifications,											
Unit - IV	Spacing and frequency allocation, Radiation Pattern, foot prints, satell	lite system link m	odels, satellite									
	system link equation. Non-ideal system parameters. INSAT com	nunications satel	lites. Multiple									
	Accessing FrequencyHopping, Channel Capacity. RADAR		1									
	MOBILE COMMUNICATION	Periods	12									
Unit - V	Evaluation and fundamentals-cellular structure and planning-frequency	allocations- propa	gation									
	problems-Base station antennas and mobile antennas-type of mobile	e system- access	method -									
	TDMA, FDMA and CDMA- DIGITAL Cellular Radio.											
	Total Periods		60									

Text Books	
1	1. Electronic Communication Systems –George Kennedy& Davis, Tata McGraw Hill, 4th Edition,
	(2006).
2	2. John M. Senior, Optical Fiber Communications, Second Edition, PHI, 6th Edition, (2009).
3	Wireless Communication Principles & Practice – Theodore S. Rappaport, 2nd Edition, (2002).
References	
1	Taub and Schiling, Principles of Communication Systems, Second edition, Tata Mc Graw Hill, 3rd
	Edition,
	(2010).
2	Simon Haykin, Communication system, Third edition John Wiley & Sons, Inc. 4th Edition, (2007).
3	Wayne, Electronic Communication Systems, 6th Edition, (2004).
E-References	
1	https://en.wikibooks.org/wiki/Communication_Systems
2	https://www.elprocus.com/what-is-a-communication-system-and-its-basic-elements/

Signature of BOS Chairman

SUSANDONAL INSTITUTION	VIVEKAN	OR	ISO 9001:2008											
		WOMEN (A Elavampalavam, 1	UTON Firuchei	OMO	DU 63	JS) 7 205.			CERTIFIED www.tuv.com iD 9105078407					
Programme	M.Sc	Programme Code		PPH			Regula	tions	2018-2019					
Department	Phy	sics		Se	em	nester			4					
			Per	riods	um Mar	ks								
Course Code	Course	e Name	per	Week										
			L	T	Р	С	CA	ESE	Total					
18P4PHE03	THIN FILM T	TECHNOLOGY	4	0	0	4	25	75	100					
COURSE	To examine th	e electrical properties in m	etallic t	nin film	ıs.	To explore the	ne transpor	t proper	ties of semi					
OBJECTIVE	conducting and insulating film. To know how the optical properties of thin film is utilized in solar													
S	cell applications.													
POs	PROGRAMME OUTCOME													
PO 1	Capable of demonstrating the basic concepts and comprehensive knowledge from undergraduate programme of study													
PO 2	Ability to express thoughts and ideas effectively Communicate with others using appropriate media and interpret the idea in clear and concise manner.													
PO 3	To identify the relevant assumptions to formulate the arguments by following scientific approach to													
	knowledge development													
PO 4	Capacity to solve different kinds of non-familiar problems and apply to real life situations													
PO 5	Ability to evaluate the reliability and relevance of evidence, analyse and synthesise data from a variety of													
	sources then draw valid conclusions and support them with evidence and examples, and addressing													
	opposing view	points.							<u> </u>					
PO 6	To define prot	olems, formulate hypothese	es, test h	ypothes	ses	s, analyse, int	erpret and	draw co	nclusions					
	from data, pre	dict cause and effect relation	onships a	and abil	lit	y to plan, exe	cute and re	eport the	e results of an					
PO 7	Ability to wor	k affectively and respectful	lly with	divorso	te	ame facilitat	e cooperat	ive or co	oordinated					
FO /	effort on the n	art of a group and act toget	ity with ther as a	group (	or	a team in the	interests c	of a com	mon cause and					
	workefficient	v as a member of a team	inci as a	group	JI.		interests (		mon cause and					
PO 8	Ability to anal	lyse interpret and draw cor	nclusion	s from a	an	antitative/qua	litative da	ta and c	ritically evaluate					
100	ideas, evidenc	e and experiences from an	open-m	inded a	nd	l reasoned per	spective	itu unu e	including e variance					
PO 9	Critical sensib	bility to lived experiences, v	with self	awaren	nes	ss and reflexi	vity of bot	h self an	d society					
PO 10	Capability to u	use ICT in a variety of lear	ning situ	ations,	de	emonstrate ab	ility to acc	ess, eva	luate, and use a					
	variety of rele	vant information sources a	nd use a	ppropria	at	e software for	analysis o	of data.						
PO 11	Ability to wor	k independently, identify a	ppropria	te resou	ur	ces required f	for a projec	ct, and n	nanage a project					
	through to con	npletion.												
PO 12	Capability to e	effectively engage in a mul	ticultura	l societ	y	and interact r	espectfully	with di	verse groups.					
PO 13	Capable of der	monstrating the ability to id	dentify e	thical is	SS	ues related to	ones work	k, avoid	unethical					
	behavior such	as fabrication, falsification	n or misr	epresen	ita	tion of data o	r committ	ing plag	iarism,					
	notadhering to	intellectual property right	S											
PO 14	Capability for	mapping out the tasks of a	team or	an orga	an	ization, and s	etting dire	ction, fo	ormulating an					
	inspiring visio	n, building a team who car	n help ac	nieve tl	he	vision, motiv	ating and	inspirin	g team					
DO 15	members to en	igage with that vision.	in also 1	a h '	~	loom that a		for the	ti ainatin a in					
PO 15	Additive to acqu	uire knowledge and skills, i	includin	g now t	0. 4	learn, that are	e necessary	ior part	ucipating in					
	learning activi	meeting economic cocicl	gn seif-p	aced an	a	self-directed	learning ai	med at j	personal					
	uevelopment,	meeting economic, social.												

COs	COURSE OUTCOME
CO 1	Acquire the knowledge of preparation of thin film. Understand the construction and uses of vapour sources
CO 2	Apply the deposition monitoring and control in micro balance.
CO 3	Analyse electrical conduction in thin metallic films.
CO 4	Understand DC conduction mechanism and analyze structure and optical properties of UV
	Spectrophotometer.
CO 5	Synthesis thin films for Solar cell application
Pre-requisites	To get knowledge

				CO/F	PO / KI	. Mapp	ing									
(3	/2/1 ind	licates t	the stree	ngth of	correla	tion, 3-	strong,	, 2-med	ium, 1-	weak)						
COs				KLs				POs					KLs			
								PO	D 1					1		
CO 1					1			PO	D 2					2		
								PO	) 3					2		
								PO	D 4					3		
CO 2			3					PO	D 5					5		
								PO	06					1		
								PO	D 7					6		
CO 3		4					PO 8						1			
<u> </u>								PO 9						1		
								PO 10					1			
CO 4			2					PC	) 11					1		
									) 12					1		
								PO 13						1		
CO 5			6					PO 14					1			
								PO 15					1			
(3	/2/1 ind	licates 1	the stre	CO ngth of	/ PO M correla	lapping tion, 3-	strong.	2-med	ium, 1-	weak)						
				Progra	ımme (	Dutcom	e (POs)	)		,						
COs	PO	PO	PO	PO	PO	PO	PO7	PO	PO	PO1	PO1	PO1	PO1	PO1	PO1	
	1	2	3	4	5	6	10,	8	9	0	1	2	3	4	5	
CO1	3	2	2	1	1	3	1	3	3	3	3	3	3	3	3	
CO2	1	2	2	3	1	1	1	1	1	1	1	1	1	1	1	
CO3	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	
CO4	2	3	3	2	1	2	1	2	2	2	2	2	2	2	2	
CO5	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	

### 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect
1. Course End Delivery

Direct

Content of the	Syllabus			
Unit - I	Preparation of Thin Films	Periods	12	
	Study of thin film vacuum coating unit-Construction and uses of	vapour sources-w	ire, sublimation,	
	crucible and electron bombardment heated sources. Physical vapour deposition- Thermal evaporation-			
	electron beam evaporation-Sputtering-Study of glow Discharge- Experimental set up for DC and RF			
	magnetron sputtering, Pulsed laser deposition and Ion beam assisted deposition. Chemical vapour			
	deposition-CVD, MOCVD and PECVD processes. Chemical methods: Qualitative study of preparation of			
	thin films by Electroplating, vapour phase growth and anodization-Nucleation and growth of thin films -			
	four stages of film growth.			
	Deposition Monitoring and Control	Periods	8	
Unit - II	Micro balance, Crystal oscillator thickness monitor, optical monitor, Resistance Monitor. Thickness			
	measurement: Multiple Beam Interferometer, FizeauTolansky technique-Fringes of equal chromatic			
	order FECO method-Ellipsometry qualitative only.			
Unit - III	Electrical properties	Periods	8	
	Sheet resistance-size effect-Electrical conduction in thin metallic films- Calculation of mobility- Effect of			
	ageing and annealing - Oxidation - Agglomeration			
	Dielectric Properties	Periods	11	
Unit - IV	DC conduction mechanism-Low field and high field conduction. Breakdown mechanism in			
	dielectric films-AC conduction mechanism. Temperature dependence of conductivity.Structure and			
	Optical Properties: Study of structure of thin films using x-ray diffraction method-Calculation of			
	particlesize-Optical constants of thin films - UV spectrophotometer- Transmittance, absorption,			
	determination ofband gap			
Unit - V	Application of Thin Films	Periods	9	
	Thin film resistors: Materials and Design of thin film resistors Choice of resistor and shape and			
	area-Trimming of thin film resistors-sheet resistance control - Individual resistor trimming. Thin film			
	capacitors: Materials-Capacitor structures-Capacitor yield and capacitor stability. Thin film field effect			
	transistors: Fabrication and characteristics-Thin film solar cells - anti reflection coatings			
	Total Periods		48	

Text Books		
1	Hand book of Thin films Technology: L I Maissel and R Clang, New York: McGraw-Hill, 1970.	
2	Thin film Phenomena: K.L. Chopra, NewYork: Mc Graw-Hill, 1969.	
3	Thin films processes – J.L.Vilsan,1993.	
References		
1	Physics of thin films, Vol. 12, First Edition Georg Hass Maurice H. Francombe John L. Vossen.	
2	Thin films solar cells –K.L. Chopra and S. R. Das, 1983.	
3	Vacuum deposition of thin films – L.Holland , 1956.	
E-References		
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