VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN

(Autonomous)

ELAYAMPALAYAM, TIRUCHENGODE (Tk.), NAMAKKAL (Dt.) An ISO 9001: 2015 Certified Institution

(Affiliated to Periyar University, Approved by AICTE & Re-accredited with 'A' Grade by NAAC) (Recognized under section 2(f) and 12(B) Under Act 1956)



PG AND RESEARCH DEPARTMENT OF PHYSICS

M.Sc., **Physics**

OBE Syllabus

(2022-2023) (Revised)

VIVEKANANDHA EDUCATIONAL INSTITUTIONS Angammal Educational Trust Elayampalayam, Tiruchengode (Tk.), Namakkal (DT).

About the College

Vivekananda College of Arts and Sciences for Women (Autonomous) was established and hailed into Women's Educational Service in the Year 1995. Angammal Educational Trust Chaired by the great Educationalist 'VidhyaRathna Prof.Dr. Μ. KARUNANITHI. B.Pharm. M.S., Ph.D., D.Litt. sponsors this college and other institutions under the name of the great Saint Vivekanandha. Our institutions are situated on either side of Tiruchengode Namakkal Main Road at Elayampalayam, 6 kms away from Tiruchengode. This is biggest women's college in India with more than 7500 girl students and more than 18 departments. The strength of the college was just 65 at the time of its establishment. With the dedication, work, sacrifice and long vision of the chairman, this institution has grown into a Himalaya stage. As a result of which UGC, New Delhi, awarded 2f and 12b, extended Autonomous status for second cycle. The National Assessment and Accreditation Council reaccredited with grade 'A' for its successful performance.

As an Autonomous Institution, academic professionals of the college fram Curriculum and Syllabi in consultation with all its stakeholders to cater the needs the young women to fulfill the women empowerment and present Industrial needs the local benefits. The students are empowering with confidence and required sk to face the society.

Quality Policy

To provide professional training by establishing a high level center of learning that provides quality education at par with the international standards and Provide excellence education with well equipped infrastructure to all the rural women.

Our Vision

To be an academic institution exclusively for women, in dynamic equilibrium with the social and economic environment, strive continuously for excellence in education, research and technological service to the nation.

Our Mission

Themission of our institution is to discover, teach and apply knowledge for the intellectual, cultural, ethical, social and economic growth of women students.

M.Sc. (Physics)

SCOPE OF THE COURSE

M.Sc. (Physics), the recent developments in Physical sciences, has been included in the enriched syllabus to meet out the present day needs of academic and research, institutions and industries. The program expects serious commitment of the student to take-up challenging students' schedules and assignments. The course involves a blend of theoretical education and practical training which run concurrently for a period of two years and equips a student with knowledge, ability, skills and other qualities required for a professional accountant.

The uniqueness of the program is its content and topic coverage, the teaching methodology and the faculty. The syllabus has been designed at a level equal to that of professional courses. The teaching methodologies include classroom lectures, industrial visits, orientation, internship, case study and research work. Focus is also on developing soft skills of the students. For Core subjects, Outsource Guest Lectures by Industrialists and Professional Men will be arranged to enable the students to get wider exposure.

SALIENT FEATURES

- ✓ Course is specially designed for a higher level Career Placement.
- ✓ Special Guest lecturers from Industrialists will be arranged.
- ✓ Exclusively caters to students interested in pursuing higher studies.
- ✓ Special Industry Orientations and Training are parts of the Degree Course.
- ✓ Project work is included in the syllabus to enhance conceptual, analytical & deductive skills.

OBJECTIVES OF THE COURSE

- ✓ The new syllabus throws light on the recent and emerging areas of Physics
- ✓ Enable the students understand Physics and make them more relevant to the society.
- Develop the analytical ability in students so that they are become objective solving problems.
- \checkmark Help the students learn practical skills in a better way.
- ✓ Inculcate research aptitude in students.
- ✓ Enable the students to go to higher levels of learning Physics.
- ✓ Improve the employability of the students.
- ✓ To inspire the students to apply their knowledge gained for the development of society in general.

ELIGIBILITY FORADMISSION

Candidates seeking admission to the first year Degree course (M.Sc Physics) shall be required to have passed an Under Graduate degree, i.e. B.Sc (Physics or Applied Sciences) of the Periyar University or an examination of som other University accepted by the syndicate as equivalent there to shall b permitted to be eligible.

DURATION OF THE COURSE

- ✓ The course shall extend over a period of two academic years consisting of four semesters. Each academic year will be divided into two semesters. The First semester will consist of the period from July to November and the Second semester from December to March.
- ✓ The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women with the approval of Periyar University.
- ✓ Each subject will have five hours of lecture per week apart from practical training at the end of each semester.

CONTINUOUS INTERNAL ASSESSMENT

The performance of the students will be assessed

continuously and the Internal Assessment Marks will be asunder:

1. Average of two Tests	- 10 Marks
2. Seminar	- 5 Marks
3. Assignment	- 5 Marks
4. Attendance	- 5 Marks
Total	= 25 Marks
	1 · · · · · · · · · · · · · · · · · · ·

The distribution of attendance marks is given as follows,

76-80 %	- 1 Mark
81-85 %	- 2 Marks
86-90 %	- 3 Marks
91-95 %	- 4 Marks
96-100 %	- 5 Marks

QUESTION PAPER PATTERN:

Question Paper Pattern for the Examinations

Time: 3 Hours, Maximum Marks: 75 Part - A Answer all the questions (Objective Type) ($20 \ge 1 = 20$ Marks) Part - B Answer all the following questions (Either or Type) ($5 \ge 5 = 25$ Marks) Part - C Answer any three questions ($3 \ge 10 = 30$ Marks)

PASSING MINIMUM

In the University Examinations, the passing minimum shall be 40 % out of 75 Marks for theory (38 marks) and 40% out of 60 marks for practical (24 Marks).

ELIGIBILITY FOR EXAMINATION

A candidate will be permitted to appear for the University Examination only on earning 75 % of attendance and only when her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

CLASSIFICATION OF SUCCESSFULCANDIDATES

Successful candidates passing the examination of Core Courses (main and allied subjects) and securing marks

- a) 75 % and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
- b) 60% and above but below 75 % shall be declared to have passed the examinations in first class without Distinction.
- c) 50% and above but below 60% shall be declared to have passed the examinations in second class.
- d) All the remaining successful candidates shall be declared to have passed the examinations in third class.
- e) Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of three consecutive academic years from the year of admission only will be eligible for University rank.

COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2022 - 2023 (i.e for the students who are to be admitted to the first year of the course during the academic year 2022 - 2023 and thereafter.

SCHEME OF CURRICULUM – M.Sc., PHYSICS

(For the candidates admitted during the academic year 2022 – 2023 onwards)

SEMESTER - I								
Subject Code	Course	Subject Title	Hrs	Credit	Exam	Int. mark	Ext. mar	Total Mark
22P1PH01	Core – I	Classical and Statistical Mechanics	6	4	3	25	75	100
22P1PH02	Core – II	Mathematical Physics	6	4	3	25	75	100
22P1PH03	Core – III	Advanced Electronics	6	4	3	25	75	100
22P1PHE01	Elective	Elective – I: Nano science	4	4	3	25	75	100
22P1PHP01	Practical	Practical – I: Advanced Electronics Experiments	8	4	4	40	60	100
	Total	l	30	20	16	140	360	500
		SEMESTE	R - II					
22P2PH04	Core - IV	Electromagnetic Theory and Plasma Physics	6	5	3	25	75	100
22P2PH05	Core - V	Quantum Mechanics - I	6	5	3	25	75	100
22P2PH06	Core - VI	Spectroscopy: Principles and Techniques	6	4	3	25	75	100
22P2PHE07	Elective	Elective – II: Medical Physics	4	4	3	25	75	100
22P2PHP02	Practical - II	Practical - II: Advanced Physics Experiments - I	8	4	4	40	60	100
22P2PHIN	Internship	Compulsory Internship Programme (15 days) Relative to Curriculum	-	-	-	-	-	-
	Total		30	22	16	140	360	500

		SEMESTE	R - III					
22P3PH07	Core - VII	Condensed Matter Physics	6	4	3	25	75	100
22P3PH08	Core - VIII	Quantum Mechanics - II	6	4	3	25	75	100
22P3PH09	Core - IX	Microprocessor and Microcontroller	4	4	3	25	75	100
21P3CHED01	EDC	Applied Polymer Chemistry	4	4	3	25	75	100
22P3PHP03	Core Practical - III	Practical - III: Microprocessor Experiments	8	4	4	40	60	100
22P3HR01	Common subject	Human Rights	2	2	3	25	75	100
	Tota	1	30	22	19	165	435	600
		SEMESTE	R - IV					
22P4PH10	Core – X	Nuclear and Particle Physics	5	5	3	25	75	100
22P4PH11	Core - X	I Communication Electronics	5	5	3	25	75	100
22P4PHE03	Elective -	III Thin Film Technology	4	4	3	25	75	100
22P4PHP04	Core Practica	l Practical - IV: Advanced Physics Experiments - II	8	4	4	40	60	100
22P4PHPR01	Core - X	I Project Work	8	8	3	50	150	200
	Тс	otal	30	26	16	165	435	600
	Total (I &	½ II Years)	120	90	67	610	1590	2200

Part	Paper	Hours / Week	Weeks/ Semester	Hour/ Paper	No. of Papers	Credit /Paper		Total Credit
I	Core Paper	6	15	90	11	4/5	990	48
I	Core Practical	al 4 15 60 4		4	4	240	16	
п	Elective	4	15	60	3	4	200	12
п	EDC	4	15	60	1	4	60	4
	Human Rights	2	15	15	1	1	15	2
-	Project Work	1	15	15	1	8	15	8
	TOTAL CREDIT							

Distribution of Duration and Credit under Different Papers

LIST OF CORE PAPRES

S.No	Code	Course Title
1.	22P1PH01	Classical and Statistical
		Mechanics
2.	22P1PH02	Mathematical Physics
3.	22P1PH03	Advanced Electronics
4.	22P2PH04	Electromagnetic Theory and Plasma Physics
5.	22P2PH05	Quantum mechanics – I
6.	22P2PH06	Spectroscopy: Principles and
		Techniques
7.	22P3PH07	Condensed Matter Physics
8.	22P3PH08	Quantum Mechanics – II
9.	22P3PH09	Microprocessor and Microcontroller
10.	22P4PH10	Nuclear and Particle Physics
11.	2242PH11	Communication Electronics

LIST OF ELECTIVES

S.No	Code	Course Title
1	20P1PHE01	Nano Science
2	20P2PHE02	Crystal Physics
3	20P4PHE03	Thin Film Technology
4	20P2PHE04	Bio Physics
5	20P2PHE05	Non Linear Dynamics
6	20P4PHE06	Sensors and Actuators
7	20P2PHE07	Medical Physics

LIST OF EXTRA DISCIPLINARY COURSE

S.No	Code	Course Title
1.	20P3PHED1	Solar Energy
2.	20P3PHED2	Electronics Appliances



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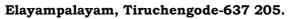
PONEN EMPOWERNEN												
Programme	M.Sc., Programme PPH Regulations									22-2023		
		Code										
Department		Physics Semester 1										
Course Code		Course		Perio er V	ods Week	C	redit	Ma	ximum	Marks		
		Name	L	Т	Р		С	CA	ESE	TOTAL		
22P1PH01		LASSICAL AND STATISTICAL MECHANICS		4	25	75	100					
COURSE OBJECTIVES	mechanics	n goal of the course and its applications nathematical techni	s in	phy						g		
POs				PI	ROGR	AMM	E OU	гсоме				
PO 1	Capable of undergrad	demonstrating the uate programme of s	basi stuc	ic co ly.	oncep	t sand	d com	prehensi	ve knov	vledge from		
PO 2	Ability to e	xpress thoughts and opriate media and i	d id	eas	effect	ively (Comm	unicate	with oth	ners		
PO 3	scientific a	the relevant assum pproach to knowled	ge d	leve	lopme	ent.		U	5	U U		
PO 4	situations.	solve different kinds				-			•			
PO 5	synthesize support th points.	Ability to evaluate the reliability and relevance of evidence, analyze and synthesize data from a variety of sources then draw valid conclusions and support them with evidence and examples, and addressing opposing view points.										
PO 6	and draw ability to p	To define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, predict cause-and-effect relationships and ability to plan, execute and report the results of an experiment.										
PO 7		vork effectively and a e or coordinated effe										
PO 8	Ability to a data and c	nalyze, interpret an ritically evaluate id d reasoned perspec	eas,	evi								
PO 9	Critical ser both self a	nsibility to lived expond nd society.	eriei	nce	s, witł	n self	aware	ness and	1 reflexi	vity of		
PO 10	Capability to access,	to use ICT in a varie evaluate, and use a tes of they are anal	vari	iety	of rel							
PO 11		vork independently, d manages a project							require	d for a		
PO 12		to effectively engage y with diverse group		a m	ulticu	ıltura	1 socie	ty and in	nteract			
PO 13	misreprese	Capable of demonstrating the ability to identify ethical issues related to ones work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data.										
PO 14	setting dire achieve the	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building at who can help achieve the vision.										
PO 15		cquire knowledge an for participating in 1	earı	ning	g activ	vities				re		
COs		COUR										
CO 1		and the fundament oscillator in Lagrang					grange	e formula	ation. Ap	oply linear		

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												ase sp	bace.		
CO 5			dersta ackbo				ns Fe	rmi D	irac s	statist	tics .A	apply i	deal I	Bose E	Cinstein
Pre-requisit						t stati	stics								
						ŀ	KNOW	/LEDO	e le	VELS					
1.Remen	nberi	ng, 2.	Unde	rstan	ding,	3.App	lying	, 4.An	alyzir	ng, 5.E	valua	ting, 6	5.Synt	hesizi	ng
		1	19 4 -				-	-		Mapr	-	0	49	1	- 1-)
CO		1 100	licate	es the	KLs	_	01 C	orrela	PO		rong,	2-me	aium	, 1-we KLs	akj
	-									D 1				1	
CO	1				2				PO					2	
									PO					2	
									PO					3	
CO	2				1				PO					5	
									PO	-				1	
									PO	7				6	
CO	3				2				PO	8				4	
								PO 9						5	
СО	4			6				PO10			1				
								PO11				2			
				-				PO 12				2			
СО	5			3				PO 13			3				
										PO14			3		
				PO 15 6											
								CO	/ PO	Map	ping				
			(3/2	2/1 ir	ndica	tes th	e stro	ength	of co	rrelat	ion, 3	-stron	ng, 2-1	nediu	m, 1-weak)
								Progr	amm	e Out	come	(POs)			
COs	PO	PO2	PO3	PO4	PO	PO6	PO	PO8	PO9	PO1	РО	PO	РО	РО	PO15
	1				5		7			0	1 1	1	1	1	
CO1	2	3	3	2	1	2	1	1	1	2	3	23	3	4	1
CO1 CO2	2 3	2	2	2 1	1	3	1	1	1	3	2	2	2 1	2 1	1
CO2	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1
C04	1	1	1	1	2	1	1	1	2	1	1	1	1	1	3
CO5	1						1	2	1	1	2	2	3	3	1
Course asse		ent m		ds		1		1		I		1	1	1	I
Direct															
1. Continuous	s Asse	essme	ent Te	st I, II	&Mc	odel									
2. Assignmen	ıt														
1. End Seme		Exam	inatio	ons											

	Content of the Syllab	us	
	FUNDAMENTAL PRINCIPLES AND LAGRANGIAN FORMULATION	Periods	12
Unit-I	Mechanics of a system of particles Constraints, Generalized coordinates, Cyclic Coo principle – Lagrange's equation of motion from Procedure for formation of Lagrange's equation - formulation: Linear Harmonic oscillator - Simp machine – Particle moving on the surface of ea - Derivation of Lagrange's equation of motio principle.	ordinates – D'A n D'Alembert's p Application of L ble pendulum – arth - Hamiltons	Membert's principle - agrange's Atwood's
Unit-II	HAMILTON'S FORMULATION OF MECHANICS AND SMALL OSCILLATIONS	Periods	12
	Hamilton's Canonical equations of r equations from variational principle – Prin Canonical transformations – Physical Significa of Hamilton's equation from modified Hamilton's least action – - Canonical transformations Hamilton - Jacobi Theory - Harmonic of Hamiltonian Jacobi method. Small Oscillation: Equilibrium – Normal Coordina	ciple of least ance of H – I s principle - Pr - Poisson br oscillator probl	action – Deduction inciple of rackets – lem using
	DYNAMICS OF A RIGID BODY AND SPECIAL THEORY OF RELATIVITY	Periods	12
Unit-III	Generalized co-ordinates for Rigid Body M reference system – Euler's theorem Euler Angles Velocity - Angular Momentum of a rigid body: of Inertia – Moment of inertia of a rigid body - E Relativistic Approach Lorentz transformation - M action and angle Variables - Relativistic Lagra Formulation.	- Components of Moments and Julers equation of otion of a symm	of Angular Products f motion - etry top –
	CLASSICAL STATISTICS	Periods	12
Unit-IV	Phase Space – Ensemble - Definition of Micro O Grand Canonical ensembles - Liouvilles theo Macrostates - Strling's formula, Entropy in statist function - Doppler broadening of spectral lines - of energy – connection between Parti thermodynamically quantities - Maxwell - Boltzma	orem - Microst tical mechanics - Principle of equi ition function	ates and - Partition - partition
	QUANTUM STATISTICS	Periods	12
Unit-V	Identical particles and Symmetry requiren Statistics and Fermi - Dirac statistics - Ideal its application: Black body radiation and Plan degeneracy – Bose - Einstein Condensation Brownian motion - Ideal Fermi Dirac gas: F emission - Paulis theory of Paramagnetism.	Bose Einstein nck Radiation L - Random w	gas and aw - Gas ⁄alk and
	Total Periods		60

Indirect	
1. Cou	rse End Delivery
	TEXT BOOKS
1	Classical Mechanics, Gupta, Kumar and Sharma, Pragati Prakashnan, Meerut, (2011).
2	Classical Mechanics, J.C.Upadyaya, Himalaya Publishing House, (2014).
3	Statistical Mechanics, Satya Prakash, (2019).
4	Statistical Mechanics, Gupta and Kumar, Pragati Prakashnan, Meerut, (2005).
5	Classical Mechanics G.Aruldhas.
	REFERENCES
1	Classical Mechanics, H.Goldstein, Narosa Publishing House, NewDelhi, (2005).
2	Classical Mechanics, C.R.Mondal, Prentice-HallofIndia, NewDelhi, (2008).
	E-REFERENCES
1	https://www.britannica.com/science/classical-mechanics
2	https://phys.libretexts.org/Bookshelves/Classical_Mechanics/Varia tional Principles in Classical Mechanics (Cline)/15%3A Advanced Hamiltonian Mechanics /15.02%3A Poisson bracket Representation of Hamiltonian Mechanics.
3	https://www.chegg.com/homework-help/definitions/classical- Mechanics-II.
4	https://nptel.ac.in/courses/115105098.
5	https://nptel.ac.in/courses/115106123.





WEN ENDONED											
Programme	M.Sc.,	M.Sc., Programme Code			PPF	ł	Regulat	ions	2022 - 2023		
Department	Phy	sics	Semester						Ι		
Course Code	Cours		Perio er W	ods /eek	Credi	t	Maxi	mum N	Marks		
		L	Т	Р	C	CA	ESI	E	Total		
22P1PH02	MATHEMATICAL PHYSICS			1	0	4	25	75		100	
COURSE OBJECTIVES	essen	 This course covers a broad spectrum of mathematical techniques essential to the solution of advanced problems in physics. The main objective of this course is to provide the student with the 									
	2. The main objective of repertoire of mathemati advanced problems enco			me	thods	that a	re esse	ntial t	o the		

COs	COURSE OUTCOME
CO 1	Understand the complex variables, Understand the characteristic equation of matrix and evaluate Hamiltonian theorem.
CO 2	Ability to solve the problem by computational method and acquire knowledge about probability.
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 To find application by using special function.
CO 5	Ability to solve PDE problem, To acquire knowledge of vector tensor and matrices. To acquire the knowledge of group theory.
Pre-requisites	To gain knowledge for solving problem.

Knowledge Levels

1. Remembering, 2. Understanding, 3. Applying, 4. Analyzing, 5. Evaluating, 6. Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1- weak)

COs	KLs	POs	KLs
		PO 1	1
CO 1	2	PO 2	2
		PO 3	2
		PO 4	3
CO 2	1	PO 5	5
		PO 6	1
		PO 7	6

					TE	CHNI	QUE					Pei	riods		12
		Pl	ROBA	BILI			-	UTA	TION	AL		P -			10
	valı			_						n the	eorem	.•		_	
	-					-					-		ofa	a mat	rix, Eigen
	Vec	ctor	analy	vsis:	Stol	ces tl	heore	m, G	auss	theo	rem -	Gree	en's T	heorer	n - Linear
	inte	egrat	ion.												
	Ser	ries	- Re	sidue	e the	eoren	n -	Eval	uatio	n of	defi	nite	integi	rals -	Contour
Unit - I			-		•		C								Laurent's
													_		equation -
	C	COMI	PLEX	AND) VEC	стоб	R ANA	LYS	[S &	MATI	RICE	S	Pe	riods	12
							СС	ONTE	NT	OF 1	HE :	SYLI	ABU	S	
1. Course	End	Deliv	very												
Indirect															
2. Assignm 3.End Sem		Exa	mina	tions	8										
1.Continuou		sessn	nent '	ſest l	I, II &	5 Moc	lel								
Direct															
Course As	sessr	nent	Met	hods	5										
CO5	1	1	1	1	3	1	2	2	3	1	1	1	1	1	2
CO4	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
CO2	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1
CO1	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1
	0 1	0 2	O 3	0 4	0 5	0 6	PO 7	0 8	0 9	10	1 1	12	13	14	PO1 5
COs	Р	Р	Р	Р	Р	Р		Р	Р	PO	PO	PO	PO	РО	
								Pro	gram	me Oı	atcom	e (PO	s)		
			(3/2/				appir stren		corr	elation	n, 3-s	trong	, 2- m	edium	, 1-weak)
) 15					6	
CO 5					5			PC) 14					3	
									0 13					3	
								PO 12				2			
CO 4		5					PO 11					2			
									0 10					1	
CO 3					1) 9			5			
CO 3			ĺ		-			PC	08					4	

	Probalibility: random variables, Binomial,	Poisson	and Normal									
Unit - II	distributions. Central limit theorem. Elements of o	computation	al Techniques:									
	Root of functions, Newton's Interpolation Polynomial	s Extrapolati	ion, Integration									
	by Trapezoidal and Simpson's 1/3 and 3/8 rules	and Solution	n of first order									
	differential equation using Runge - Kutta method. Fi	differential equation using Runge - Kutta method. Finite difference methods.										
	FOURIER AND LAPLACE TRANSFORMS	Periods	12									
	Fourier series: Dirichelt's condition – determinati having arbitrary period – Fourier series for square wa											
	Fourier Transform: Properties of Fourier transfor	rm - Fourie	r transform of									
Unit -III	domination . Formion sing and agains therefore of domination . Application of											
		- Method of	finding Inverse									
	Laplace Transform: Properties of Laplace transform – Method of finding Inverse Laplace transform - Properties of inverse Laplace transform - Solving equations for LCR circuit.											
	SPECIAL FUNCTIONS AND DIFFERENTIAL											
	EQUATIONS	Periods	12									
Unit-IV	Special Function: Beta function - property of beta beta function - Evaluation of gamma function - I Gamma functions.											
	&second order - Solution for Bessel, Leger	-										
	&second order - Solution for Bessel, Leger differential equations - Properties - Generating fur	ndre, Lagur	e and Hermite									
	-	ndre, Lagur	e and Hermite									
	differential equations - Properties - Generating fur	ndre, Lagur	e and Hermite									
Unit - V	differential equations - Properties - Generating fur Orthogonal properties, Recurrence relation. GROUP THEORY, APPLICATION OF PDE AND	ndre, Lagur actions, Rod: Period s able - Sub g	e and Hermite rigues formula, 12									
Unit - V	differential equations - Properties - Generating fur Orthogonal properties, Recurrence relation. GROUP THEORY, APPLICATION OF PDE AND TENSOR Group Theory: Basic Definition - Multiplication Ta	ndre, Lagur actions, Rod Period s able - Sub g SU(2).	e and Hermite rigues formula, 12 groups - Cosets									
Unit - V	differential equations - Properties - Generating fur Orthogonal properties, Recurrence relation. GROUP THEORY, APPLICATION OF PDE AND TENSOR Group Theory: Basic Definition - Multiplication Ta and Classes, - Character Table - C2Vas examples,	ndre, Lagur actions, Rod Period s able - Sub g SU(2).	e and Hermite rigues formula, 12 groups - Cosets									
Unit - V	 differential equations - Properties - Generating fur Orthogonal properties, Recurrence relation. GROUP THEORY, APPLICATION OF PDE AND TENSOR Group Theory: Basic Definition - Multiplication Ta and Classes, - Character Table - C2Vas examples, Application of PDE: Laplace, wave and heat equation 	ndre, Lagur actions, Rod Period s able - Sub g SU(2). juations in	e and Hermite rigues formula, 12 groups - Cosets two and three									
Unit - V	 differential equations - Properties - Generating fur Orthogonal properties, Recurrence relation. GROUP THEORY, APPLICATION OF PDE AND TENSOR Group Theory: Basic Definition - Multiplication Ta and Classes, - Character Table - C2Vas examples, Application of PDE: Laplace, wave and heat eq dimensions. 	ndre, Lagur nctions, Rod Period s able - Sub g SU(2). quations in tensors, Ra	e and Hermite rigues formula, 12 groups - Cosets two and three									

	TEXT BOOKS										
1	Mathematical Physics, B.D. Gupta, Vikas Publishing House, (2004).										
2	Mathematical Physics, Satyaprakash, Sultan Chand and Sons, (2004).										
3	Mathematical Physics, HK Das, S.Chand Co, New Delhi (2022).										
	REFERENCES										
1	Mathematical Physics, P.K. Chattopadhyay, Wiley Eastern India, (1990).										

2	Chemical applications of group theory, F.A. Cotton, Wiley Eastern India, (2001).
3	Elements of group theory for physicist, A.W Joshi, New age international Publishers, (2002).
4	Mathematical Physics, MP Kakani, S.Chand Co,.
	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.
4	https://nptel.ac.in/courses/115106086.
5	https://nptrel.ac.in/courses/ 111106148.





Elayampalayam, Tiruchengode-637 205.

TEN ENPONER														
Programme	M.Sc.,	Programme Code	P	PH	Re	ons	2022-2023							
Department	Phy	vsics		Sem		Ι								
Course Code	Cour	se Name	Peri per V		Credit		Maxim	imum Marks						
			L T	Р	С	CA	ESE	Total						
	ADVANCED 6 0 0 4 25 75 10 ELECTRONICS 6 0 0 4 25 75 10													
22P1PH03														
COURSE OBJECTIVES		of the course is to s of electronics.	introdu	ice th	ne students	s to the	e advan	.ced						
		basic knowledge o al Amplifier, Memo												
POs		PROGRAMME	OUTCO	OME										
PO 1	Capable o knowledge	f demonstrating the from undergradua	e basic ate Prog	conce ramn	ept sand co ne of study	ompreh 7.	iensive							
PO 2		express thoughts a ng appropriate med anner.												
PO 3	To identify	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	synthesize support tl	Ability to evaluate the reliability and relevance of evidence, analyze a synthesize data from a variety of sources then draw valid conclusions a support them with evidence and examples, and addressing opposing Viewpoints.						usions and						
PO 6	interpret	problems, formulat and draw conclu nips and ability to p nt.	sions f	rom	data, pre	edict c	ause-a	nd-effect						
PO 7	Ability to cooperative a group.	work effectively and re or coordinated ef	l respec fort on	tfully the p	with dive art of a gro	rse tear oup and	ms, fac d act to	ilitate ogether as						
PO 8	/qualitati	Ability to analyze, interpret and draw conclusions from quantitative /qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.												
PO 9		nsibility to lived ex lf and society.	perienc	es, w	ith self aw	arenes	s and r	eflexivity						
PO 10	ability to and use a	r to use ICT in a v access, evaluate, a ppropriate software	nd use a for an	a vari alysis	iety of releves of data.	vant in	formati	ion sources						
PO 11		work independently and manages a pro					rces re	quired for						
PO 12		to effectively engaged ly with diverse grou		nulti	cultural so	ociety a	nd inte	eract						
PO 13	ones work	f demonstrating the , avoid unethical b entation of data.												

PO 14	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision.
PO 15	Ability to acquire knowledge and skills, including how to learn, that are necessary for participating in learning activities throughout life.
COs	COURSE OUTCOME
CO 1	To get knowledge about the basics information 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.
CO 5	To acquire Knowledge the memory devices and apply in optoelectronic devices.
Pre- requisites	To Acquire idea about Advanced Electronics.

Knowledge Levels																
1.Remembe	ring, i	2.Unc	lersta	nding	, 3.Aj	pplyin	ıg, 4.A	nalyz	zing, 5	.Evalı	Jating	, 6.Sy	nthesi	izing		
CO / PO / KL Mapping																
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)																
COs			KLs					POs					KLs			
CO 1					1				O 1			1				
					T				D 2					2		
									C 3					2		
CO 2					3				D 4					3		
					5				D 5					5		
									D 6					1		
CO 3					2				O 7					6		
005					4				2 8 C					4		
									C 9					5		
CO 4			6					PO 10				1				
001								PO 11				2				
								PO 12					2			
CO 5					1			PO 13					3			
					-			PO 14					3			
									0 15					6		
								lapp								
	(3/2	2/1 ir								8-stro	ng, 2-	mediu	ım, 1-	weak)	
COs	р	П		-				e (PC	-	DO	DO	DO	DO	DO	DO	
	P O	P O	P O	P O	P O	P O	PO 7	P O	P O	PO 1	PO 1	PO 1	PO 1	PO 1	PO 1	
	Ū	0	Ũ	C	0	Ū		Ũ	0	0	1	2	3	4	5	
	1	2	3	4	5	6		8	9						-	
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	
CO5	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
Course Ass	sessn	ient l	Metho	ods												
Direct																

I. Continuous Assessment Test - I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

1. Course End Delivery

	CONTENT OF THE SYLL	ABUS										
	OPERATIONAL AMPLIFIER	Periods	12									
Unit - I	Operational amplifiers: Basic information - Ideal op-amp - Open loop operation - Feedback in ideal op-amp - Inverting and Non - inverting amplifier, Voltage Follower, Differential amplifier, CMRR. DC Characteristics - Input bias current, Input offset current, Input offset voltage, Total output offset voltage, Thermal drift. AC Characteristics - Frequency Response, Stability of an Op - amp, Frequency Compensation, Slew rate.											
	ANALOG COMPUTATION AND WAVEFORM GENERATORS	Peri	ods 12									
Unit - II	Basic Op-amp Applications - Antilogarithmic amplifiers. Adder – subtra Analog divider – Differentiator – Integrator – Analog Computation - Solving Simultane Differential equation - Sine wave oscillator - Wein - Bridge oscillator, method - Harmonic	ctor- Anal Squarer – cous equ RC Phase sh	og multiplier- comparator - lation and nift oscillator -									
	Hamiltonian Comparator, Schmitt trigger,											
	multivibrators - Triangular wave generator.											
	FILTERS AND DATA CONVERTERS	Periods										
Unit - III	FILTERS: RC Active filters - First order order active filter, Higher order low pass filter Band pass filters and Band reject filters	· low pass	filter, Second									
Unit - III		low pass r, High pas	filter, Second s active filter,									
Unit - III	order active filter, Higher order low pass filte Band pass filters and Band reject filters. DATA CONVERTERS: Basic DAC techn DAC, R-2R Ladder DAC. Basic ADC to	low pass r, High pas iques: Weig chniques	filter, Second s active filter, ghted resistor - Successive									
Unit - III	order active filter, Higher order low pass filte Band pass filters and Band reject filters. DATA CONVERTERS: Basic DAC techn DAC, R-2R Ladder DAC. Basic ADC te approximation A/D convertor, Dual -	low pass r, High pas iques: Weig chniques	filter, Second s active filter, ghted resistor - Successive									
Unit - III	order active filter, Higher order low pass filte Band pass filters and Band reject filters. DATA CONVERTERS: Basic DAC techn DAC, R-2R Ladder DAC. Basic ADC to	low pass r, High pas iques: Weig echniques Slope AD0	filter, Second s active filter, ghted resistor - Successive C, DAC/ADC									
Unit - III Unit - IV	order active filter, Higher order low pass filte Band pass filters and Band reject filters. DATA CONVERTERS: Basic DAC techn DAC, R-2R Ladder DAC. Basic ADC to approximation A/D convertor, Dual - Specifications.	low pass r, High pas iques: Weig echniques Slope ADO Periods Monostable– r – Bistable	filter, Second s active filter, ghted resistor - Successive C, DAC/ADC 12 Multivibrator multivibrator									
Unit - IV	order active filter, Higher order low pass filte Band pass filters and Band reject filters. DATA CONVERTERS: Basic DAC techn DAC, R-2R Ladder DAC. Basic ADC to approximation A/D convertor, Dual - Specifications. IC 555 TIMER AND APPLICATIONS IC 555 Timer – Internal architecture – M - – Linear ramp generator – Frequency divide - Astable Multivibrator – Applications in ast	low pass r, High pas iques: Weig echniques Slope ADO Periods Monostable– r – Bistable	filter, Second s active filter, ghted resistor - Successive C, DAC/ADC 12 Multivibrator multivibrator									
	order active filter, Higher order low pass filte Band pass filters and Band reject filters. DATA CONVERTERS: Basic DAC techn DAC, R-2R Ladder DAC. Basic ADC to approximation A/D convertor, Dual - Specifications. IC 555 TIMER AND APPLICATIONS IC 555 Timer – Internal architecture – M - – Linear ramp generator – Frequency divide - Astable Multivibrator – Applications in ast loops – Monolithic phase locked loops.	 low pass r, High pas iques: Weig echniques Slope ADO Periods Monostable- or – Bistable table mode- Periods ROM, EARO AM – Compa 	filter, Second s active filter, ghted resistor - Successive C, DAC/ADC 12 Multivibrator multivibrator -phase locked 12 M. RAM –									

	TEXT BOOKS							
1	Handbook of Electronics, Gupta and Kumar, Pragati Prakashnan, Meerut, (2003).							
2	Linear Integrated Circuits, D. Roy choudry, New Age Publications, (2015).							
3	VK Metha, Sedha.							
	REFERENCES							
1	Electronic Measurement and Instrumentation, William Cooper, TMG Hill,(2001).							
2	Operational Amplifier, Robert F, Pearson Hill, (2015).							
	E-REFERENCES							
1	www.khanacademy.org/science/physics/electronics/operational amplifier.							
2	www.khanacademy.org/science/physics/electronics/memory and optoelectronic devices.							





Elayampalayam, Tiruchengode-637 205.

AN EMPOWEN													
Programme	M.Sc.,	Programme Code	PPH Regulations 2022-20										
Department	Phy			Ι									
	Periods Credit Maximum Marks												
Course Code	Cour	se Name	per Week										
			L T P	С	CA	ESE	Total						
	A	LECTIVE:	4 0 0	4	25	75	100						
22P1PHE01		NO SCIENCE											
COURSE	1. To provi	ide the basic skills Vanomaterials.	s required to	understa	ind, deve	elop, an	d						
OBJECTIVES													
DO	2. 10 01110	2. To enhance the research interest in Nanotechnology PROGRAMME OUTCOME											
POs	0 11				1	1 .							
PO 1	-	of demonstrating to the from undergrad		-	-	renensi	ve						
DO 0		express thoughts				icate wi	th						
PO 2													
		others using appropriate media and interpret the idea in clear and concise manner.											
PO 3	To identify	To identify the relevant assumptions to formulate the arguments by following											
		scientific approach to knowledge development.											
PO 4	- •	o solve different ki	nds of non-fai	miliar pro	blems ar	nd apply	to real						
		life situations.											
PO 5	Abilitytoevaluatethereliabilityandrelevanceofevidence,analyzeandsynthes												
	edat a from a variety of sources then draw valid conclusions and sug them with evidence.												
PO 6			late hypothe	ses test	hypothe	<u></u>	1.770						
100	To define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw Conclusions from data, predict a use-and-effect												
	relationships and ability to plan, execute.												
PO 7		work effectively ar			verse tea	ams, fac	cilitate						
107		ve or coordinated											
	a group.												
	•	analyze, interpret					_						
PO 8	-	ve/qualitative dat		-			ce and						
		es from an open-r					oflorizites						
PO 9	Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.												
	Capability to use ICT in a variety of learning situations, demonstrate												
PO 10													
10 10	sources and use appropriate software for analysis of data.												
	Ability to work independently, identify appropriate resources required for												
PO 11	project, and manage a project through to completion.												
PO 12	Capability to effectively engage in a multicultural society and interact												
	respectful	ly with diverse gro	oups.										
DO 10	=	f demonstrating t	-	-									
PO 13		, avoid unethical	behavior suc	h as fabr	rication,	falsifica	tion or						
	=	entation of data.	.1 . 1 .			•							
PO 14		for mapping out			-								
1017	-	rection, formulatir eve the vision.	ig an inspirir	ig vision,	building	s a tean	i who can						
	-	acquire knowledge	and skills	including	how to	learn +1	hat are						
PO 15	-	for participating		-			in ar c						
	y	participating											

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 luminescence spectroscopy. Understand the working principle of XRD and UV.
CO 5	Apply carbon nano tubes for electronics applications.
Pre-requisites	To Acquire idea about Nano Science.

					wledg										
1.Remembe	ring, 2	2.Und	lersta	nding	g, 3.Ag		-	-				, 6.Sy	nthesi	zing	
						CC) / P	0/1	KL M	appi	ng				
	(3	3/2/1	indi		the s	streng	gth of			1, 3-st	trong,			, 1-we	ak)
COs				KLs					Os				KLs		
CO 1					1			Р	O 1					1	
					T			PO	D 2					2	
								PO	C 3					2	
CO 2					4			PO	D 4					3	
					7			PO	D 5					5	
								PO	06					1	
CO 3					2			P	O 7					6	
003					2			PO	2 8 C					4	
								PO	D 9					5	
00.4					0			PC	0 10					1	
CO 4					2			PC) 11					2	
								PC) 12					2	
								PC) 13					3	
CO 5	05				3			PC) 14			3			
								PC) 15					6	
				-	PO N		_								
	(3/	2/1 iı	ndica	tes tł	ne stro	ength	ı of co	rrela	tion.	3-stro	ng, 2-	-medi	um, 1	-weak	-)
	(0) /	4/11				U		ncia	,		Ċ,				-)
COa	(07.				amm		tcom				U/				-)
COs	Р	Р	P	Prog	Р	e Ou P	tcom PO	e (PC P)s) P	РО	РО	PO	РО	PO	PC
COs		P O	P O	Prog	P O	e Ou	tcom	е (РС Р О)s)		PO 1	PO 1 2			PC 1
	Р О 1	P 0 2	P 0 3	Prog P O 4	Р О 5	е Ои Р О б	PO 7	e (PC P 0 8)s) P O 9	PO 1 0	PO 1 1	1 2	PO 1 3	PO 1 4	PC 1 5
COs CO1 CO2	P O	P O	P O	Progr P O	P O	P O	tcom PO	е (РС Р О)s) P O	PO 1	PO 1	1	PO 1	PO 1	PC 1 5
CO1	P 0 1 3	P 0 2 2	P 0 3 2	Progr P O 4 1	P 0 5 1	P 0 6 3	PO 7	e (PC P 0 8 1	Ds) P O 9 1	PO 1 0 3	PO 1 1 2	1 2 2	PO 1 3 1	PO 1 4 1	PC 1 5 1 1
CO1 CO2	P 0 1 3 1	P 0 2 2 1	P O 3 2 1	Prog P 0 4 1 2	P 0 5 1 2	P 0 6 3 1	PO 7 1 1	e (PC P 0 8 1 3	P 0 9 1 2	PO 1 0 3 1	PO 1 1 2 1	$ \begin{array}{c} 1\\ 2\\ \hline 1\\ \hline 1\\ \hline 1 \end{array} $	PO 1 3 1 2	PO 1 4 1 2	PC 1 5 1
CO1 CO2 CO3	P 0 1 3 1 2	P 0 2 2 1 3	P O 3 2 1 3	Progr P 0 4 1 2 2	P 5 1 2 1	P O 6 3 1 2	PO 7 1 1 1	e (PC P 0 8 1 3 1	P O 9 1 2 1 <th1< th=""> <th1< th=""> <th1< th=""> <th1< th=""></th1<></th1<></th1<></th1<>	PO 1 0 3 1 2	PO 1 1 2 1 3	1 2 2 1 3	PO 1 3 1 2 2	PO 1 4 1 2 2	PC 1 5 1 1
CO1 CO2 CO3 CO4	P O 1 3 1 2 2 2 1	P 02 2 1 3 3 2	P 0 3 2 1 3 3 3 2	Progr P 0 4 1 2 2 2 3	P 5 1 2 1 1	P O 6 3 1 2 2	tcom PO 7 1 1 1 1 1	e (PC P 0 8 1 3 1 1	P O 9 1 2 1 <th1< th=""> <th1< th=""> <th1< th=""> <th1< th=""></th1<></th1<></th1<></th1<>	PO 1 0 3 1 2 2	PO 1 1 2 1 3 3	1 2 2 1 3 3	PO 1 3 1 2 2 2	PO 1 4 1 2 2 2 2	PC 1 5 1 1 1
CO1 CO2 CO3 CO4 CO5	P O 1 3 1 2 2 1	P 02 2 1 3 3 2	P 0 3 2 1 3 3 3 2	Progr P 0 4 1 2 2 2 3	P 5 1 2 1 1	P O 6 3 1 2 2	tcom PO 7 1 1 1 1 1	e (PC P 0 8 1 3 1 1	P O 9 1 2 1 <th1< th=""> <th1< th=""> <th1< th=""> <th1< th=""></th1<></th1<></th1<></th1<>	PO 1 0 3 1 2 2	PO 1 1 2 1 3 3	1 2 2 1 3 3	PO 1 3 1 2 2 2	PO 1 4 1 2 2 2 2	PC 1 5 1 1
CO1 CO2 CO3 CO4 CO5 Course Asse	P 0 1 3 1 2 2 1 5	P 0 2 2 1 3 3 2 mt Me	P 0 3 2 1 3 3 2 ethod	Progr P 0 4 1 2 2 2 3 s	P 05 1 2 1 1 1	P 0 6 3 1 2 2 1	tcom PO 7 1 1 1 1 1	e (PC P 0 8 1 3 1 1	P O 9 1 2 1 <th1< th=""> <th1< th=""> <th1< th=""> <th1< th=""></th1<></th1<></th1<></th1<>	PO 1 0 3 1 2 2	PO 1 1 2 1 3 3	1 2 2 1 3 3	PO 1 3 1 2 2 2	PO 1 4 1 2 2 2 2	PC 1 5 1 1
CO1 CO2 CO3 CO4 CO5 Course Asse Direct	P 0 1 3 1 2 2 1 5	P 0 2 2 1 3 3 2 mt Me	P 0 3 2 1 3 3 2 ethod	Progr P 0 4 1 2 2 2 3 s	P 05 1 2 1 1 1	P 0 6 3 1 2 2 1	tcom PO 7 1 1 1 1 1	e (PC P 0 8 1 3 1 1	P O 9 1 2 1 <th1< th=""> <th1< th=""> <th1< th=""> <th1< th=""></th1<></th1<></th1<></th1<>	PO 1 0 3 1 2 2	PO 1 1 2 1 3 3	1 2 2 1 3 3	PO 1 3 1 2 2 2	PO 1 4 1 2 2 2 2	PC 1 5
CO1 CO2 CO3 CO4 CO5 Course Asse Direct Continuous A	P O 1 3 1 2 2 1 ssmet	P Q 2 1 3 3 2 nt Me	P 0 3 2 1 3 3 2 ethod	Progr P 0 4 1 2 2 2 3 s	P 05 1 2 1 1 1	P 0 6 3 1 2 2 1	tcom PO 7 1 1 1 1 1	e (PC P 0 8 1 3 1 1	P O 9 1 2 1 <th1< th=""> <th1< th=""> <th1< th=""> <th1< th=""></th1<></th1<></th1<></th1<>	PO 1 0 3 1 2 2	PO 1 1 2 1 3 3	1 2 2 1 3 3	PO 1 3 1 2 2 2	PO 1 4 1 2 2 2 2	PC 1 5
CO1 CO2 CO3 CO4 CO5 Course Asse Direct Continuous A Assignment	P O 1 3 1 2 2 1 ssmet	P Q 2 1 3 3 2 nt Me	P 0 3 2 1 3 3 2 ethod	Progr P 0 4 1 2 2 2 3 s	P 05 1 2 1 1 1	P 0 6 3 1 2 2 1	tcom PO 7 1 1 1 1 1	e (PC P 0 8 1 3 1 1	P O 9 1 2 1 <th1< th=""> <th1< th=""> <th1< th=""> <th1< th=""></th1<></th1<></th1<></th1<>	PO 1 0 3 1 2 2	PO 1 1 2 1 3 3	1 2 2 1 3 3	PO 1 3 1 2 2 2	PO 1 4 1 2 2 2 2	PC 1 5
CO1 CO2 CO3 CO4 CO5 Course Asse Direct Continuous A Assignment End Semeste Indirect	P O 1 3 1 2 2 1 ssmer	P O 2 1 3 3 2 nt Me ment	P O 3 2 1 3 3 2 ethod	Progr P 0 4 1 2 2 2 3 s	P 05 1 2 1 1 1	P 0 6 3 1 2 2 1	tcom PO 7 1 1 1 1 1	e (PC P 0 8 1 3 1 1	P O 9 1 2 1 <th1< th=""> <th1< th=""> <th1< th=""> <th1< th=""></th1<></th1<></th1<></th1<>	PO 1 0 3 1 2 2	PO 1 1 2 1 3 3	1 2 2 1 3 3	PO 1 3 1 2 2 2	PO 1 4 1 2 2 2 2	PC 1 5 1 1 1
CO1 CO2 CO3 CO4 CO5 Course Asse Direct Continuous A Assignment End Semeste	P O 1 3 1 2 2 1 ssmer	P O 2 1 3 3 2 nt Me ment	P O 3 2 1 3 3 2 ethod	Progr P 0 4 1 2 2 2 3 s	P 05 1 2 1 1 1	P 0 6 3 1 2 2 1	tcom PO 7 1 1 1 1 1	e (PC P 0 8 1 3 1 1	P O 9 1 2 1 <th1< th=""> <th1< th=""> <th1< th=""> <th1< th=""></th1<></th1<></th1<></th1<>	PO 1 0 3 1 2 2	PO 1 1 2 1 3 3	1 2 2 1 3 3	PO 1 3 1 2 2 2	PO 1 4 1 2 2 2 2	PC 1 5 1 1

	CONCEPT OF NANOSCIENCE	Periods	12						
Unit - I	 Introduction of nanoscale science: surface to volume ratio Quantum Size effect - Particle Size - Particles shape; Nanostructures: Zero, One, Two and Three dimensional structure Physical properties of nanoparticles: 								
	Particle density; Melting point ; Surface ter Composite structure - Surface characteristics of surface area and pore - Mechanical properties - Optical properties - Electrical properties - Magnetic	nsion; wetta nanoparticle Crystalline _I	bility and s - Specific						
	NANOFABRICATION	Periods	8						
Unit - II	Unit - II Top down and bottom up ideas – Top down approach Ball Milling method – Sputtering Technique – Sol – gel – Hydrothermal – CVD method- and electron beam Lithography - Bottom up approach - PVD method - thermal Evaporation – Microwave techniques.								
	CHARACTERIZATION TECHNIQUES	Periods	11						
Unit - III	Jnit - III Transmission Electron Microscope (TEM); Atomic Force Microscope (AFM); Working Principle, Instrumentation and applications - Structural analysis: XRD, XRF – Optical analysis: Photoluminescence (PL) Spectroscopy – UV-Vis-NIR Spectroscopy analysis. FTIR - Thermal analysis: Differential Scanning Calorimeter (DSC), Differential Thermal Analyzer (DTA), Thermogravimetric Analysis (TGA). Working Principle, Instrumentation and applications.								
Unit - IV	NANO SYSTEMS	Periods	8						
	Quantum Hall effect – Carbon nanostructure fullerenes derivatives; CNT: SWNT – MWNT; applic nanomaterials: Polymer nanocomposites – nanoer	cations - Gra							
Unit - V	APPLICATIONS OF NANOMATERIAL Periods								
	Optoelectronic properties of molecular materials - Nanotechnology devices: OLEDs, TFT, OTFTs - Biological application of nano particles - Drug delivery system.								
I									

	TEXT BOOKS
1	RolandWiesendanger"ScanningProbeMicroscopyandSpectroscopy. Methodsand 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 Inter science, (1990).
2	Sergei N.Magonov, Myung-Hwan Whangbo; Surface Analysis with ST Mand 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%20Nanoparticl e+fil etype%3Adoc
2	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=5&cad=rja &uact=8&ved=2ahUKEO_cDVnvvcAhXJqY8KHTN2D_YQFjAEegQIBhAC&url=http %3A%2F%2 www.lehigh.edu%2F~inmatpac%2Fsyllabus%2Fs2004mat398.doc&usg=AOvV aw2 0OmcUT7mNM2qfDrdLTkkG



Elayampalayam, Tiruchengode-637 205.



POWEN EMPONERMEN													
Programme	M.Sc.,	Programme Code	PPH Regulations							2022 -2023			
Department		Physics	Semester II										
Course Code		Course		erio		Cre	edit		Maxi	imum	Marks		
		Name	Pei L	T We		C	2	CA		ESE	Total		
22P2PH0		ANTUM CHANICS - I	6	0	0	5	5	25	7	75	100		
COURSE	To acquire	knowledge of non-	relativ	visti	c ar	nd rela	tivisti	c quant	um	mecha	nics.		
OBJECTIVE	S Theabilityte	ounderstandconcer	otsand	ltor	oerfo	ormcal	culati	onsofsc	atter	ingofp	articles.		
POs		PROGRAMME OUTCOME											
PO 1	Capable of undergradu	demonstrating the late programme of	basic study	; CO1 7.	ncep	ots and	d com	prehens	sive k	nowle	dge from		
PO 2	Ability to example appropriate	xpress thoughts an e media.	d idea	as e	ffec	tively	Comm	unicate	with	n other	rs using		
PO 3	To identify scientific a	o identify the relevant assumptions to formulate the arguments by following cientific approach to Knowledge development.											
PO 4	Capacity to situations.	apacity to solve different kinds of non-familiar problems and apply to real life tuations.											
PO 5		bility to evaluate the reliability and relevance of evidence, analyse and ynthesize data from a variety of sources.											
PO 6		roblems, formulat		oth	ese	s, test	hypot	heses, a	inaly	se, int	erpret		
PO 7		ork effectively and or coordinated ef							facil	itate			
PO 8	data and c	Ability to analyze, interpret and draw conclusions from quantitative /qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.											
PO 9	Critical ser self and so	Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.											
PO 10		Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources.											
PO 11		Ability to work independently, identifies appropriate resources required for a project, and manages a project through to completion.											
PO 12		Capability to effectively engage in a multicultural society and interact respectfully with diverse groups.											
PO 13	Capable of work, avoid	Capable of demonstrating the ability to identify ethical issues related to ones work, avoid unethical behavior such as fabrication.									ones		
PO 14	direction, f	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achiev the vision, motivating and inspiring team members to engage with that vision.								achieve			
PO 15	Ability to acquire knowledge and skills, including how to learn, that are nece for participating in learning activities throughout life, through self-paced an directed learning.												
COs		COURSE OUTCO	ME										
CO 1 '	To get the kno of dynamical	owledge about Ehre		the	ore	m .Un	dersta	nd the l	Expe	ctatio	n values		
CO 2		stand spin angular	mom	ent	um	. To ar	nalyze	the eige	en va	lues s	pectrum.		
		ne characteristic eq	uatio	n o	far	natrix	. To ar	nalyze tl	ne Hi	ibert s	pace.		
		e independent pert	-								-		
		tal concepts Variat									-		

00 5	
CO 5	Apply the selection rule for dipole radiation. Evaluate adiabatic and sudden
	approximation.
Pre-	GET KNOWLEDGE
requisites	

							ŀ	Inowle	edge I	evels						
1.Re	memb	pering	, 2.U	nders	tandir	ng, 3. <i>1</i>	Apply	ing, 4	.Analy	zing,	5.Eva	luatir	ıg, 6.S	ynthe	sizing	
					O / P ngth o											
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C	201				1					PO 2				2		
										PO 3				2		
					-					PO 4				3		
	CO 2				2					PO 5				5		
										PO 6				1		
	CO	3			4					PO 7				6		
	00	0			•					PO 8				4		
			_							PO 9	0			5		
	CO 4				3			PO 10 PO11					1 2			
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	CO 5				5					PO 1				3		
										PO 1	5			6		
			CO	/ PO				indio ediun			treng	th of o	correla	ation,	3-	
~ ~ ~]	Prog	amm	e Ou	tcom	e (PO	s)				
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CO 1	3	2	2	1	1	3	1	1	1	3	2	2	1	1	1	
CO 2	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
CO 3	1	1	1	2	2	1	1	3 2 1 1 1 2 2					1			
CO 4	1	2	2	3	1	1	1						1			
CO 5	1	1	1	1	3	1	2	2	3	1	1	1	1	1	2	
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2. A 3. E	ssignr nd Se	nent emest	er Ez	kamir	natior	ıs										
ndirect																

1. Course End Delivery

GENERAL FORMALISM OF QUANTUM MECHANICS Periods 12 Unit-I Linear vector space – Linear operator – Adjoint and Self adjoint operators – Eigen function and Eigen value – Hermition operator for dynamical variables – Postulates of Quantum Mechanics the Time dependent and Time independent Schroedinger equations – Expectation values of dynamical quantities - Probability of current density – Ehrenfest theorem – Orthonormality – Heisenberg Uncertainty principle – Relations - Simultaneous measurability of observables - Diracs notation – Momentum representation. Unit-II ANGULAR MOMENTUM Periods 12 Orbital angular momentum and their properties – Spin angular momentum – Total angular momentum operators – Commutation relation of total angular momentum with components – ladder operators – commutation relation of Jz, with J+ and J-, - Eigen values spectrum of J ⁷ , Jx, Jy and Jz – Matrix representation of J ³ , Jz, J+ and J-, Addition of angular momenta: Clebsch Gordon Coefficients – selection rules – Properties and its evaluation. 12 Unit-III MATRIX AND OPERATOR FORMULATION Periods 12 Isigen values, Eigen vectors: Characteristic equation of a matrix Schrodinger, Heisenberg and Interaction Pictures matrix representation- Unitary transformations associated with translations and rotations. Diracs Bra and Ket Vectors: Notation and Dual Space, Hibert Space, Projection Operator, Unitary Operator and Matrix Theory of Harmonic Oscillator. 12 First and second orders of Time Dependent Perturbation theory –Non – degenerate case: the First order and the second order – Selection rule – The degenerate case: Removal of Deg	Unit-I	MECHANICS Linear vector space – Linear operator – Adjoin operators – Eigen function and Eigen value – Her dynamical variables – Postulates of Quantum M	nt and Sel							
Unit-I operators - Eigen function and Eigen value - Hermition operator for dynamical variables - Postulates of Quantum Mechanics the Time dependent and Time independent Schroedinger equations - Expectation values of dynamical quantities - Probability of current density - Ehrenfest theorem - Orthonormality - Heisenberg Uncertainty principle - Relations - Simultaneous measurability of observables - Diracs notation - Momentum representation. Unit-II ANGULAR MOMENTUM Periods 12 Orbital angular momentum and their properties - Spin angular momentum of their properties - Spin angular momentum - Total angular momentum with components - ladder operators - commutation relation of Jz, us, Jy and Jz - Matrix representation of J ² , Jz, J+ and J-, Addition of angular momenta: Clebsch Gordon Coefficients - selection rules - Properties and its evaluation. 12 Unit-III MATRIX AND OPERATOR FORMULATION Periods 12 Ligen values, Eigen vectors: Characteristic equation of a matrix Schrodinger, Heisenberg and Interaction Pictures matrix representations. Unitary transformations associated with translations and rotations. 12 Diracs Bra and Ket Vectors: Notation and Dual Space, Hibert Space, Projection Operator dual the second order -Selection rule - The degenerate case: Removal of Degeneracy-Ground State of Helium Atom - Application to ground state of an harmonic oscillator and State of Helium Atom - Application to ground state of an anomicol coscillator and State is application to Hydrogen Molecule - WKB approximation. 12	Unit-I	operators – Eigen function and Eigen value – Her dynamical variables – Postulates of Quantum M		f adioint						
Unit-IIOrbital angular momentum and their properties – Spin angular momentum – Total angular momentum operators – Commutation relation of total angular momentum with components – ladder operators – commutation relation of Jz with J+ and J-, - Eigen values spectrum of J², Jx, Jy and Jz – Matrix representation of J², Jz, J+ and J-, Addition of angular momenta: Clebsch Gordon Coefficients – selection rules – Properties and its evaluation.Periods12Unit-IIIMATRIX AND OPERATOR FORMULATION Eigen values, Eigen vectors: Characteristic equation of a matrix Schrodinger, Heisenberg and Interaction Pictures matrix representation – Unitary transformations associated with translations and rotations. Diracs Bra and Ket Vectors: Notation and Dual Space, Hibert Space, Projection Operator, Unitary Operator and Matrix Theory of Harmonic Oscillator.Periods12First and second orders of Time Dependent Perturbation theory –Non – degenerate case: the First order and the second order – Selection rule – The degenerate case: Removal of Degeneracy-Ground State of Helium Atom - Application to ground state of an harmonic oscillator and Stark Effect in Hydrogen – Spin – Orbit interaction -Variation Method & its application to Hydrogen Molecule – WKB approximation.Periods12		dependentandTimeindependentSchroedingerequations–Expectation values of dynamicalquantities-Probabilityof currentdensity-Ehrenfesttheorem-Orthonormality-HeisenbergUncertaintyprinciple-Relations-Simultaneousmeasurabilityofobservables-Diracsnotation-Momentumrepresentation.ANGULAR MOMENTUMPeriods12								
Unit-IISpinangularmomentum– Totalangularmomentumoperators – Commutation relation of totalangularmomentumwith components – ladder operators – commutation relation of Jzwith J+ and J-, - Eigen values spectrum of J², Jx, Jy and Jz –Matrix representation of J², Jz, J+ and J-, Addition of angularmomenta: Clebsch Gordon Coefficients – selection rules –Properties and its evaluation.Periods12Eigen values, Eigen vectors: Characteristic equation of a matrix Schrodinger, Heisenberg and Interaction Pictures matrix representation - Unitary transformations associated with translations and rotations.Diracs Bra and Ket Vectors: Notation and Dual Space, Hibert Space, Projection Operator, Unitary Operator and Matrix Theory of Harmonic Oscillator.Unit-IVFirst and second orders of Time Dependent Perturbation theory -Non – degenerate case: the First order and the second order -Selection rule – The degenerate case: Removal of Degeneracy-Ground State of Helium Atom - Application to ground state of an harmonic oscillator and Stark Effect in Hydrogen – Spin – Orbit interaction -Variation Method & its application to Hydrogen Molecule – WKB approximation.		ANGULAR MOMENTUM	Periods	12						
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Unit-III Characteristic equation of a matrix Schrodinger, Heisenberg and Interaction Pictures matrix representation- Unitary transformations associated with translations and rotations. Diracs Bra and Ket Vectors: Notation and Dual Space, Hibert Space, Projection Operator, Unitary Operator and Matrix Theory of Harmonic Oscillator. Image: Space state of the second order o		MATRIX AND OPERATOR FORMULATION	Periods	12						
Unit-IVFirst and second orders of Time Dependent Perturbation theory -Non - degenerate case: the First order and the second order -Selection rule - The degenerate case: Removal of Degeneracy-Ground State of Helium Atom - Application to ground state of an harmonic oscillator and Stark Effect in Hydrogen - Spin - Orbit interaction -Variation Method & its application to Hydrogen Molecule - WKB approximation.TIME DEPENDENT PERTURBATION THEORYPeriods12	Unit-III	 Characteristic equation of a matrix Schrodinger, Heisenberg and Interaction Pictures matrix representation- Unitary transformations associated with translations and rotations. Diracs Bra and Ket Vectors: Notation and Dual Space Hibert Space, Projection Operator, Unitary Operator and Matrix 								
Unit-IV - degenerate case: the First order and the second order -Selection rule - The degenerate case: Removal of Degeneracy-Ground State of Helium Atom - Application to ground state of an harmonic oscillator and Stark Effect in Hydrogen - Spin - Orbit interaction -Variation Method & its application to Hydrogen Molecule - WKB approximation. TIME DEPENDENT PERTURBATION THEORY Periods 12		APPROXIMATION METHODS	Periods	12						
THEORY Periods 12	Unit-IV	 degenerate case: the First order and the second order -Selection rule - The degenerate case: Removal of Degeneracy-Ground State of Helium Atom - Application to ground state of an harmonic oscillator and Stark Effect in Hydrogen - Spin - Orbit interaction -Variation Method & its application to Hydrogen Molecule - WKE approximation. 								
The Devent of Devent of the Theory Direct and Ocean 1 Contemport			Periods	12						
Transitions – Transition to Continuum of States: Fermi Golden Rule – Constant and Harmonic Perturbation – Transition Probabilities –Selection Rules for Dipole Radiation-Adiabatic and Sudden Approximation – Charged Particle in an Electromagnetic	Unit-V	Time Dependent Perturbation Theory –First Transitions – Transition to Continuum of Sta Rule – Constant and Harmonic Perturba Probabilities –Selection Rules for Dipole Radia	tes: Fermi tion – Tr ation-Adiab	Golden cansition atic and						
1 ⁻¹ Clu.		Total Per	iods	60						

	TEXT BOOKS	
1	Advanced Quantum Mechanics, SatyaPrakash, Kedar Nath Ram Nath Publications, (2013).	
2	Quantum Mechanics, S.L. Gupta, V. Kumar, H.V. Sharma and R.C.Sharma, Jai Prakash Nath & Co., Meerut (2001-2002).	
3	Quantum Mechanics, Claude, Frank and Bernard, John Wiley Inter science, (2003).	
4	G. Aruldass, Quantum Mechanics, Prentice–Hall of India (PHI) Learning Pvt. Limited, (2019).	
5	Introduction to Quantum Mechanics by Griffiths Cambridge university Press.	
6	Quantum Mechanics: Concepts and Applications by Nouredine Zettili Wiley Second Edition (2009).	
	REFERENCES BOOKS	
1	1.A text book of Quantum Mechanics, Mathews and Venkatesan, TMG Hill, (2002).	
2	2.Quantum Mechanics, JaspritSingh, John Wiley Inter science, (2005).	
	WEBSITES SOURCES :	
1	http://alan.ece.gatech.edu/ECE6451/Lectures/ECE6451L4 Postulates Of QMAndOperator sVer2.pdf	
2	https://www.youtube.com/watch?v=IKJAJdDEqhM.	
3	https://www.youtube.com/watch?v=Rx9KdNjQmo&list=PL3V8X5 qW C1MRmSvEMZUjTU3BisDsi2KqV.	
4	https://nptel.ac.in/courses/122/106/122106034.	

PORTE ENCORPORT	VIVE	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
Programme	M.Sc.,	M.Sc., Programme PPH Regulations 2022-2 Code									
Department	Pł	nysics		Seme	ster					II	
Course Code	Cou	Periods Course Name per Week Maximum Ma									
22P2PH06	SPECTROSCOPY -									Total 100	
COURSE OBJECTIVES	and to k	ow the Basic ideas a now the principle ar entations.	about nd fu	differer nctions	nt type of spec	s o: ctro	f spect oscopic	rosco	pio	e theories	
POs		PROGRAMME	OUT	СОМЕ							
PO 1		of demonstrating t ge from undergrad						orehei	ns	ive	
PO 2	Ability to express thoughts and ideas effectively Communicate with others using appropriate 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, analyze and synthesize data from a variety of sources.										
PO 6	To define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data.										
PO 7	Ability to work effectively and respectfully with diverse teams, facilitate cooperative or coordinated effort on the part of a group.										
PO 8	Ability to analyze, interpret and draw conclusions from quantitative / qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.										
PO 9	Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society										
PO 10	Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources.										
PO 11	Ability to work independently, identifies appropriate resources required for a project, and manages a project through to completion.										
PO 12	Capability to effectively engage in a multicultural society and interact respectfully with diverse groups.										
PO 13	Capable of demonstrating the ability to identify ethical issues related to ones work, avoid unethical behavior such as fabrication.										
PO 14	setting d can help engage w	ty for mapping out irection, formulating achieve the vision with that vision.	ng ar , mot	i inspiri ivating	ng visi and in	ion .spi	, build iring te	ling a eam r	ne:	eam who mbers to	
PO 15	necessar	acquire knowledge y for participating i d and self - directed	n lea	rning ac							
COs	Join pace	COURSE OUT									
CO 1		nd the techniques s and their spectra									

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

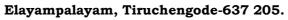
						Kn	owled	lge Lo	evels							
1.Rer	nembo	ering,	2.Un	derst	andin	g, 3.A	pplyi	ng, 4.	Analy	zing,	5.Eval	uating	g, 6.Sy	nthesi	zing	
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CO3	2	3	3	2	1	2	1	1	1	2	3	3	2	2	1	
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CO5	1	1	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$					3	2	1	1	1	2	2	1	
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2. Assignm	ent															
3. End Sen	neste	r Exa	mina	tions	5											

1. Course	End Delivery											
	CONTENT OF THE SYLLABUS											
	ATOMIC SPECTROSCOPY AND MICROWAVE SPECTROSCOPY	Periods	12									
Unit - I	Atomic Spectroscopy: Quantum states of electron in atoms – Hydrogenatom spectrum – Basics Principles - Atomic absorption spectrum and Emission spectrum – atomic Absorption Spectrometer - Electron spin – Stern - Gerlach experiment.											
	Microwave Spectroscopy: Rotation of molecules and their Spectra, Diatomic molecules, Intensity of line spectra, The effect of isotropic substitution, Non - rigid rotator and their spectra, Polyatomic molecules (Linear and Symmetric top molecules) – Microwave Spectrometer.											
	INFRARED AND RAMAN SPECTROSCOPY	Periods	12									
Unit - II	Infrared Spectroscopy: Vibrational energy of diatomic molecules, Simple Harmonic Oscillator, Anharmonic oscillator, Diatomic vibrating rotator, Vibration - Rotation spectrum of carbon monoxide, Influence of rotation on the spectra of polyatomic molecules (Linear and Symmetric top Molecules).											
	Raman Spectroscopy: Raman Effect, Quantum Theory of Raman Effect, Pure Rotational Raman Spectra (Linear and Symmetric top molecules), Selection Rules - Degree of depolarization - Rotational Raman Spectrum - Vibrational Raman Spectrum - Structure determination using IR and Raman spectroscopy - Principles and Working of Raman Spectrometer.											
	IR and Raman spectroscopy - Principles a Spectrometer.		-									
	Spectrometer. ELECTRONIC SPECTROSCOPY	and Workin Periods	g of Raman									
Unit - III	Spectrometer.	Periods Periods Coarse and Dissociation of electronic Spectrum - Chemica y by excite	g of Raman 12 d their energy and - Vibration of molecular l analysis by									
Unit - III	Spectrometer. ELECTRONIC SPECTROSCOPY Born-Oppenheimer Approximation, Vibrational progressions - Franck- Condon Principle-I their products - Rotational fine structure of Transition - Molecular Orbital theory - hydrogen-Change of shape on excitation electronic spectroscopy-Re-emission of energy Instrumentation of UV Photoelectron Spectros	And Workin Periods I Coarse and Dissociation of electronic Spectrum - Chemica y by excite copy.	g of Raman 12 d their energy and - Vibration of molecular l analysis by ed molecule-									
Unit - III Unit - IV	Spectrometer. ELECTRONIC SPECTROSCOPY Born-Oppenheimer Approximation, Vibrational progressions - Franck- Condon Principle-I their products - Rotational fine structure of Transition - Molecular Orbital theory - hydrogen-Change of shape on excitation electronic spectroscopy-Re-emission of energy	And Workin Periods 1 Coarse and Dissociation of electronic Spectrum - Chemica y by excite copy. Periods Classical Des ple and Wor	g of Raman 12 d their energy and - Vibration of molecular l analysis by ed molecule- 12 scription - king of High									
	Spectrometer. ELECTRONIC SPECTROSCOPY Born-Oppenheimer Approximation, Vibrational progressions - Franck- Condon Principle-I their products - Rotational fine structure of Transition - Molecular Orbital theory - hydrogen-Change of shape on excitation electronic spectroscopy-Re-emission of energy Instrumentation of UV Photoelectron Spectros NMR AND NQR SPECTROSCOPY NMR Spectroscopy: Quantum Mechanical and O Bloch Equations - Relaxation Processes - Princip Resolution - NMR Spectrometer -Chemical Sh	And Workin Periods I Coarse and Dissociation of electronic Spectrum - Chemical y by excite copy. Periods Classical Des ple and Wor ift - Applica ndamental r of NQR t	g of Raman 12 d their energy and - Vibration of molecular 1 analysis by ed molecule- 12 scription - king of High tions of NMR requirements - frequencies -									
	Spectrometer. ELECTRONIC SPECTROSCOPY Born-Oppenheimer Approximation, Vibrational progressions - Franck- Condon Principle-I their products - Rotational fine structure of Transition - Molecular Orbital theory - hydrogen-Change of shape on excitation electronic spectroscopy-Re-emission of energy Instrumentation of UV Photoelectron Spectros NMR AND NQR SPECTROSCOPY NMR Spectroscopy: Quantum Mechanical and O Bloch Equations - Relaxation Processes - Princip Resolution - NMR Spectrometer -Chemical Sh Spectroscopy: MRI. NQR Spectroscopy: Basic principles - Furgemental detection	And Workin Periods I Coarse and Dissociation of electronic Spectrum - Chemical y by excite copy. Periods Classical Des ple and Wor ift - Applica ndamental r of NQR t	g of Raman 12 d their energy and - Vibration of molecular l analysis by ed molecule- 12 scription - king of High tions of NMR requirements - frequencies -									
Unit - IV	Spectrometer. ELECTRONIC SPECTROSCOPY Born-Oppenheimer Approximation, Vibrational progressions - Franck- Condon Principle-I their products - Rotational fine structure of Transition - Molecular Orbital theory - hydrogen-Change of shape on excitation electronic spectroscopy-Re-emission of energy Instrumentation of UV Photoelectron Spectros NMR AND NQR SPECTROSCOPY NMR Spectroscopy: Quantum Mechanical and O Bloch Equations - Relaxation Processes - Princip Resolution - NMR Spectrometer -Chemical Sh Spectroscopy: MRI. NQR Spectroscopy: Basic principles - Fu General Principle - Experimental detection Interpretation and Chemical explanation of NQR	Periods I Coarse and Dissociation of electronic Spectrum - Chemical y by excite copy. Periods Classical Des ple and Wor ift - Applical ndamental r of NQR Spectroscop Periods rometer - Res	ig of Ramar 12 itheir energy and d their energy and - Vibration of molecular i analysis by d molecular i analysis by i molecular scription - king of king of High ations of NMR requirements frequencies oy. 12 flection flection									
	Spectrometer. ELECTRONIC SPECTROSCOPY Born-Oppenheimer Approximation, Vibrational progressions - Franck- Condon Principle-I their products - Rotational fine structure of Transition - Molecular Orbital theory - hydrogen-Change of shape on excitation electronic spectroscopy-Re-emission of energy Instrumentation of UV Photoelectron Spectros NMR AND NQR SPECTROSCOPY NMR Spectroscopy: Quantum Mechanical and O Bloch Equations - Relaxation Processes - Princip Resolution - NMR Spectrometer -Chemical Sh Spectroscopy: MRI. NQR Spectroscopy: Basic principles - Fu General Principle - Experimental detection Interpretation and Chemical explanation of NQR ESR AND MOSSBAUER SPECTROSCOPY ESR Spectroscopy: Basic Principles, ESR Spectro	Periods I Coarse and Dissociation of electronic Spectrum - Chemical y by excite copy. Periods Classical Desple and Wor ift - Applical ndamental r of NQR Spectroscop Periods rometer - Res Hyperfine Str ffect, Recoil perimental - Doppler v	ig of Ramarian 12 itheir energy and d their energy and of of molecular analysis by indication molecule 12 scription - king of High tions of NMR requirements - frequencies - y. 12 flection ucture. less emission techniques - relocity shift - scription -									

	TEXT BOOKS
1	D.N.Sathyanarayana, Vibrational Spectroscopy: Theory and Applications, First Edition, New Age International Publishers Pvt., Ltd., New Delhi (2011).
2	G.Aruldhas, Molecular Structure and Spectroscopy, Second Edition, PHI Learning Pvt., Ltd., New Delhi (2008).
3	C.N.Banwell and E.Mccash, Fundamentals of Molecular Spectroscopy, Fifth Edition, Mcgraw- Hill Education India Pvt., Ltd., New Delhi (2013).
	REFERENCES
1	B.P.Straughan and S.Walkar, Spectroscopy, Volume I-III, Chapman and Hall, New York (1976).
2	Randhawa, Modern Molecular Spectroscopy, Macmillan India Ltd., New Delhi (2003).
	E-REFERENCES
1	www.khanacademy.org/science/physics/spectroscopy/microwave spectroscopy.
2	www.khanacademy.org/science/physics/spectroscopy/IR/raman spectroscopy



A



Programme	M.Sc.,	Programme Code	F	PPH		Regulatio	2022-2023						
Department	Phy	vsics		Sen	nester			II					
Course Code	Cour	se Name	Perio per V	Veek	Credit		um Marks						
			L	T P	C	CA	ESE	2 Total					
22P2PHE02	I	ELECTIVE: BIO PHYSICS	4	0 0	4	25	75	100					
COURSE OBJECTIVE S	To learn about the basic biophysics and to know about the principle a working of bio instrumentations and its applications.												
POs			PRC	GR/	AMME O	UTCOME	2						
PO 1		f demonstrating the e from undergradua					hensiv	ve					
PO 2	Ability to others us	express thoughts an ing appropriate med	nd idea lia.	as ef	fectively	Commun	icate v	with					
PO 3		y the relevant assur scientific approach					ument	ts by					
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 problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data.											
PO 7		work effectively and ve or coordinated eff					ams, fa	acilitate					
PO 8		Ability to analyze, interpret and draw conclusions from quantitative/qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.											
PO 9		ensibility to lived exp of both self and so		ces,	with self	awarene	ss and						
PO 10		Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources.											
PO 11	Ability to work independently, identifies appropriate resources required for a project, and manage a project through to completion.												
PO 12	Capability to effectively engage in a multicultural society and interact respectfully with diverse groups.												
PO 13	Capable ones work	Capable of demonstrating the ability to identify ethical issues related to ones work, avoid unethical behavior such as fabrication.											
PO 14	setting di can help	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision											
PO 15	Ability to necessary	engage with that vision. Ability to acquire knowledge and skills, including how to learn, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning.											

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

Knowledge Levels																
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating,																
6.Synthesizing CO / PO / KL Mapping																
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)																
COs	2/11	iuica		KLs	ciigu.				Os Os	011 <u>g</u> , 2			KLs	x)		
								PO 1					1			
CO 1			1					PO 2					2			
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			_			PO 4					3					
CO 2					3			PO 5						5		
								PO 6						1		
00.0					4			P	7 C					б		
CO 3					4			PO) 8				4	4		
) 9			5				
CO 4					2			PO 10						1		
004					4				0 11					2		
								PO 12					2			
CO 5			2					PO 13					3			
								PO 14					3			
								PO 15 PO Mapping					6			
	(3	/9/1	indic	ates	the st			of correlation, 3-strong,					2-medium 1-weak)			
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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 CO4	1	1	1	2	2	1	1	3	2	1	1	1	2	2	1	
C04 C05	2	3	3	2	1	2	1	1	$\frac{1}{1}$	2	3	3	2	2	1	
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Direct				- 40												
1. Continuous	Asses	ssmer	nt Tes	t I, II	&Mo	del										
2. Assignmen			-		-											
3. End Semes		xam	inatic	ns												
Indirect																
1. Course	End I	Delive	ery													
			-													

	CONTENT OF THE SYLLABUS										
	BONDS	Periods	8								
Unit - I	Unit - IIonization energy electron affinity - chemical bonding - electro negativity -strong bonds secondary 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	8								
Unit - II	Artificial (or) Induced radioactivity - Radioactiv	Radiation Biology: Radio activity- Natural radiation (Cosmic rays) - Artificial (or) Induced radioactivity - Radioactive disintegration - Geiger- Muller counter - Crystal counter: Method of detection of disintegration frequency - Biological effects of radiation.									
	BIOLOGICAL STRUCTURE	2 Periods	8								
Unit - III	Bio - molecules and biological energy Biol acids – DNA – RNA – conformation - p Biological Membranes: Historical backg chemistry and structure - membrane phy Energy consumption respiration – photosynt	roteins protei round – r ysics. Biologic	n folding. nembrane al energy:								
	NATURE OF ORGANISMS	B Periods	8								
Unit - IV	Movement of organisms Bacterial r memory in primitive organisms - muscular r performance, nerve signals and memory Ex Diffusion and mobility of Ions - resting pote Passive response - Nerve impulses (action po- system.	ovement - hun citable membr ntial Nerve si	nan ranes: gnals:								
	INSTRUMENTATION	Periods	12								
Unit - V	Control of movement Primary of movement simplified visual system - more sophisticat structure of muscle fibers - central pattern reflexes – volition - and Free will - consciousr in mental processing.	ed - mode of generators - c	control - onditioned								
	Total Periods		40								

	TEXT BOOKS									
1	Rodyney M.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:// <u>www.google.com/search?q=http%2F+radiation+physics&ie=utf-8&oe=utf-8&</u> <u>clie</u> nt=firefox-b-ab.									





EN ENPOWER'S												
Programme	M.Sc.,	Programme Code		PPH	R	egulation	ns	2022-2023				
Department	Phy	sics		Sen	nester				II			
Course Code	Cours	se Name	P	eriods								
	Court		-	per /eek	Credit		Ma	ximu	ım Marks			
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22P2PH04	ELECTRO	MAGNETIC										
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COURSE	design Ele	ide the basic skill ectromagnetic ma	is req	uirea i s.	to unders	tand, de	evelo	p, an	a			
OBJECTIVES	_	nce their search			electricity	and ma	agne	tism				
POs			DD	OGPA	MME O	ΙΙΤΟΟΝ	/F					
105	0 11				_							
PO 1	knowledg	of demonstrating e from undergra	duate	e prog	ramme o	f study.	-					
PO 2		express thoughts ng appropriate n anner.										
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, analyze and synthesize data from a variety of sources then draw valid conclusions and support them with evidence and examples, and addressing opposing											
PO 6	interpret a	problems, formul and draw conclus ips and ability to	sions	from d	lata, pred	ict caus	e-an	d-eff	ect			
PO 7	Ability to	work effectively a ve or coordinated										
PO 8	qualitative	analyse, interpre e data and critica pen-minded and	lly ev	aluate	ideas, ev	idence a						
PO 9		nsibility to lived If and society.	exper	iences	, with sel	f awarer	ness	and	reflexivity			
PO 10	Capability ability to a	to use ICT in a vaccess, evaluate, nd useappropriate	and i	ise a v	rariety of	relevant	info					
PO 11		Ability to work independently, identifies appropriate resources required for a project, and manage a project through to completion.										
PO 12		Capability to effectively engage in a multicultural society and interact respectfully with diverse groups.										
PO 13	Capable o	f demonstrating , avoid unethical	the at	oility to				es rel	lated to			
PO 14		for mapping out rection, formulati					gani	zatio	n, and			
PO 15		acquire knowledg for participating							hat are			

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.

						Knov	vledge	e Leve	els							
			iberin sizing		Jnder	stand	ing, 3	.Appl	ying,	4.Ana	lyzing	, 5.Ev	aluati	ng,		
					C	O /	PO /	KL I	Map	ping						
(3/	2/1 in	ndica	tes th	ne str	ength	of co	orrela	tion,	3-stro	ong, 2	-med	ium, 1	l-wea	k)		
COs				KLs				P	Os				KLs			
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								PO 3						2		
CO 2					2			PO	D 4					3		
0.02					4			PO	D 5					5		
								PO	06					1		
CO 3					2			P	7 C					6		
003				2				PO	28					4		
									09					5		
CO 4					3				0 10					1		
004					5				D 11					2		
								PO 12					2			
CO 5					3			PO 13						3		
000			5					PO 14				3				
									0 15					6		
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		Ŭ	U	U	0	U		Ŭ	U	0	1	2	3	4	5	
	1	2	3	4	5	6		8	9							
CO	3	2	2	1	1	3	1	1	1	3	2	2	1	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	
Course As	sessm	ient l	Metho	ods		L	. <u> </u>					1	1	1		
Direct																
1. Continuous	Asses	ssmer	nt Tes	t - I, I	I & N	lodel										
2. Assignmen	t															
3. End Seme	ster E	xami	inatio	ons												
Indirect																
1. Course	End I	Delive	ery													
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	CONTENT OF THE SYLLABUS		
	ELECTROSTATICS	Periods	14
Unit - I	Coulombs law - Field due to point and continuous and its application - Laplace and Poissons equation equation in spherical Coordinates - Point charge sphere - Multipole expansion - Electrostatic er Polarization and Displacement vectors, Boundary sphere in a uniform field - Molecular polariz susceptibility - Clausis- Mossotti equation.	ons - Solution in front of a nergy - Di conditions	n of Laplace conducting electrics - - Dielectric
	MAGNETOSTATICS	Periods	10
Unit - II	Biot-Savarts law - Divergence and curl of magnetic vector potential - Amperes circuital law - Magnetic current distribution - Magnetic moment and distribution in an electric field - Magneto stat induction and Magnetic field in a macroscopic magnetic dipole - Boundary conditions - Uniform Magnetic Scalar & Vector Potential - Characteristic	ic field of a force on a ic energy - media - C ily magnetize	a localized a current Magnetic Concept of
	ELECTROMAGNETICS	Periods	10
Unit - III	Faradays law of induction - Maxwell's equati isotropic media - Maxwell's displacements curre potential - Boundary conditions on the field a between field theory and circuit theory - Gauge Gauge - Coulomb gauge – Conservation laws fo Poynting theorem.	nt - Vector a t interfaces transformatio	and Scalar - Relation on, Lorentz
	WAVE PROPAGATION	Periods	14
Unit - IV	Propagation of waves in rectangular wave guide	on and Tran ls Law - Inte s - Wave	smission erference,
	PLASMA PHYSICS	Periods	12
Unit - V	Plasma - Debye length - Plasma oscillations - magnetic field - Boltzmann equation – Magneto h - Electron plasma oscillations - Debye shield confinement in a magnetic field – Pinch effect - I waves - Alfven waves – Dynamics of charg electromagnetic fields - Plasma arc welding techni	ydrodynamic ing problem Magneto hyd ed particle i	e equations - Plasma rodynamic
	Total Periods		60
	TEXT BOOKS		
1 2	Introduction to Electrodynamics, Griffith, Prent Electromagnetic Waves and Fields, Paul Corson Publishers, (2005).		, ,
	REFERENCES		
1	Basic Electromagnetics with Application, N. Naraya India, (2001).		
2	Electromagnetic Theory and Applications, Umesh S Publications, (2005).	Sinha, Tech I	ndia
	E-REFERENCES		
1	https://www.google.com/search?q=http%2F+electron 8&oe=utf-8&client=firefox-b-ab	magnetic+the	ory&ie=utf-
2	.https://www.google.com/search?q=hppt%2F+magne 8&oe=utf-8&client=firefox-b-ab	etostatics&ie=	-utf-





AN ENDANCE.												
Programme	M.Sc.,	Programme Code	F	PH		Regul	ations	2022-2023				
Department	Phy	/sics		Se	eme	ster		III				
Course Code	Cour	se Name	Per per	Wee	ek	Credit		laximum Marks				
			L	Т	Р	С	CA	ES E	Total			
22P3PH07	CONI	DENSED MATTER	5	0	0	4	25	75	100			
COURSE OBJECTIVE S	physics.	oject provides an enge the student										
POs			PR	OGI	RAN	IME OUTC	OME					
PO 1		f demonstrating e from undergrad						rehens	sive			
PO 2		express thoughts ropriate media an										
PO 3	following	To identify the relevant assumptions to formulate the arguments by following scientific approach to knowledge development.										
PO 4	Capacity to life situation	Capacity to solve different kinds of non-familiar problems and apply to real life situations.										
PO 5	-	evaluate the reliat data from a vari	-					-				
PO 6	interpret a	problems, formula and draw conclust ips and ability to t.	ions fro	om o	lata	, predict o	cause-a	nd-eff	ect			
PO 7	cooperativ together a	work effectively an ve or coordinate as a group or a t iently as a memb	ed effo eam in	rt th	on e ir	the part nterests o	of a	group	and act			
PO 8	qualitative	analyze, interpret data and critical pen-minded and	ly evalu	late	e ide	eas, evider						
PO 9		nsibility to lived e f and society.	experier	nces	3, W	ith self-av	varenes	s and	reflexivity			
PO 10	ability to	to use ICT in a access, evaluate, ac appropriat	and us	e a	var	iety of rele	evant in					
PO 11	Ability to work independently, identifies appropriate resources required for a project, and manages a project through to completion.											
PO 12		to effectively eng ly with diverse gro	-	a m	ulti	cultural s	ociety a	nd int	eract			
PO 13	respectfully with diverse groups. Capable of demonstrating the ability to identify ethical issues related to ones work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual proper tyrights.											

PO 14	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision.
PO 15	Ability to acquire knowledge and skills, including how to learn, that are necessary for participating in learning activities 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

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		0.55	mine	sizing		CO /	PO /	KL N	[appir	ופ								
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PO 14 3 PO 14 PO 14 PO 15 CO / PO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak) COs Programme Outcome (POs) Programme Outcome (POs) PO PO </td <td>CO 5</td> <td></td> <td></td> <td></td> <td></td> <td>5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="4"></td>	CO 5					5												
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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	
Course Assessment Methods																
Direct																
1. Continuous Assessment Test - I, II & Model Exam.																
2. Assignment.																

3. End Semester Examinations.

Indirect

	CONTENT OF THE SYLLAB	BUS								
	ELECTRON ENERGY BANDS	Perio	ods 12							
Unit - I	Fundamentals of crystailline states - indices –Simple crytal structure (SC,BCC,J energy bands - Fermi surface - Density of st - Kronig Penney model - Brillouin zones - r bands in a general periodic potential - Mo dimensional lattice - Effective mass of an elec and band overlapping - Anomalous skin effe effect.	FCC)-Basic ates - The reciprocal i otion of an ctron - Eff	e concepts of Blochs Theorm lattice - Energy electron in one fective band gap							
	FREE ELECTRON THEORY OF METALS	Perio	ds 12							
Unit - II	Free electron in metals - Drude Lorentz free electron theory - Electrical conductivity - Thermal conductivity- Weidemann Franz law -Sommerfield free electron theory – Mattiessens Rule- Thermionic emission - Relaxation time - Collision time - Mean free path -Quantum theory of free electrons- Escapeofelectronsfrommetal-Potentialenergyofanelectronoutsidethe metal- Dulong and Petit law –Debye theory- Einstein theory of specific heat									
	BAND THEORY OF SEMICONDUCTORS	Perio	ds 12							
Unit - III	Introduction Band structure of semiconductors law – intrinsic semiconductor: carrier conductivity – Extrinsic semiconductor: derivation of carrier concentration for P-type a the variation of Fermi level with temperature – of Hall coefficient and its applications.	oncentratio Bandgap and n-type	on – electrical determination- semiconductor-							
	DIAMAGNETISM, PARAMAGNETISM ANDFERROMAGNETISM	Periods	12							
Unit - IV	Diamagnetism -Langevin classical th Paramagnetism - Weiss theory of paramagne Paramagnetism –Demagnetization of a paramag of susceptibility of para and diamagnetism Ferromagnetism - Quantum theory of ferromag	etism –Qua gnetic salt using Gu	- Determination oys method -							
		romagneti								

	SUPERCONDUCTIVITY AND SPINTRONICS Periods	12
Unit – V	Superconductivity and its historical perspective - Temperature - Persistent current - Energy gap and its Te dependence - Type I and Type II superconductors - BCS the quantization – London equation - DC and AC Josephson et temperature Superconductors – Ceramic Super Con- Applications: SQUID - High temperature. Spintronics : Electron spin in Solid - Spin relaxation and spacing – Spintronic devices	emperature cory - Flux effect High iductors -
	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.



VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.



WEN EMPOWER										
Programme	M.Sc.,	Programme Code	PPH	Regulat	ions	2022-2023				
Department	Ph	ysics	Sem	ester	III					
Course Code	Cour	rse Name	per Week N			Marks				
22P3PH08	0114 117		L T F	-	CA		Total			
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COURSE OBJECTIVES	quantu	aire knowledge of r m mechanics. itytounderstandco es.					atteringo			
POs		PROGRAMME	OUTCOME							
PO 1		of demonstrating ge from undergrad				prehens	ive			
PO 2	others	using appropriate media and interpret the idea in clear and concise								
PO 3	To identif	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, analyze and synthesize data from a variety of sources then draw valid conclusions.								
PO 6	To define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, predict cause-and-effect relationships and ability to plan, execute and report the results of an experiment.									
PO 7	Ability to work effectively and respectfully with diverse teams, facilitate cooperative or coordinated effort on the part of a group and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.									
PO 8	Ability to analyze, interpret and draw conclusions from quantitative / qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.									
PO 9	Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.									
PO 10	Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources and use appropriate software for analysis of data.									
PO 11	-	Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.								
PO 12	Capability to effectively engage in a multicultural society and interact respectfully with diverse groups.									
PO13	ones wo falsificati	of demonstrating th ork, avoid uneth on or misrepresen ring to intellectual	hical behav tation of dat	rior such a or com	ı as	fabrica	tion,			

PO 14	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision.
PO 15	Ability to acquire knowledge and skills, including how to learn, that are necessary for participating in learning activities throughout life.
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

	Knowledge Levels														
		1.Re	emem vnthes	bering	g, 2.U	nders	standi	ng, 3.	.Apply	ving, 4	.Analy	zing,	5.Eval	luatin	g,
		0.05	intine	,121115											
						CO	/ PC) / K	L Ma	appin	g				
	(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)														
COs				KLs				Р	Os]	KLs		
CO 1				1				Р	O 1					1	
					T			PO 2						2	
									C 3					2	
CO 2				4					D 4					3	
			7						D 5					5	
									06					1	
CO 3					3			PO 7				6			
								PO 8				4			
								PO 9				5			
CO 4		5 PO 10						1							
									PO 11 PO 12			2			
								PO 12 PO 13				3			
CO 5		4 PO 13						3							
								PO 15				6			
								1010					0		
				CO	/ PO	Мар	ping								
		(3/2	2/1 in							3-stro	ong, 2-1	mediu	m, 1-w	veak)	
					-		Outco	•							
COs	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 1	PO 1	РО 1	PO 1	РО 1	PO 1
							'			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	1	2	2	3	1	1	1	2	1	1	2	2	3	3	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	ssment Methods		
	ssessment Test - I, II & Model Exam.		
Assignment.			
	er Examinations.		
Indirect			
1. Course E	1d Delivery		
	CONTENT OF THE SYLLABUS	S	
	THEORY OF RADIATION	Periods	12
	Emission & Absorption of radiation Electric	dipole appro	oximation ·
	Einstein's Transition probabilities and A & B	Coefficients	- Selection
Unit - I	rules – Interaction with matter - Spontaneous &		
	forbidden transitions.		
	Quantum theory of Valance Band, VD method	Litton Ior	adan thaar
	Quantum theory of Valence Bond: VB method		
	of Hydrogen molecule in VB method - Refinemen	its of Simple	MO and vi
	approximations.		
	SCATTERING THEORY	Periods	12
			-
	Scattering cross section - differential and total	cross section	S
	- Scattering amplitude – Kinematics of scatter	ing process	- Green's
TT	function - Partial wave analysis - Phase shifts - S	Scattering by	Coulomb
Unit - II	potential - Low energy scattering: Scattering leng	gth and effect	ive range
	- Scattering by a perfectly rigid sphere.		
	MANY ELECTRON ATOMS	Periods	12
	e i j	metrical a	
Unit - III	symmetrical wave functions - Paulis Exclusion		nd Anti
01111 - 111	ania Onia francticana frantzara alectarena diana		clusion of
	spin - Spin functions for two electrons - three e	lectrons - He	nclusion of lium atom
	spin - Spin functions for two electrons - three e - Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Kob	lectrons - He i model of th	nclusion of lium atom
	- Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Kol	lectrons - He i model of th nn-Sham.	nclusion of lium atom he atom -
	- Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Koh RELATIVISTIC WAVE EQUATION	lectrons - He i model of th nn-Sham. Periods	nclusion of lium atom he atom - 12
	- Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Koh RELATIVISTIC WAVE EQUATION Klein - Gordan Equation – Dirac's equation fo	lectrons - He i model of th nn-Sham. Periods or a free partic	nclusion of lium atom he atom - 12 Ele - Dirac
Unit - IV	 Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Kole RELATIVISTIC WAVE EQUATION Klein - Gordan Equation – Dirac's equation for Matrics - Covariant form of dirac equation - Proba 	lectrons - He i model of th nn-Sham. Periods or a free partic ability density	nclusion of lium atom he atom - 12 ele - Dirac y and
Unit - IV	 Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Kole RELATIVISTIC WAVE EQUATION Klein - Gordan Equation – Dirac's equation for Matrics - Covariant form of dirac equation - Probacurrent density - Plane wave solution - significant 	lectrons - He i model of th nn-Sham. Periods or a free partic ability density	nclusion of lium atom he atom - 12 ele - Dirac y and
Unit - IV	 Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Kole RELATIVISTIC WAVE EQUATION Klein - Gordan Equation – Dirac's equation for Matrics - Covariant form of dirac equation - Proba 	lectrons - He i model of th nn-Sham. Periods or a free partic ability density	nclusion of lium atom he atom - 12 ele - Dirac y and
Unit - IV	 Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Kole RELATIVISTIC WAVE EQUATION Klein - Gordan Equation – Dirac's equation for Matrics - Covariant form of dirac equation - Probacurrent density - Plane wave solution - significant 	lectrons - He i model of th nn-Sham. Periods or a free partic ability density	nclusion of lium atom he atom - 12 ele - Dirac y and
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Unit - IV	 Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Koher RELATIVISTIC WAVE EQUATION Klein - Gordan Equation - Dirac's equation for Matrics - Covariant form of dirac equation - Probacurrent density - Plane wave solution - significant states - Hydrogen atom. QUANTUM FIELD THEORY 	lectrons - Hei i model of th nn-Sham. Periods or a free partice ability density nee of negative Periods	12 12 12 12 12 12 12 12 12 12
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Unit - IV Unit - V	 Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Koh RELATIVISTIC WAVE EQUATION Klein - Gordan Equation – Dirac's equation for Matrics - Covariant form of dirac equation - Probacurrent density - Plane wave solution - significant states - Hydrogen atom. QUANTUM FIELD THEORY Quantization of the wave fields - Classical Lagra Classical Hamiltonian equation - Field Quar relativistic Schrodinger equation - Creation, Detection 	lectrons - Hei i model of th nn-Sham. Periods or a free partice ability density nee of negative Periods ungian equation antization of estruction an	nclusion of lium atom he atom - 12 cle - Dirac y and e eigen 12 on- the non d Number
	 Central field approximation - Thomas Fermi Hatree Equation - Hatree - Fock Equation - Koh RELATIVISTIC WAVE EQUATION Klein - Gordan Equation – Dirac's equation for Matrics - Covariant form of dirac equation - Probacurrent density - Plane wave solution - significant states - Hydrogen atom. QUANTUM FIELD THEORY Quantization of the wave fields - Classical Lagra Classical Hamiltonian equation - Field Quar relativistic Schrodinger equation - Creation, Decomposition - Creation, Decomposition - Photons - Anti Commutation Relation 	Periods Periods Periods Periods Periods Periods Periods Periods Ingian equation antization of Periods antization antizati	12 12 12 12 12 12 12 12 12 0n- the non d Number
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	TEXT BOOKS
1	Quantum Mechanics G Aruldhas - Prentice Hall of India, (2006).
2	Quantum Mechanics "Satyaprakash - Sultan Chand Publishers, (2013).
3	Quantum Mechanics "Gupta Kumar Sharma - JaiprakashNath Publications,Meerut, (2013).
	REFERENCES
1	A text Book of Quantum Mechanics "P. M.Mathews & K.Venkatesanâ 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/





022-2023									
III									
Marks									
Total									
100									
Ability to express thoughts and ideas effectively Communicate with others using appropriate media and interpret the idea in clear and concise manner.									
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, analyze and synthesize data from a variety of sources then draw valid conclusions.									
To define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, predict cause-and-effect relationships.									
Ability to work effectively and respectfully with diverse teams, facilitate cooperative or coordinated effort on the part of a group.									
Ability to analyze, interpret and draw conclusions from quantitative/qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.									
Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.									
Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources and use appropriate software for analysis of data.									
Ability to work independently, identifies appropriate resources required for a project, and manages a project through to completion.									
Capable of demonstrating the ability to identify ethical issues related to ones work, avoid unethical behavior as fabrication.									
d									
are									

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 in8085.
CO 3	To acquire the knowledge of INTEL 8257. Apply the direct memory access in Data transfer.
CO 4	To get the knowledge about applications of microprocessor architecture of 8051. Understand the counters and timers.
CO 5	To get the knowledge about architecture of 8051 and instruction set of 8051. Apply the ascending and descending order program in8051.
Pre- requisites	To Acquire idea about microprocessor programming

]	Know	ledge	Leve	els						
1.Re	memt	pering	, 2.Ur	nderst	tandiı	ng, 3.	Apply	ing, 4	.Anal	yzing,	5.Eva	luatin	g, 6.S	ynthe	sizing
						/ PO				-					
	3/2/1	indi	cates	ates the strength of correlation, 3-strong, 2-medium, 1-weak										eak)	
COs				KLs					Os]	KLs	_	
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CO 2					5				C) 4 C) 5					3 5	
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CO 3					1			PO 7 PO 8						4	
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								PO 9 PO 10				1			
CO 4			3					PO 11				2			
								PO 12				2			
								PO 13				3			
CO 5			2					PO 14				3			
								PO 15				6			
					CC) / P	O Ma	D Mapping							
	(3/2/	1 ind	icates	the					-	strong	g, 2-m	edium	ı, 1-w	eak)	
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CO1	3	2	2	1	1	3	1	1	1	03	2	2	3	4	5 1
CO1 CO2	1	1	1	1	3	1	2	2	3	1	1	1	1	1	2
CO2 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
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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 SYLLABU	IS							
	EVOLUTION AND ARCHITECTURE OF MICROPROCESSORS 8085	Periods	12						
Unit - I	Evolution of Microprocessors - INTEL 8085 microprocessor - Pin configuration - Pins and their functions - Bus system - Control and status signals - Externally initiated signals including interrupts - Architecture - ALU - Flags - Registers. Timing and Sequencing: Instruction cycle, Machine cycle -Halt state and Wait state.								
	Interrupts: Types of interrupts - Hardware and Software interrupts - masking and unmasking interrupts.								
	INSTRUCTION SETS & PROGRAMMING OF MICROPROCESSOR 8085	Periods	12						
Unit - II	Assembly language - Instruction sets of 8085 - Stacks - Counters - Subroutines – MACRO - Delay Subroutine - Examples of Assembly language Programming 16 bit Addition - 16 bit Subtraction - 16 bit Multiplication - 16 bit Division – The Largest and Smallest number in a								
	data array - Ascending and Descending orders o of a series in arrays- Factorial of a given number.	t a set of arr	ays -Sum						
	PERIPHERAL DEVICES AND THEIR INTERFACING	Periods	12						
Unit - III	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 (Counter) Timer (PIT) INTEL 8253. Data Transfers: Types of parallel and serial data transfer schemes - Direct Memory Access (DMA) controller INTEL								
	8257. Interfacing: Working and Programming of PIC	8259 with 8	085.						
	INTERFACING DEVICES AND THEIR APPLICATIONS	Periods	12						
Unit - IV									
	ARCHITECTURE AND MICROCONTROLLER 8051 PROGRAMMING	Periods	12						
Unit - V	Introduction–Comparison between microcontroller and microprocessors - Key features of 8051 - Architecture of 8051 – Instruction set of 8051 – Assembly language programming – Sum of 'n' numbers - biggest and smallest in an array - Ascending and								
	descending order program in an array – Software	C C	iung anu						

	TEXT BOOKS
1	Ramesh S.Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Fifth Edition, Penram International Publishing Pvt., Ltd., Mumbai (2000).
2	B. Ram, Fundamentals of Microprocessors and Microcontrollers, Ninth Edition, Dhanpat Rai Publications Pvt., Ltd., New Delhi (2019).
3	KennethJ.Ayala,The8051Microcontroller –Architecture, Programming & Applications, Third Edition, West Publishing Company, NewYork India (2007).
	REFERENCES
1	A.P.Godse and D.A.Godse, Microprocessors and Microcontrollers, Technical Publications, Pune (2015).
2	M.Gilmore, Microprocessor Principles and Applications, Second Edition, Mcgraw- Hill Education India Pvt., Ltd., New Delhi (1995).
3	Aditya P.Mathur, Introduction to Microprocessors, Third Edition, Mcgraw-Hill Education India Pvt., Ltd., New Delhi (2006).
4	Rafiquzzaman, Microprocessors - Theory and Applications: Intel and Motorola, Revised Edition, Prentice Hall of India Pvt., Ltd., New Delhi (1993).
5	Kenneth J. Ayala, The 8051 Microcontroller – Architecture, Programming & Applications, Third Edition, West Publishing Company, New York India (2007).
	E-REFERENCES
1	https://onlinecourses.nptel.ac.in/noc20_ec03.
2	https://www.elprocus.com/microprocessor-and-microcontroller/





			I _			-					
Programme	M.Sc.,	Programme Code	F	PPH		Regi	lations	202	2-2023		
Department	Ph	ysics		Se	mes	ster			III		
Course Code	Cour	rse Name		erioo r We		Credit		Maximu	m Marks		
			L	Т	Р	С	CA	ESE	ESE Total		
22P3PHED1	EDC : SOLAR ENERGY 4 0 0 4 25								100		
COURSE OBJECTIVES	 Energy resources around us. Threatening to our energy resources. How to conserve energy. 										
POs		PROGRAM	~	тсо	ME						
PO1		of demonstratir gefrom undergra						orehensi	ive		
PO2		express though propriate media.		idea	is e	ffectively C	Commun	icate wit	h others		
PO3		y the relevant as scientific approa						uments	by		
PO4	situations					-					
PO5	synthesiz	Ability to evaluate the reliability and relevance of evidence, analyse and synthesize data from a variety of sources.									
PO6		To define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data.									
PO7	cooperati	work effectively ve or coordinate	d effor	t on	the	e part of a	group.				
PO8	qualitativ	analyze, interpr e data and critic pen-minded and	cally ev	valua	ate	ideas, evid	-		,		
PO9		ensibility to lived elf and society	1 expe	rieno	ces,	with self-a	awarene	ss and r	eflexivity		
PO10		y to use ICT in a access, evaluate		•							
PO11		work independe and manage a j						arces rec	quired for		
PO12		y to effectively en lly with diverse a			mu	lticultural	society a	and inte	ract		
PO13	-	of demonstrating k, avoid unethic	-		· ·	•		ues rela	ted to		
PO14	setting di	y for mapping ou rection, formula eve the vision, n vision.	ting ar	n ins	spir	ing vision,	building	g a team	who can		
PO15	necessary	acquire knowled 7 for participatin self-paced and se	ıg in le	arni	ng	activities t			at are		

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.

Knowledge Levels 1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating,																
		1.Rer	nemb	ering,	2.Un	derst	andin	g, 3.A	pplyi	ng, 4./	Analyz	zing, 5	.Evalu	lating,	,	
							0.5	ynthe	SIZITIĘ	5						
					CC) / P	0/1	KL M	appi	ng						
(3	3/2/	'1 inc	licate	s the	strer	ngth o	of cor	relatio	on, 3-	stron	g, 2-n	nediui	m, 1-			
							weak	,								
COs				KLs					Os			KLs				
CO 1					1				$\frac{01}{2}$					1		
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								PO 15				6				
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	(3,	/2/1	indic	ates t	he st	rengt	h of c	correla	ation	, 3-str	ong, 2	2-med	lium,	1-wea	k)	
COs –				-				(POs								
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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	1	2	1	1	1	2	1	1	1	1	1	3	
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	
Course Asses	ssm	ient l	Metho	ods												
Direct																

- 1. Continuous Assessment Test I, II &Model Exam.
- 2. Assignment.
- 3. End Semester Examinations.

Indirect

	CONTENT OF THE SYLLABU	JS							
Unit - I	INTRODUCTION TO ENERGY SOURCES	Periods	9						
	Classification of Energy sources - Worlds reserve of commercial energy sources and their availability - Geothermal energy - wind energy - Ocean thermal energy conversion - Energy from waves and tides (basic ideas) - Merits and Demerits.								
	SOLAR THERMAL ENERGY	Periods	9						
	Introduction about thermal properties - Renewable energy - Solar water heater - Solar Pumping - Sola heating and cooling - Solar thermal technologies Pond - Merits and Demerits of solar energy.	r furnace - S	Solar space						
	SOLAR CELL	Periods	9						
	Introduction about semiconductor - Photo voltaic solar cell - Solar cell Parameter - Solar cell efficiency – Choice of materials for solar cell - E obtaining an effective solar cell - Power generatio	l characteri Basic require	stics and ements for						
	BIOMASS ENERGY FUNDAMENTALS	Periods	9						
Unit - IV	Biomass energy - Classification - Photosynth Generation - Introduction basic process and e Biomass conversion technology – Wet and dry p and its Applications - Advantages and Disadvar biomass energy.	nergetic, Ac process - Go	lvantages -						
	ENERGY STORAGE	Periods	9						
Unit - V	Introduction - Liquid media storage - Solid m collector - Chemical storage-Capacitor, Electroma Magnet Energy Storage (SMES)systems.								
	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								





OWEN EMPOWERMEN											
Programme	M.Sc.,	Programme Code	PPH Regulations						22-2023		
Department	Phy	sics		Sen	nester				IV		
Course Code	Cours	e Name		Periods Week	Credit	Maximum			n Marks		
			L	T P	С	CA	ES	E	Tota		
22P4PH10	NUCLEA	R AND PARTICLE PHYSICS	6	0 0	5	25	75	5	100		
COURSE	1 Explain	central concepts law	<u>s an</u>	1 mod	el sin nuc	lear a	nd narti	cle n	hysics		
OBJECTIVES	-	c laws and relations					ina parti	cic p	11y 5105.		
POs	21 0 0 0 0 000				AMME OU		IE				
PO 1	Capable of from unde	demonstrating the l rgraduate programm	basic le of s	conce study.	epts and co	ompro	ehensive	knov	wledge		
PO 2		xpress thoughts and opriate media and in									
PO 3	To identify scientific a	To identify the relevant assumptions to formulate the arguments by following scientific approach to knowledge development.									
PO 4	Capacity to situations.	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, analyses and synthesize data from a variety of sources then draw valid conclusions.										
PO 6		oroblems, formulate conclusions from dat									
PO 7		vork effectively and r e or coordinated effe						ilitat	e		
PO 8	qualitative	nalyze, interpret an data and critically e inded and reasoned	evalu	ates id	leas, evide						
PO 9		nsibility to lived expe nd society.	erieno	ces, wi	ith self aw	arene	ess and r	eflex	ivity of		
PO 10	to access,	to use ICT in a vari evaluate, and use a e software for analys	varie	ty of r							
PO 11		vork independently, d manage a project					rces requ	Jired	for a		
PO 12		to effectively engage y with diverse group		multio	cultural so	ociety	and inte	eract			
PO 13		demonstrating the a dunethical behavior				cal is	sues rela	ated	to ones		
PO 14		for mapping out the ection, formulating a				n orga	anizatior	i, and	1		
PO 15		cquire knowledge ar for participating in l						nat a	re		

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 Gamow's 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

					1	Know	ledge	Leve	ls							
	1.]	Reme	mberi	ng, 2	.Unde					, 4.An	alyzin	g, 5.E	valua	ting,		
					CO		6.Syn / KI		zıng ppinş	у У						
	(3/)	/1 in	dicat		-		-				η α Ω_1	mediu	ım 1_	weak)		
COs	(5/2	/ 1 11	uicat	KLs	500	iigiii			$\frac{1011, 0}{0s}$	-51101	1g, 2-1		KLs	weak		
									01			1				
CO 1					1				 2 2					2		
									C 3					2		
								P	D 4					3		
CO 2					2			P	O 5					5		
								P	0 6					1		
					_			Р	07					6		
CO 3					1			P	2 8 C					4		
								PO	C 9					5		
00.4					-			PC	0 10				1			
CO 4					5			PO 11					2			
									0 12					2		
CO 5					4				0 13					3		
000					Т			PO 14				3				
								PO 15					6 3-strong, 2-medium,			
CO / I weak)	PO Ma	appin	ıg (3/2	2/1 i	ndica	tes th	ne str	ength	of co	orrelat	ion, 3	-stroi	ng, 2-:	mediu	ım,	
]	Progr	amm	e Ou	tcom	e (PC)s)							
COs	Р	Р	Р	Р	Р	Р	PO	Р	Р	PO	PO	PO	PO	PO	PO	
	0 1	0 2	0 3	0 4	0 5	0 6	7	0 8	0 9	$\begin{array}{c} 1\\ 0\end{array}$	1 1	$\frac{1}{2}$	1 3	1 4	1 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	
Course Ass	sessm	ient l	Metho	ods												
Direct																
1. Continuous	Asse	ssme	nt Tes	st - I,	II & N	Model										
2. Assignmen	t															
3. End Seme	ster E	Exam	inatio	ons												

Indirect

	CONTENT OF THE SYLLAP	BUS								
	NUCLEAR PROPERTIES AND MODELS	Periods	12							
Unit - I	 I Basic nuclear properties: Size, shape and charge distribution-spin and parity-determination of nuclear mass-binding energy - nuclear stability- Mass Parabola - Liquid drop model - Semi empirical mass formula - Shell Model - Prediction of Magic numbers and energy levels by shell model - Prediction and failure of the shell model - Optical Model - Introduction to collective model - Collective model of Bohr and Mottelson. 									
	NUCLEAR REACTIONS	Periods	12							
Unit - II	Nuclear reactions and reaction mechanism - Types of reactions and conservation laws – Reciprocity theorem - Energetic of 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-Wigner one level formula - continuum theory of nuclear reaction.									
	NUCLEAR INTERACTIONS	Periods	12							
Unit - III	Nature of Nuclear forces - Exchange forces - Two body problems - ground state of deuteron - Magnetic moment - Quadrupole moment - Nucleon -nucleon interaction: NP scattering, PP scattering at low energy, non- central - Meson theory of nuclear forces - Effective range theory - Spin dependence of nuclear forces-Charge independence and charge symmetry of nuclear forces.									
		ependence a								
		ependence a Periods								
Unit - IV	symmetry of nuclear forces.	Periods 7 of beta dec 2 nomentum a 2 comparative - Non-conse	nd charge 12 cay - Total and parity half-lives – ervation of							
Unit - IV	symmetry of nuclear forces. NUCLEAR DECAY Gamow's theory of alpha decay - Fermi's theory decay rate - Mass of the neutrino - Angular in selection rules - Allowed and forbidden decays - O Gamma decay - Neutrino Hypothesis – Helicity parity - Multipole transitions in nuclei - Interna	Periods 7 of beta dec 2 nomentum a 2 comparative - Non-conse	nd charge 12 cay - Total and parity half-lives – ervation of							
Unit - IV Unit - V	symmetry of nuclear forces. NUCLEAR DECAY Gamow's theory of alpha decay - Fermi's theory decay rate - Mass of the neutrino - Angular ra- selection rules - Allowed and forbidden decays - O Gamma decay - Neutrino Hypothesis – Helicity parity - Multipole transitions in nuclei - Interna- isomerism. PARTICLE PHYSICS	Periods v of beta dec momentum a comparative - Non-conse 1 conversion Periods entary part s- Symmetries C invariance ubo mass for	12 cay - Total and parity half-lives – ervation of - Nuclear 12 icles s and - Isospin							

	TEXT BOOKS
1	Satya Prakash, Nuclear Physics and Particle Physics, First Edition, Sultan Chand & Sons, New Delhi (2005).
2	S.L.Kakani and Shubhra Kakani, Nuclear and Particle Physics, Second Edition, Viva Books Pvt., Ltd., New Delhi (2013).
3	M.L.Pandya, R.P.S.Yadav and Amiya Dash, Elements of Nuclear Physics, Kedar Nath Ram Nath, Meerut (2020).
4	D.C.Tayal, Nuclear and Particle Physics, Second Edition, Himalaya Publishing House, Mumbai (2020).
	REFERENCES
1	Kenneth S.Krane, Introductory Nuclear Physics, Wiley India Pvt., Ltd., New Delhi (2008).
2	David Griffiths, Introduction to Elementary Particles, Second Edition, John Wiley and songs, New York (2008).
3	S.N.Ghoshal, Nuclear Physics, S.Chand Publishing Company, New Delhi (2019).
4	H.S.Hans, Nuclear Physics: Experimental and Theoretical, Revised Second, New Age International Publishers Pvt., Ltd., New Delhi (2019).
5	S.B.Patel, Nuclear Physics: An introduction, Second Edition, New Age International Publishers Pvt., Ltd., New Delhi (2011).
6	R.R.Roy and B.P.Nigam, Nuclear Physics, New Age International Publishers Pvt., Ltd., New Delhi (2005).
	E-REFERENCES
1	https://onlinecourses.nptel.ac.in/noc20_ph02/course
2	https://en.wikipedia.org/wiki/Particle_physics





WEN EMPOWERING											
Programme	M.Sc.,	Programme Code		PI	РΗ		Regula	tions	:	2022-2023	
Department	Phys	sics			Ser	nester	IV			IV	
Course Code	Cours	e Name		erio r W	ds eek	Credit	Maximum Marks				
			L	Т	Р	С	CA	ES	SE	Total	
22P4PH11		DMMUNICATION ELECTRONICS	6	0	0	5	25	7	75 100		
COURSE OBJECTIVES		1. The working principles of communication systems.									
	2. How to	handle the com					3.				
POs	0 11	PROGRAMME					1	1		•	
PO 1	knowledge	f demonstrating t e from undergradu	late j	pro	gra	mme of st	udy.	-			
PO 2	using app	express thoughts a ropriate media.				Ũ					
PO 3	To identify following s	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 analyses and synthesize data from a variety of sources.										
PO 6		To define problems, formulate hypotheses, test hypotheses, analyses, interpret and draw conclusions from data.								rses,	
PO 7		vork effectively an e or coordinated e							fac	ilitate	
PO 8	qualitative	analyses, interpret data and criticall pen-minded and re	y eva	lua	ate	ideas, evic					
PO 9		nsibility to lived ex f and society.	cperie	enc	ces,	with self-	awarene	ess an	ld r	eflexivity	
PO 10		to use ICT in a va ccess, evaluate, a									
PO 11	Ability to v	vork independent and manage a pro							s re	quired for	
PO 12		to effectively enga y with diverse gro		ıa	mu	lticultural	society	and i	nte	ract	
PO 13		demonstrating th , avoid unethical t							rela	ated to	
PO 14	setting dir help achie with that		g an vatir	ins 1g a	spir and	ing vision inspiring	, buildin team m	ig a te embe	am rs t	who can o engage	
PO 15	necessary	cquire knowledge for participating is and self-directed	n lea:	rni	ng						

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-requisit es	Laser in Medicine Communication Systems

Knowledge Levels 1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating,																	
	.Reme Syntl	embeı nesizi	ring, 2 ng	2.Und	erstar	nding	, 3.Ap	plyin	g, 4.A	nalyzi	ng, 5.1	Evalua	ating,				
	CO / PO / KL Mapping																
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-																	
COs	weak)																
COs	COsKLsPOsKLsPO 11																
CO	L						2			PO PO							
														2			
										PO PO				2			
CO 2							1			PO				5			
										PO				1			
	PO 6 1 PO 7 6																
CO 3	CO 3					4								6			
					-					PO 8 PO 9				5			
										PO				1			
CO 4							3			PO				2	2		
										PO	12			2	2		
										PO	13			3	5		
CO 5							3			PO	14			3	;		
										PO	15			6			
				CO	/ P0) Ma	ppin	g									
	(3/2	/1 in	dicat	es the	e stre	ngth	of cor	relati	ion, 3	-							
					ng, 2	-med	ium,	1-wea	ak)								
Course A	ssess	ment	t Met	hods													
Direct								0.4									
COs	P	D	Р	Р	P	P P	PO	P	P	s (PO) PO	PO	PO	PO	PO	PO		
	0	Р О	Ο	г О	0	О	7 7	Ο	0	1	1	1	1	1	1		
	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	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		

. Continuous Assessment Test - I, II & Model Exam.

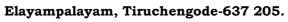
2. Assignment.

3. End Semester Examinations.

Indirect										
1. Course	End Delivery									
CONTENT OF THE SYLLABUS										
	MODULATION SYSTEMS	Periods	12							
Unit - I	 t - I Theory of Amplitude modulation - frequency modulation - phase modulation - Pulse code modulation - Pulse width modulation - Sampling theorem - low pass and band pass signals, PAM, Differential PCM delta modulation - Delta modulation - Adaptive Delta modulation - BPSK,QPSK. 									
	FIBER OPTICS COMMUNICATION	Periods	12							
Unit - IIBasics principle of Fiber Optics – Classification - Single mode and multimode, Step index and Graded index - Fiber Losses - Attenuation, Absorption, Leaky modes, Bending losses, Transmission losses, and Core and cladding losses. Propagation of Light in an Optical Fiber: Acceptance Angle – Numerical Aperture – Dispersion – Applications.										
	MICROWAVE COMMUNICATION SYSTEM Periods 12									
	Microwave Generation - Multicavity Klystror	n - Reflex Kly	stron -							
Unit - III		n - Reflex Kly MASER - ommunicatio	stron - Microwave on - LOS							
Unit - III	Microwave Generation - Multicavity Klystron Magnetron - Travelling Wave Tubes (TWT) – communication system - Analog Microwave Co microwave system - OTH microwave system - Dig	n - Reflex Kly MASER - ommunicatio	stron - Microwave on - LOS							
Unit - III Unit - IV	Microwave Generation - Multicavity Klystron Magnetron - Travelling Wave Tubes (TWT) – communication system - Analog Microwave Co microwave system - OTH microwave system - Dig Microwave Systems, Bandwidth efficiency. SATELLITE COMMUNICATIONS Orbital Satellites, Geostationary Satellites, angles, Orbital Classifications, Spacing and Radiation Pattern, foot prints, Satellite System	n - Reflex Kly MASER - ommunicatio jital Hierarch Periods Orbital Patt frequency n link model parameters RADAR- Ele	stron - Microwave on - LOS lies, Digital 12 erns, Look allocation, s, Satellite - INSAT							
	Microwave Generation - Multicavity Klystron Magnetron - Travelling Wave Tubes (TWT) – communication system - Analog Microwave Co microwave system - OTH microwave system - Dig Microwave Systems, Bandwidth efficiency. SATELLITE COMMUNICATIONS Orbital Satellites, Geostationary Satellites, angles, Orbital Classifications, Spacing and Radiation Pattern, foot prints, Satellite System system link equation - Non-ideal system communications satellites - Channel Capacity – Radar System – Radar Equation - Cable TV, CCTV	n - Reflex Kly MASER - ommunicatio jital Hierarch Periods Orbital Patt frequency n link model parameters RADAR- Ele	stron - Microwave on - LOS lies, Digital 12 erns, Look allocation, ls, Satellite - INSAT							
	Microwave Generation - Multicavity Klystron Magnetron - Travelling Wave Tubes (TWT) – communication system - Analog Microwave Co microwave system - OTH microwave system - Dig Microwave Systems, Bandwidth efficiency. SATELLITE COMMUNICATIONS Orbital Satellites, Geostationary Satellites, angles, Orbital Classifications, Spacing and Radiation Pattern, foot prints, Satellite System system link equation - Non-ideal system communications satellites - Channel Capacity – Radar System – Radar Equation - Cable TV, CCTV	 A - Reflex Kly MASER - ommunication gital Hierarch Periods Orbital Patter Grobital Patter frequency A link model parameters RADAR- Ele Structure a Problems - B mobile system 	stron - Microwave on - LOS ites, Digital 12 erns, Look allocation, s, Satellite - INSAT ments of a 12 and ase em -							

	TEXT BOOKS							
1	Electronic Communication Systems –George Kennedy& Davis, Tata McGraw Hill, 4th Edition, (2006).							
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 McGraw Hill, 3rd Edition, (2010).							
2	Simon Haykin, Communication system, Third edition John Wiley & Sons, Inc. 4 th 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.							







Programme	M.Sc.,	Programme Code		PP	H		Regula	tions	2022-2023			
Department	Phy			ç	Sen	nester				IV		
Course Code	Cours	e Name	pe	Perio er Veek	ds	Credit		Maxi	Maximum Marks			
			L	Т	Р	C	CA	ES	SE	Total		
22P4PHE03	TI	LECTIVE: HIN FILM CHNOLOGY	4	0	0	4	25	7	5	100		
COURSE	1. To exam	ine the electrical	prop	ertie	s ir	n metalli	c thin fi	lms.				
OBJECTIVES		ore the transport p							l ins	sulating film.		
	-	howtheopticalprop						0		0		
POs		PROGRAI	MME	OU'	гсо	OME						
PO 1	from unde	f demonstrating t ergraduate program	nme	e of s	tuc	ly.		-				
PO 2		express thoughts a ropriate media and										
PO 3	scientific a	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, analyze and synthesize data from a variety of sources then draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.											
PO 6	and draw	problems, formula conclusions from y to plan, execute	data	, pre	dic	t cause	and effe	ect rel	atio	nships		
PO 7	cooperativ as a grou	vork effectively an ve or coordinated o or a team in the a same member	effor e inte	rt or erest	th ts c	ie part c	f a grou	p and	act	together		
PO 8	data and o	analyze, interpret a critically evaluate i id reasoned persp	ideas	s, evi				-		· -		
PO 9		nsibility to lived ex nd society.	xperi	ience	es,	with self	awaren	ess an	d re	eflexivity of		
PO 10	access, ev	to use ICT in a va aluate, and use a e software for ana	varie	ety o	f re	levant ir				-		
PO 11	•	vork independentl Id manages a pro							req	uired for a		
PO 12		to effectively enga y with diverse gro			nul	ticultura	al society	y and i	ntei	ract		
PO 13	respectfully with diverse groups. Capable of demonstrating the ability to identify ethical issues related to ones work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights.											

PO 14	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision.								
PO 15	Ability to acquire knowledge and skills, including how to learn, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, 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	Analyze 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								

Knowledge Levels																
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing																
0	.Synti	liesizi	ng													
CO / PO / KL Mapping																
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-																
weak)																
COs]	KLs				PO				KL	s	
CO 1							2			PO				1		
	-						4			PO	2			2	2	
										PO	3			2	2	
CO 2							1			PO				3		
							T			PO				5		
										PO	6			1	-	
CO 2	CO 3 4 PO 7								6							
0.5	CO 3						4			PO			4			
										PO	9			5	5	
CO 4					3 PO 10		1									
0 4							3			PO			2			
										PO	12			2	2	
CO 5							3			PO	13			3	3	
							3			РО	14			3		
										PO	15			6		
				CO	/ P0	О Ма	ppin	ıg								
	(3/2	2/1 in	dicat	es the	e stre	ngth	of cor	rrelat	ion, 3	-stror	ng, 2-1	mediu	ım, 1-	weak)		
Course A	ssess	ment	t Metl	hods												
Direct																
COs					Pı	ogra	mme	Outo	omes	s (PO)						
	P	P	P	P	Р	P	PO 7	P	P	PO 1	PO 1	PO 1	PO 1	PO 1	PO 1	
	0 1	0 2	0 3	0 4	0 5	0 6	7	0 8	0 9	1 0	1 1	1 2	1 3	1 4	1 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	
	<u> </u>											-				

CO5

- Continuous Assessment Test I, II & Model Exam. Assignment. End Semester Examinations. 1.
- 2.
- 3.

Indirect

	CONTENT OF THE SYLLAR	SUS								
	THIN FILM FORMATION METHODS	Periods	12							
Unit - I	thin films Va urces – wire- ment of Press oor deposition - Pulsed laser	crucible ure – (PVD) -								
	Ion beam assisted deposition - Chemical vapor d		-							
	DEPOSITION MONITORING AND THICKNESS MEASUREMENT	Periods	8							
Unit - II	Electrical methods: Quartz crystal monitor thickness monitor- Resistance Monitor. Optical methods: Multiple Beam Interferometechnique - Fringes of equal chromatic order (FE Ellipsometry.	eter, Fizeau -								
	ELECTRICAL PROPERTIES OF THIN FILM	Periods	8							
Unit - III	Influence of thickness on resistivity - Electrica metallic films - Resistivity of the metallic film effect - Calculation of mobility - DC condu- field and high field conduction AC conduction Temperature dependence of conductivity - The Breakdown mechanism in dielectric films.	- Sheet resist ction mechar mechanism.	ance - Hall nism - Low							
	CHARACTERIZATION TECHNIQUES	Periods	11							
Unit - IV	Structural analysis: X-ray diffraction – power determination of lattice parameters - structure - spectroscopy (XPS) – ftir Instrumentations. Optical analysis: Optical constants of thin fill spectrophotometer - Transmittance, absorption, gap.	X-ray photoel ms - UV	ectron							
	Surface analysis: Field Emission scanning E (FESEM) - Transmission electron microscopy (TE microscopy (AFM).		-							
	APPLICATION OF THIN FILMS	Periods	9							
Unit - V	 Thin film resistors: Materials and Design of thin film resistors. Thin film capacitors: Materials - Capacitor structures-Capacitor yield and capacitor stability. Fabrication and characteristics: Thin film field effect transistors - 									
	Thin film solar cells - anti reflection coatings.		nsistors -							

TEXT BOOKS									
1	Thin Film Fundamentals by A. Goswami.								
2	Hand book of Thin films Technology: L I Maissel and R Clang.								
3	3 Thin film Phenomena: K L Chopra.								
4	4 Physics of thin films, vol. 12, Ed George Hass and others.								
5	5 Thin films solar cells – K L Chopra and S R Das.								
	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								
1	https://www.tno.nl/en/focus-areas/industry/expertise-groups/thin- film- technology/								





TEN EMPORENT											
Programme	M.Sc.,	Programme Code		Pl	PH	Reg	gulation	is 2	022-2023		
Department	Phys	sics			Sen	nester			IV		
Course	Cours	e Name]	Peri per V	ods Veek	Credit	Maximum Marks				
Code	Cours	L T P C CA ESE Tot									
22P2PHE07	ELECTIVE: MEDICAL PHYSICS 4 0 0 4 25 75 10										
COURSE OBJECTIVES	 To examine the particle accelerators. To explore the construction of X-ray generator used in Diagnostic radiology. 										
	3. To kno	w about the radi	o i	sotor	pes, la	aser appli	cations	in medicin	e.		
POs		PROGRA		-							
PO 1	knowled	of demonstrating ge from undergra	adı	uate	progr	amme of	study.	-			
PO 2	using ap	express thought propriate media a	ano	d int	erpre	t the idea	in clear	and concis	se manner.		
PO 3	To identify the relevant assumptions to formulate the arguments by following scientific approach to knowledge development.										
PO 4	Capacity situations	to solve different.	kin	ids o	f non-	familiar p	roblems	and apply	to real life		
PO 5	Ability to evaluate the reliability and relevance of evidence, analyze and synthesize data from a variety of sources then draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.										
PO 6	interpret	problems, formu and draw conclu hips and ability t nts	isio	ons f	rom o	lata, pred	ict caus	se and effec	t		
PO 7	cooperati	work effectively we or coordinate or a team in t y as a member of	ed o the	effor e inte	t on t erests	he part o	f a groi	ap and act	together		
PO 8	/qualitat	analyze, interprive data and critic minded and reas	ica	lly ev	valua	te ideas, e					
PO 9	Critical s both self	ensibility to lived and society.	l ez	xperi	ences	s, with sel	faware	ness and re	eflexivity of		
PO 10	to access	y to use ICT in a , evaluate, and u opriate software	ise	a va	riety	of relevan					
PO 11	-	work independe and manages a p		-					uired for a		
PO 12	-	y to effectively er Illy with diverse ध	-	-		ulticultur	al socie	ty and inte	ract		
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PO 14	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision.												ieve		
PO 15	nece: self-p	ty to a ssary f paced omic, s	or pa and	rticip self-d	ating	in	learr	ning	activi	ties th	nrougl	nout l	ife, th	nrougł	
COs		COURSE OUTCOME													
CO 1	To le	To learn the construction and working of different types of particle accelerators.													
CO 2	To le	To learn the construction of X-ray generator used in Diagnostic radiology.													
CO 3	medi	To learn the radioisotopes produced from the above equipment and their medical applications.													
CO 4		cations													
CO 5	•••	cations													
Pre- requisites	To ge	et knov	vledge	e aboi	it Me	dical	Physi	lcs.							
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	CONTENT OF THE SYLLA	BUS						
	X-RAYGENERATORS	Periods	10					
Unit-I	Discovery - Production - Properties of X-rays - continuous spectra - Design of hot cathode X requirements of medical diagnostic, therape radiographic tubes - Rotating anode tubes - - Rating of tubes – standard exposure cha loading Safety devices in X-ray tubes - Insulatio tubes.	K-ray tube eutic and Hooded an arts, Limita	- Basic industrial ode tubes ations on					
	PARTICLE ACCELERATORS	Peri	10					
Unit-II	Particle accelerators for industrial research applications - The Resonant of generator - Pelletron – Synchro – Cyclotron Klystron and magnetron – Travelling a Acceleration-Microtron - Working principle charged particle accelerators , Applications medicine, Types of Cyclotrons: Beam transp delivery systems –Energy slits. Computed T emission tomography (PET).	transformer - Linear Acc nd Standi of Cyclo s of cycl ort system	Cascade celerator – ng Wave tron and otrons in s – Beam					
	RADIATION SOURCES AND THEIR	Derei						
Unit-III	MEDICAL APPLICATIONS	Peri ods	10					
	Radiation sources - Natural and artificial Cyclotron produced isotopes (20 F, 13 N, products (137 Cs, 99 Mo, 131 I, 90 Sr) brachytherapy sources - Beta ray applic applicators (90 Sr, 125 I, 106 Ru etc.,).	15 O, 11 (– Require	C) -Fission ement for					
	LASERSINMEDICINE	Periods	9					
Unit-IV	Lasers in medicine – applications of Ultrafa Lasers in dermatology,oncology and cellbiology – measurement-Fiberoptics in medicine – microso birefringence – Fluorescence microscope –co Hazards of lasers and their safety measures.	- Lasers in	blood flow nedicine -					
	ULTRASOUND IN MEDICINE	Periods	9					
Unit-V	Production, properties and propagat waves - Bioacoustics – Acoustical characteri Ultrasonic Dosimetry - High power ultraso Ultrasound cardiography (UCG) – Dopp Doppler shift – Doppler systems – ultra applications of ultrasound in medicine.	stics of hur ound in th oler effect	eraphy – – Double					
	Total Periods48							
	TEXT BOOKS							
1	F. M. Khan, The Physics of Radiation therapy, 3 Williams & Wikins, Philadelphia, 2003.	rd Edition,	Lippincott					
2	H. E. John and J. R. Cunningham, Physics of R Charles C Thomas Pub. Ltd., 1983.	adiology, 4t	h Edition,					
3	J. P. Woodcock, Ultrasonic, Medical Physics Ha Hilger, Bristol, 2002.	ndbook seri	es 1, Adam					

4	J. R. Greening, Medical Physics, North Holland Publishing Co., New York, 1999.
REFERENCES	
1	W. R. Hendee, Medical Radiation Physics, Year Book Medical Publishers Inc., London, 2003.
2	R. Pratesi and C. A. Sacchi, Lasers in Photo medicine and Photobiology, Springer Verlag, West Germany, 1980.

<u>SEMESTER – I</u>

Credit: 4

Max. Hours: 48

<u>PRACTICAL – I: ADVANCED ELECTRONICS EXPERIMENTS</u> PAPER CODE: 22P1PHP01

- 1. FET Characteristics and construct FET amplifier circuit.
- 2. Design Phase shift oscillator.
- 3. Construct Schmitt trigger using IC 555 & IC 741.
- 4. Design square wave generator using IC 555 & IC741.
- 5. Design monostable multivibrator using IC 741 & IC 555.
- 6. Binary addition and subtraction using IC 7483.
- 7. BCD counter- Seven segment display.
- 8. UJT Characteristics and construct saw tooth wave oscillator.
- 9. Multiplexer and De-Multiplexer.
- 10. Decoder and Encoder.
- 11. Analog computation Solving simultaneous equation.
- 12. Shift registers using 7476/7473 IC.
- 13. Study of Flip Flops using IC 7400.
- 14. Design second order butter worth active filter circuit Low pass, high pass and band pass filters using IC 741.
- 15. Design of R/2R ladder and Binary weighted method of DAC using IC 741.
- 16. Photo diode and Photo transistors.

SEMESTER - II

PRACTICAL - II: ADVANCED PHYSICS EXPERIMENTS - I

Paper Code: 22P2PHP02 Credit: 4

Max. Hours: 48

- Determine the Young's Modulus of the material of the given plate by forming elliptical fringes. Repeat the experiment at least twice by changing the position of the suspended masses.
- 2. Determine the Young's Modulus of the material of the given plate by forming hyperbolic fringes. Take 2 sets of readings.
- 3. Using the given experimental setup determine the value of Stefan's constant. Assuming the solar constant 'S'. Calculate the temperature of the SUN.
- 4. Find the thickness of the air film in FP etalon.
- 5. Determine the compressibility of the given solution by using an ultrasonic interferometer. Repeat the experiment at least for four different concentrations and hence draw the concentration vs. compressibility graph.
- 6. Determine the compressibility of the given four liquids/solution by using an ultrasonic interferometer.
- 7. Determine
 - (a) Hall voltage and Hall coefficient
 - (b) Number density of the charge carriers and
 - (c) Hall angle and mobility.

Repeat the experiment for a different value of magnetic field.

- 8. Measure the diameter of a circular aperture, the diameter of a thin wire and diameter of sleeve using Fresnel's diffraction phenomenon.
- 9. Determine the wavelength of the laser light by using transmission grating and determine the number of lines in a transmission grating.

SEMESTER - III

Credit: 4

Max. Hours: 48

PRACTICAL – III: MICROPROCESSOR EXPERIMENTS

Paper Code: 22P3PHP03

- 1. 8 Bit Decimal Addition and Subtraction.
- 2. 8 Bit Multi-byte Addition and Subtraction.
- Number Conversion: BCD to Binary, Binary to BCD, ASCII to Hexadecimal and Hexadecimal to ASCII.
- 4. 16 bit Addition and Subtraction.
- 5. 16 bit Multiplication and Division.
- 6. 16 bit Square of a number and 16 bit Square root of a number.
- 7. Sum of simple series and Factorial of a number.
- 8. ADC interfacing.
- 9. Stepper motor interfacing.
- 10. Interfacing of an 8 bit DAC Converter and Waveform generation-Triangular, Saw tooth, Sine, Square, Rectangular.
- 11. Traffic light controller.
- 12. Finding the Largest/Smallest number in a data array.
- 13. Ascending/Descending order in a given array.
- 14. Multibyte decimal addition.
- 15. Data transfer Program.

SEMESTER - IV

<u>PRACTICAL – IV: ADVANCED GENERAL EXPERIMENTS - II</u> Paper Code: 22P4PHP04

Credit: 4 Max. Hours: 48

- 1. Rydberg constant-grating –Hydrogen spectrum.
- 2. Magnetic susceptibility Quincke's method.
- 3. Magnetic susceptibility Guoy's method.
- 4. Band gap of a semiconductor Four probe method.
- 5. Rydberg constant Solar Spectrum.
- 6. Thermal conductivity of a good conductor Forbe's method.
- 7. Coefficient of Viscosity Searle's Viscometer.
- 8. Charge of an electron using Spectrometer.
- 9. Determination of wavelength Michelson's Interferometer.
- 10. Charge of an electron Milikan's oil drop method.
- 11. Compressibility of the Liquid Ultrasonic Diffractometer.
- 12. Temperature Coefficient & Energy Band Gap of a Thermistor.