GOVERNMENT ARTS COLLEGE (Autonomous),

(Re-accredited with 'A' Grade by NAAC and Affiliated to Bharathidasan University, Tiruchirappalli)

KARUR - 639 005.

PG

COURSE STRUCTURE

Course Structure under CBCS System

(Applicable to the Candidates admitted from the Academic Year 2021 – 2022 onwards)

M.Sc.,

PHYSICS

GOVERNMENT ARTS COLLEGE, KARUR – 639 005

DEPARTMENT OF PHYSICS

VISION

MISSION

DEPARTMENT OF PHYSICS

Department of Physics (BSc physics) was established in the year **1969** and MSc Physics was started in the year **2005** . After Autonomy, some modern inter-disciplinary subjects like Nano science, Biophysics, Medical Physics, Advanced Computer applications in Physics have been included in the present syllabus at both UG and PG level. CBCS system is being followed successfully curriculum has been designed with keen interest so as to ensure that our students get maximum benefits while they study the higher education. Apart from the traditional method of teachning through chalk and talk methods, group discussions, seminar are being conducted at frequent intervals, power point presentation and video clipping are also being used effectively.

Department has B.Sc, M.Sc, M.Phil and Ph.D Physics (Regular) courses. Department has got a good library with 4000 books and 7 journals. The laboratory in this department is a well equipped one with modern amenities like, UV Spectrometer, Constant temperature bath, Spray Pyrolysis apparatus with computerized equipment, Mercury spectrum with computerized, Research softwares are available like Gaussian-2009, Gauss view 05 and wingx(crystallography Software).

What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. The following Table shows the correlation between credits and hours. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For PG courses, a student must earn a minimum of **90 (+4)** credits as mentioned in the table below. The total number of minimum courses offered by a department is given in the course pattern.

POST GRADUATE COURSE PATTERN (2021 ONWARDS)

PART	SEMESTER	SPECIFICATION	NO. OF COURSES	HOURS	CREDITS	TOTAL CREDITS
III	I to IV	Core Course Theory	**10**	**55**	**46**	**86**
		Core Course Practical	**4**	**16**	**16**	
		Elective Course	**5**	**26**	**24**	
IV	II &III	Internship Programme	**1**	-	**2**	**2**
		Massive Open Online Course	**1**	-	**2**	**2**
III	IV	Project Work	**1**	**7**	**4**	**4**
TOTAL			**22**	**120**	**90 (+4)**	**90 (+4)**

Course Pattern

The Postgraduate degree course consists of two vital components. They are as follows:

Part - III: Core Course (Theory), Project Work

Part - IV: Internship Programme, MOOC's

Core Courses

A core course is the course offered by the parent department related to the major subjects, components like theories, practical's, Project work, field visits and etc.

Core Elective

The core elective course is also offered by the parent department. The objective is to provide choice and flexibility within the department. There are FIVE core electives. They are offered in different semesters according to the choice of the college.

Extra Credit Courses

In order to facilitate the students gaining extra credits, the extra credit courses are given. There are two extra credit courses - Massive Open Online Courses (MOOC) and Internship Programme. According to the guidelines of UGC, the students are encouraged to avail this option of enriching by enrolling themselves in the MOOC provided by various portals such as SWAYAM, NPTEL, etc.

Subject Code Fixation

The following code system (9 characters) is adopted for Post Graduate courses:

Year of Revision	PG Code of the Dept	Semester	Specification of Part	Running number in the part
↓	↓	↓	↓	↓
2021	**P21**	***x***	***x***	***xx***
2021	**PPH**	**1**	**x**	**1**

For example:

I M.Sc. Physics – Mathematical Physics - I

The code of the paper is **P21PH1C1.**

Thus, the subject code is fixed for other subjects.

EXAMINATION

Continuous Internal Assessment (CIA):

PG - Distribution of CIA Marks	
Passing Minimum: 50 Marks	
THEORY CIA MAXMIMUM = 25	THEORY CIA MINIMUM = 10
PRACTICAL CIA MAXIMUM = 40	PRACTICAL CIA MINIMUM = 16

End - Semester Tests

Centralized - Conducted by the office of Controller of Examinations.

Semester Examination

Testing with Objective and Descriptive questions.

Section - A: 10 Questions x 2 Marks = 20 Marks (No Choice - Two questions from each unit)

Section - B: 5 Questions x 5 Marks = 25 Marks (Either… or Type - One pair from each unit)

Section - C: 3 Questions x 10 Marks = 30 Marks (3 Out of 5 - One question from each unit)

Duration of Examination:

3- Hours examination for courses.

Grading System

1. Grading

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added. The marks thus obtained, will then be graded as per the scheme provided in Table 1.

From the second semester onwards the total performance within a semester and the continuous performance starting from the first semester are indicated by **Semester Grade Point Average (GPA)** and **Cumulative Grade Point Average (CGPA),** respectively. These two are calculated by the following formulae.

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{1=1}^{n} C_i} \quad WAM\,(Weighted\ \ Average\,Marks) = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$$

Where, 'C_i' is the Credit earned for the Course - i,

'G_i' is the Grade Point obtained by the student for the Course 'i'.

'M' is the marks obtained for the course 'i', and

'n' is the number of Courses **Passed** in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

2. Classification of Final Results

i) For each of the three parts, there shall be separate classification on the basis of the CGPA, as indicated in the following Table - 2.

ii) For the purpose of Classification of Final Results, the Candidates who earn CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly, the candidates who earn the CGPA between 8.00 - 8.99, 7.00 - 7.99, 6.00 - 6.99 and 5.00 - 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good' and 'Above Average' respectively.

iii) Absence from an examination shall not be taken as an attempt.

Table - I - Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
Below 50	NA	RA

Table – 2 – Final Result

CGPA	Classification of Final Results	Corresponding Grade
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
Below 5.00	RA	Re - Appearance

Credit based weighted Mark System is adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

A Pass will continue to be mandatory although the marks will not count for the calculation of the CGPA.

Declaration of Result:

Mr./Ms. _____ has successfully completed the Post Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) in Part - III is _____ and the class secured is _____ by completing the minimum of 90 credits. The candidate has acquired _____ (if any) extra credits offered by the parent department courses.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-639005

(Reaccredited with 'A' Grade by NAAC and Affiliated to Bharathidasan University, Tiruchirappalli)

M.Sc. PHYSICS COURSE STRUCTURE UNDER CBCS SYSTEM

(For the candidates admitted from the year 2021-22 onwards)

SEMESTER	COURSE	SUBJECT TITLE	SUBJECT CODE	INSTR.HOUS/ WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
							INT	EXT	
I	Core Course - I	Mathematical Physics – I	P21PH1C1	6	4	3	25	75	100
	Core Course - II	Classical Dynamics and Relativity	P21PH1C2	6	4	3	25	75	100
	Core Course – III	Analog and Digital Electronics	P21PH1C3	5	4	3	25	75	100
	Elective Course – I	Condensed matter Physics	P21PH1E1	5	4	3	25	75	100
	Core Practical – I	Basic Practical lab (General and Electronics)	-	4	-	-	-	-	-
	Core Practical – II	Advanced General Experiments Lab	-	4	-	-	-	-	-
II				**30**	**16**				**400**
	Core Practical – IV	Basic Practical lab (General and Electronics)	P21PH2C4P	4	4	4	40	60	100
	Core Practical - V	Advanced General and Microprocessor Lab	P21PH2C5P	4	4	4	40	60	100
	Core Course – VI	Mathematical Physics - II	P21PH2C6	5	5	3	25	75	100
	Core Course - VII	Quantum Mechanics	P21PH2C7	6	5	3	25	75	100
	Core Course – VIII	Electromagnetic Theory	P21PH2C8	6	5	3	25	75	100
	Elective Course - II	Microprocessor and Microcontroller	P21PH2E2	5	5	3	25	75	100
	Extra Credit Course	Internship Programme (It should be completed the 2nd semester Holidays)			(2)				
				30	**28**				**600**
III	Core Course – IX	Thermodynamics and Statistical Mechanics	P21PH3C9	6	5	3	25	75	100
	Core Course - X	Nuclear and Particle Physics	P21PH3C10	6	5	3	25	75	100
	Core Course – XI	Communication Electronics	P21PH3C11	5	5	3	25	75	100
	Elective Course - III	Crystal growth and Thin Film Physics	P21PH3E3	5	5	3	25	75	100
	Core Practical – III	Advanced General & Electronics Lab - I	-	4	-	-	-	-	-
	Core Practical - IV	Advanced General & Electronics Lab– II	-	4	-	-	-	-	-
	Extra Credit Course	Massive Open Online Course (MOOC's)			(2)				
				30	**20**				**400**
IV	Core Practical – XII	Advanced Electronics Lab – I	P21PH4C12P	4	4	4	40	60	100
	Core Practical - XIII	Advanced Electronics Lab –II	P21PH4C13P	4	4	4	40	60	100
	Core Course - XIV	Molecular Spectroscopy	P21PH4C14	4	4	3	25	75	100
	Elective Course - IV	Nano science and Nano technology	P21PH4E4	6	5	3	25	75	100
	Elective Course - V	Bio medical Instrumentation	P21PH4E5	5	5	3	25	75	100
	Project Work	Project Work	P21PH4PW	7	4	-	-	-	100
				30	**26**				**600**
TOTAL				**120**	**90 (+4)**				**2000**

** Dissertation-80 marks and Viva - voce Examinations- 20 marks

CHAIRMAN
BOARD OF STUDIES

CONTROLLER OF EXAMINATIONS

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR -05 DEPARTMENT OF PHYSICS	
Programme:	M.Sc. Physics
Programme Code:	PH
Duration:	**2 years**
Programme Outcomes:	1. Ability to apply knowledge on the latest development of the topic 2. Experimental/Programming /Problem solving skills 3. Team work/Analytical skills 4. Out spoken/group discussion/facing questions in the topic 5. Independent thinking/confidence in the subject studied
Programme Specific Outcomes:	1. Problem Analysis – Ability to identify and analyze complex Physics problems using the Physics principles /mathematical tools. 2. Acquired skills will put the learners at an advantage in careers as diverse as physics, material physics, bio-physics, quantum physics, bio-medical, applied mathematics, education and computer science. 3. Graduates will be molded to adopt, absorb and develop innovative ideas 4. Ability to work in a team in sharing the knowledge learned exhibiting the effective individual talent 5. Ability to communicate effectively with peers and professionals and society at large by giving seminars / popular lectures / talks

CREDIT: 4 **COURSE CODE: P21PH1C1**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc. PHYSICS – I SEMESTER – CORE COURSE – I

(For the candidates admitted from the year 2021-22 onwards)

MATHEMATICAL PHYSICS –I

COURSE OBJECTIVES:

1. To expose students to describe physical quantities in the vector form
2. To teach about basic properties of complex functions and related theorems
3. To impart the knowledge on tensors and their properties
4. To provide knowledge on various analytical methods for solving differential equations.
5. To expose students to different types of groups and their properties.

UNIT – I	**VECTOR ANALYSIS** The Scalar and vector fields – Gradient, divergence and curl – Orthogonal curvilinear coordinates – Cylindrical and spherical coordinates as a special curvilinear system – Vector integration – Line, surface and volume integrals – Gauss divergence theorem – Stoke's theorem in the space - Green's theorem in the plane.
UNIT – II	**COMPLEX VARIABLES** Complex Algebra- Argand diagram- Properties of Moduli and arguments- CauchyRiemann Conditions-Cauchy's integral Theorem- Cauchy's integral Formula-Taylor's and Laurent's expansion- Singularities- Mapping- Conformal mapping- Cauchy's residue theorem-Computation of residue – Evaluation of integral
UNIT –III	**TENSORS** Definition of Tensors – Contravariant, covariant and mixed tensors – Addition and Subtraction of Tensors – Summation convention- Symmetry and Anti-symmetry Tensor-Contraction and direct product – Quotient rule- Pseudo tensors, Levi- Civita Symbol - Dual tensors, irreducible tensors-Metric tensors-Christoffel symbols – Geodesics.
UNIT –IV	**GAMMA, BETA AND ERROR FUNCTIONS** Definition of Gamma and Beta functions- Fundamental properties of Gamma functions – Evaluation of $\Gamma(1/2)$ and graph of the Gamma function- Transformation of Gamma function - Different forms of Beta functions – Relation between Beta and Gamma functions- Reduction of definite integrals to Gamma functions- Error function / probability integral.
UNIT-V	**GROUP THEORY** Basic definitions – Multiplication table – Sub–groups, Co–sets and Classes – Direct product groups – Point groups and Space groups - Elementary ideas of rotation groups. – Representation theory – Homomorphism and isomorphism – Reducible and irreducible representations – Schur's lemma – The great orthogonality theorem – Character tables – c2v, c3v.

TEXT BOOKS

1. Sathyaprakash, Mathematical Physics, Sultan Chand And Sons, 6th Revised Edition, New Delhi, 2014
2. G.Arfken and H.J Weber, Mathematical Methods for Physicists, Prism Books, Bangalore, 1995.
3. A.W.Joshi, Matrices and Tensors in Physics, Wiley Eastern Ltd., New Delhi, 1975.
4. B.D.Gupta, Mathematical Physics, , Vikas Publishing House, 4th edition, 2010
5. A.W.Joshi, Elements Of Group Theory For Physicists, New Age International Pvt. Ltd, New Delhi, 2005.

REFERENCE BOOKS

1.Mathematical Physics, Rajput, PragatiPrakasam, 17th Edition, 2004

2.Advanced Engineering mathematics, Erwin Kreyszig, Wiley Eastern Limited, 7th Edition, 1993

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Lecture (Chalk and talk/OHP/LCD), Flipped learning/blended class room-E-content, Videos, Problem solving, Group Discussion, Peer learning, Seminar.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

CO1	Choose right method to solve problems in physics	K1-K4
CO2	Integrate various functions with singularities	K1-K5
CO3	Transform physical quantities between coordinate systems.	K1-K4
CO4	Classify the differential equations and choose right method to solve problems	K1-K4
CO5	Characterize the physical system using group operations and table	K1-K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6– Create

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**	**PSO 5**	**Score**
CO 1	4	5	4	4	4	4	4	3	3	3	3.8
CO 2	4	4	3	3	3	4	4	4	3	3	3.5
CO 3	3	3	4	3	4	3	4	4	4	4	3.6
CO 4	3	4	3	4	3	3	4	4	4	3	3.5
CO 5	3	4	5	4	3	3	3	4	3	3	3.4

H-High **M-Medium** **L-Low**

COURSE DESIGNER:

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 4 **COURSE CODE : P21PH1C2**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc. PHYSICS – I SEMESTER – CORE COURSE – II

(For the candidates admitted from the year 2021-22 onwards)

CLASSICAL DYNAMICS AND RELATIVITY

COURSE OBJECTIVES

To make the students to

1. Students will demonstrate conceptual understanding of the basic principles of classical mechanics.
2. Students will demonstrate the ability to apply basic methods of classical mechanics towards solutions of various problems, including the problems of i) Complicated oscillatory systems,
   ii) the motion of rigid bodies iii) mechanics of continuous media.

UNIT – I	**FUNDAMENTAL PRINCIPLES AND LAGRANGIAN FORMULATION** Mechanics of a particle and system of particles – Conservation laws – constraints – Generalized co–ordinates – D'Alembert's principle and Lagrangian equation – Hamilton's principle – Langrange's equations – Applications: simple pendulum – compound pendulum – Atwood's Machine – Deduction of Hamilton's Principle.
UNIT – II	**TWO BODY CENTRAL FORCE PROBLEMS** Reduction of Two –Body central Force problem to the Equivalent one – Body problem, Central force and motion in a plane-Equations of motion under central force and first integral differential equation for an orbit- Inverse square law of Force-Kepler's law of planetary motion and deduction –Virial theorem – Scattering in a central force field- Scattering cross section – Rutherford scattering.
UNIT –III	**HAMILTON'S FORMULATION** Cyclic co-ordinates and conservation theorems- Hamilton's equation from variational principle – principle of least action- canonical transformation - Identity transformation and inverse transformation- Lagrange and Poisson brackets – Hamilton Jacobi method – Action angle variables – Kepler's problem in action angle variable –one dimensional Harmonic oscillator.
UNIT –IV	**RIGID BODY DYNAMICS AND OSCILLATORY MOTION** Principle axis transformation-angular momentum-kinetic theory-Degrees of freedom of a rigid body-Euler angles – Moments and products of inertia –Euler's equation – symmetrical top – heavy symmetrical top-Theory of small oscillations and normal modes – Frequencies of free vibration and normal co–ordinates – Linear triatomic molecule
UNIT-V	**RELATIVITY** Postulates of Special theory of relativity - Four vectors in special theory of relativity – Lorentz transformation in real four dimensional spaces – Minkowskispace covariant four dimensional formulations – Force and energy equation relativistic mechanics – Lagrangian and Hamiltonian of relativistic mechanics.

BOOKS FOR STUDY

1. Classical Mechanics: Herbert Goldstein, 3rdEdition, New Delhi, Narosa publishing House.
2. Classical Mechanics: S.L. Gupta, V. Kumar, PragatiPrakashan, 2013.
3. Classical Mechanics: J. Upadhyaya, Himalaya, 2010.
4. Theory of Relativity: R.K.Pathira, Dover Pub., Inc., New York 2003.

BOOKS FOR REFERENCE

1. Classical Mechanics: N.C.Rana and P.S.Joag, Tata McGraw Hill.
2. Introduction to Classical Mechanics: R.G.TakwalcalP.S.Puranik, TMGH.
3. Lagrangian and Hamiltonian: M.G.Calkin, Scientific Pub. Co., Ltd.,
4. Introduction to general Relativity: S.K Bose, Wiley and Sons.
5. Classical dynamics by Goldstein's

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Lecture (Chalk and talk/OHP/LCD), Flipped learning/blended class room-E-content, Videos, Problem solving, Group Discussion, Peer learning, Seminar.

COURSE OUTCOMES

By the end of this course, Students will be able to

Course Outcome	**Course Outcome statement**
CO1	understand lagrange's formulations of classical mechanics and apply the simple systems
CO2	appreciate the two body central force problem
CO3	understand the Hamilton's jacobi theory , action angle variables of mechanics and solve simple problems
CO4	explain the rigid body dynamics and oscillatory motion
CO5	acquire knowledge related to special theory of relativity

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

Mapping Course Outcome with PO and POS

Course Outcome (COs)	Programme Outcomes(POs)					Programme Specific Outcome (PSOs)						Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	
CO1	2	3	3	2	3	2	2	3	2	3	-	2.5
CO2	3	3	2	3	2	3	3	3	2	3	-	2.7
CO3	3	2	3	2	3	3	2	3	3	2	-	2.6
CO4	2	3	2	3	3	3	3	2	2	3	-	2.6
CO5	3	3	2	3	2	2	3	2	3	2	-	2.5
	Mean overall score											2.58

Result: The Score for this course is 2.58 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. V. SHANMUGAM

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT : 4 **COURSE CODE : P21PH1C3**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc. PHYSICS – I SEMESTER – CORE COURSE – III

(For the candidates admitted from the year 2021-22 onwards)

ANALOG AND DIGITAL ELECTRONICS

COURSE OBJECTIVES

To make the students to

1. Know the applications of Thyristors and how it acts as a switch.
2. Impart the knowledge about different types of transducers.
3. Acquire knowledge about various filters and oscillators.
4. Compare various logic hardware
5. Impart the knowledge about different types of Memories devices.

UNIT - I	**THYRISTORS AND THEIR APPLICATIONS** Silicon control rectifier – Operation –Equivalent circuit –V-I Characteristics- 900 variable half wave rectifier -180˚ Variable half wave rectifier –SCR-Full wave rectifier - TRIAC – Operation –V-I Characteristics - TRIAC power control –TRIAC phase control - Unijunction transistor – Construction – Equivalent circuit – Operation – V-I characteristics -DIAC – V-I characteristics – DIAC Phase control.
UNIT - II	**TRANSDUCERS AND INSTRUMENTATION AMPLIFIERS** Displacement Transducer – Capacitive Transducer –Inductive Transducer- Variable Differential Transformer Transducer (LVDT) –Oscillation Transducer – Piezo electric Transducer – Potentiometer Transducer – Velocity Transducer. Introduction to instrumentation amplifier-Requirements of good instrumentation amplifier-Difference amplifier using one op-amp-modified difference amplifier-Instrumentation amplifier using transducer bridge-Application of instrumentation amplifier.
UNIT- III	**OP-AMP FILTERS AND OSCILLATORS** **Active filters**: First and second order low and high pass Butter worth filter – Band pass filter- Log and antilog amplifiers – Solving second order differential equations - Oscillators: Phase shift oscillator - Wien bridge oscillator- Square wave generator – Triangular wave generator- Saw tooth generator – Voltage controlled oscillator.
UNIT - IV	**BINARY CODES AND LOGIC HARDWARE** Binary codes: Weighted Binary Codes - non weighted codes – error deducting codes – error correcting codes- Logic hardware: Diode as a DC switch – Diode as a AC switch – Bipolar Transistor as a DC switch – Bipolar Transistor as a AC switch – Logic families: Resistor Transistor Logic (RTL) - Diode Transistor Logic (DTL) – Transistor - Transistor Logic(TTL)
UNIT – V	**SEQUENTIAL AND MEMORY CIRCUITS** Sequential circuits: Ripple Counters – Up/Down Counters – type T design - Non sequential counting– Type D design - Shift Register – Ring Counters – Type JK design – Cycle Counters - Memory circuits: Introduction to memories – Read only memories – Bipolar ROMs – MOSROMs - Applications of ROM – Static Random Access Memories – Bipolar RAMs – MOS RAMs - Dynamic Random Access Memories.

TEXT BOOKS

1. A Text book of applied electronics – Dr. R.S. Sedha- Revised edition 2013 – S.Chand Company Limited.
2. Modern electronic instrumentation and measurement techniques – A.D Helfrick and W.D Cooper – PHI Private Ltd.
3. OPAMPs and linear integrated circuits – Ramakant A Gayakwad 3rd edition PHI private ltd. New Delhi.

REFERENCE BOOKS

1. Digital Principles and Applications- A.P. Malvino and D.P. Leach- McGraw Hill Publications.
2. Digital Design-M.Morris Mano- 3rd Edition- PHI (P) Ltd., New Delhi.

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Chalk and talk Lectures; seminar; ICT based presentations; Video Lectures; Group Discussions; Interactive activities; Mini – project; MCQs

Course Outcome No	**Course Outcome**	**Knowledge Level**
CO1	Know the characteristics of various components	K1
CO2	Understand the utilization of components	K2
CO3	Design and analyze small signal amplifier circuits.	K3
CO4	Design and analyze combinational and sequential circuits.	K4
CO5	Know about the logic families and realization of logic gates.	K5

K1=Remember,K2=Understand,K3=Apply,K4=Analyze,K5=Evaluate

Nature of Course			
Knowledge and Skill		Employability Oriented	
Skill oriented		Entrepreneurship Oriented	✓

MAPPING

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**	**PSO 5**	**Score**
CO 1	4	5	4	4	4	4	4	3	3	3	3.8
CO 2	4	4	3	3	3	4	4	4	3	3	3.5
CO 3	3	3	4	3	4	3	4	4	4	4	3.6
CO 4	3	4	3	4	3	3	4	4	4	3	3.5
CO 5	3	4	5	4	3	3	3	4	3	3	3.4

COURSE DESIGNER: G. MAHALAKSHMI

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 4 **COURSE CODE: P21PH1E1**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc. PHYSICS – I SEMESTER – ELECTIVE COURSE – I

(For the candidates admitted from the year 2021-22 onwards)

CONDENSED MATTER PHYSICS

COURSE OBJECTIVES

To make the students to

1. To determine crystal structure and to study the different types of X-ray diffraction techniques.
2. To understand andexplain the different types of non-destructive techniques and defects in solids.
3. To know the classical theory of lattice heat capacity and Lattice Vibrations
4. To know the Kronig – Penny model and to study the types of semiconductors and hall effect.
5. To understand the types of superconductor applications and properties and applications of advanced materials.

UNIT – I	**RECIPROCAL LATTICE AND X-RAY DIFFRACTION TECHNIQUES** Reciprocallatticesandtheirapplicationstodiffractiontechniques-Ewald Sphere-interaction of X-Rays with matter-Absorption of X-rays–Experimental diffraction techniques- Laue's diffraction technique–Powder X-ray Diffraction Technique–Indexing of powder photographs and lattice parameter determination-Applications of Powder X-ray diffraction method–General concept of atomic scattering factor and structure factor.
UNIT – II	**DEFECTS IN SOLIDS AND NON-DESTRUCTIVE TESTING (NDT)** Defects in Solids: Point defects-Line defects (Slip, Plastic Deformation, Edge Dislocation, Screw Dislocation, Burger's Vector, Concentration of line defects and Estimation of dislocation density), surface (Planar) defects- Grain boundaries and stacking faults. Non-Destructive Testing: X-Ray Radiography Technique and displacement method–X-ray fluoroscopy–Merits and Demerits of X-Ray Radiography–Liquid penetrate method–Ultrasonic flaw detector- Merits and Demerits of Ultrasonic testing.
UNIT –III	**LATTICE VIBRATIONS AND THERMAL PROPERTIES** Vibration of monoatomic lattices–Lattices with two atoms per Primitive cell–Quantization of lattice vibrations–Phonon momentum–Inelastic scattering of neutrons by Phonons–Lattice heat capacity–Classical theory of lattice heat capacity–Einstein model–Density of modes in one dimension and three dimension–Debye model of lattice heat capacity– Thermal conductivity.
UNIT –IV	**ENERGYBANDS IN METALSAND SEMICONDUCTOR MATERIALS** Energy levels and density of states–Fermi–Dirac distribution–Free electron gain three dimensions – Heat capacity of the electron gas–Kronig Penny model–Semiconductors– Band gap – Effective mass–Intrinsic carrier concentration–Derivation–Fermi level-Variation of Fermi level with temperature–Electrical conductivity – Bandgap determination–Extrinsic semiconductors – Carrier concentration–Derivation– Hall effect in semiconductors.
UNIT-V	**SUPER CONDUCTIVITY AND ADVANCED MATERIALS** Introduction–Meissner effect–Thermodynamical properties–London equation–BCS theory–Type-I &Type-II Superconductors–Josephs on effect (Both AC&DC) – High Tc Superconductors–SQUIDS–Metallic glasses: Preparation-Properties-Uses-Shape Memory Alloys (SMAs) – Characteristics–Properties of Ni-Ti alloy–Applications–Advantages and disadvantages of Shape Memory Alloys.

BOOKS FOR STUDY

1. Introduction to Solid State Physics, C. Kittel, WileyEastern-New Delhi.
2. Solid State Physics, A.J. Dekker, Macmillan,India.
3. Solid State Physics, S.O. Pillai, WileyEasternLtd.
4. Solid State Physics, B.S. Saxena, R.C. Gupta&P.N. SaxenaPragatiPrakashan, Meerut.
5. Crystallography for solid state physics, A.R. Verma and O.N. Srivastava, Wiley.
6. Elements of X-ray crystallography, L.V. Azaroff, McGraw-Hill.

BOOKSFOR REFERENCE

1. Solid State Physics –S.L.Gupta&Dr.V.Kumar.
2. Fundamentals of Solid State Physics– Saxena Gupta and Saxena.
3. N.W.Asherof and N.D. Mermin, Solid State Physics, Holt, Rinehartand Winston, International Edition, Philadelphia.
4. J. S. Blakemore, Solid State Physics, Second edition Cambridge University Press, Cambridge, London (1974).
5. M. M. Woolf son, An Introduction to X-ray Crystallography, Vikas publishing Ltd. (1978)

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Lecture (Chalk and talk/OHP/LCD), Flipped learning/blended class room-E-content, Videos, Problem solving, Group Discussion, Peer learning, Seminar.

Course Outcomes

By the end of this course, Students will be able to

CO1	Understand crystal structure and X-ray diffraction techniqes.	K2
CO2	Acquire the knowledge of the defects in solids and the different types of Non- destructive testing (NDT) techniques.	K2
CO3	Study lattice vibrations and thermal properties.	K2,K3
CO4	Understand theoretical backgrounds of metals and semiconductors.	K4
CO5	Explore superconductibity of solids and advanced materials.	K5

K1=Remember,K2=Understand,K3=Apply,K4=Analyze,K5=Evaluate

Nature of Course			
Knowledge and Skill		Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**	**PSO 5**	**Score**
CO 1	**4**	**5**	**4**	**4**	**4**	**4**	**4**	**3**	**3**	**3**	**3.8**
CO 2	**4**	**4**	**3**	**3**	**3**	**4**	**4**	**4**	**3**	**3**	**3.5**
CO 3	**3**	**3**	**4**	**3**	**4**	**3**	**4**	**4**	**4**	**4**	**3.6**
CO 4	**3**	**4**	**3**	**4**	**3**	**3**	**4**	**4**	**4**	**3**	**3.5**
CO 5	**3**	**4**	**5**	**4**	**3**	**3**	**3**	**4**	**3**	**3**	**3.4**

COURSE DESIGNER: R.VASANTHA KUMARI

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT : 4 **SUBJECT CODE: P21PH2C4P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc. PHYSICS – II SEMESTER– CORE PRACTICAL – IV

(For the candidates admitted from the year 2021-22 onwards)

BASIC PRACTICAL LAB (GENERAL AND ELECTRONICS)

COURSE OBJECTIVES

To make the Students

1. To get the knowledge of handling microscope , Anderson bridge and Lecher wire
2. To be familiar with the bread board.
3. To get to know the oscilloscope device and its usage.
4. Acquire knowledge of using laser.
5. To know the working of transistorized and IC based multivibrator circuits.
6. To plot the characteristics of transistor
7. To measure the the frequency of oscillators.

A.General Experiments (Minimum six)

1. Determination of Co-efficient of coupling by ac BridgeMethod.
2. Determination of q, n,σ by Elliptical fringesMethod.
3. Determination of q, n, σ by Hyperbolic fringesMethod.
4. Determination of Stefan'sConstant.
5. Determination of Dielectric Constant at high frequency by LecherWire.
6. Determination of e/m of an Electron MagnetronMethod.
7. Determination of L of a coil by Anderson'sMethod.
8. Photo Electric Effect (Planck's constantDetermination).
9. Determination of numerical aperture of an opticalfiber.
10. Diameter of a thin wire & pin hole usinglaser.
11. Determination of particle size & verification of Maluslaw.
12. B-H loop – Energy loss of a magnetic material Anchor ring usingBG
13. Determination of dielectric constant of a liquid by R.Foscillators.

B.Electronics experiments (Minimum six)

14. Design and study of monostable Multivibrator usingIC.
15. Design and study of Astable Multivibrator usingIC.
16. UJT Characteristics and Relaxation oscillator usingUJT.
17. Common Drain Amplifier usingFET.
18. FET Amplifierdesign.
19. Construction of Dual regulated powersupply.
20. Design and study of Wien bridge oscillator using IC741.
21. Design and study of Phase shift oscillator using IC741.
22. Filters using IC741.
23. Solving simultaneous and differential equations using IC 741.

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COURSE OUTCOMES

By the end of this course, Students will be able to

Course Outcome No.	Course Outcome	Knowledge Level
CO1	Able to determine young's modulus, self inductance and Dielectric constant	K1
CO2	To find a diameter of a thin wire and pin hole using laser	K2
CO3	Able to use Op-amp to generate Square Wave form.	K3
CO4	Remember the concepts of UJT and observe its characteristics	K4
CO5	Understand the need and requirements to obtain frequency response from a transistors that design of Wein bridge Oscillator and Phase Shift Oscillator is feasible.	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and Skill		Employability Oriented	
Skill oriented		Entrepreneurship Oriented	✓

MAPPING COURSE OUTCOME WITH PO AND POS

Outcome	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	POS6	POS7	POS8	TOT	
CO1	**3**	**3**	**2**	**-**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**30**	**2.3**
CO2	**3**	**3**	**3**	**3**	**-**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**30**	**2.3**
CO3	**3**	**2**	**-**	**3**	**-**	**2**	**3**	**2**	**2**	**3**	**-**	**2**	**1**	**23**	**1.8**
CO4	**3**	**3**	**3**	**1**	**2**	**3**	**3**	**3**	**3**	**-**	**3**	**2**	**2**	**31**	**2.9**
CO5	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**1**	**29**	**2.2**
Mean overall score															**2.3**

Result: The core for this course is 2.3 (High relationship)

Note:

Strength level	Low	Medium	High
Value	1	2	3

Values Scaling

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Mean Score of COs = Total of Value / Total No. of Pos & PSOs

Mean overall score for COs = Total of Mean Score / Total No. of COS

COURSE DESIGNER: G. MAHALAKSHMI

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 4 **SUBJECT CODE: P21PH2C5P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc., PHYSICS – II SEMESTER – CORE PRACTICAL – V

(For the candidates admitted from the year 2021-22 onwards)

ADVANCED GENERAL AND MICROPROCESSOR LAB

COURSE OBJECTIVES

To make the Students

1. To make the students to understand experimental physics
2. To apply the theoretical knowledge for developing new devices

A. Advanced general experiments (Minimumsix)

1. Four Probe Method-Determination of resistivity of a sample
2. Determination of Carrier concentration and Hall Co-efficient in Semiconductors
3. Determination of Magnetic Susceptibility of liquid by Guoy's Method
4. Determination of Magnetic Susceptibility of Quincke's Method
5. Determination of Wavelength and thickness of a film using Michelson's Interferometer.
6. Charge of an electron by Spectrometer.
7. Polarizability of liquids by finding the refractive indices at different wavelengthsby spectrometer.
8. Refractive Index of Transparent Solids, Liquids and Brewster's angle usinglaser.
9. Rydberg's constant byspectrometer.
10. Wavelength calculation using Hartmann's formula by constant deviationspectrograph.
11. Determination of specific rotatory power of a liquid usingPolarimeter.
12. Determination of wavelength of monochromatic source usingbiprism.
13. Determination of compressibility of a liquid by ultrasonicmethod.
14. Michelson's Interferometer using Laser source.
15. Characteristics study of LED, LDR, and Photo diode using Laser.

B.Microprocessor experiments (Minimum six)

1. To find the largest and smallest number.
2. To find the sum ofseries.
3. Interfacing –LED.
4. Interfacing – A/Dconverter.
5. Interfacing – D/Aconverter.
6. Interfacing –Relay.
7. Interfacing – Stepper Motor.
8. Interfacing – Temperature Measurement.
9. Interfacing – Traffic control system.
10. Interfacing – Seven Segment Display add on board.

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BOOKS FOR STUDY

S.No.	Title of theBook	Author	Publisher	Year	Vol./Edition
1	Practical Physics	AnchalSrinivasa & R.K.Shukla	New age International Publishers	2018	Second edition.
2	A textbook of PhysicsPractical–PartI	Prof.C.C. Ouseph & Prof.V.Srinivasan	S.Viswanathan Publishers	1990	-
3	A textbook of Physics Practical–PartII	Prof.C.C. Ouseph & Prof.G.Ranga Rajan.	S.Viswanathan Publishers	1996	-
4	AdvancedPracticalPhysics II	Dr.S.P.Singh	PragatiPrakashan–Meerut	2000	Twelth Edition

BOOKS FOR REFERENCE

S.No.	Title of the Book	Author	Publisher	Year	Vol./Edition
1.	Practical Physics With Viva– voce	Dr.S.P.Singh	PragatiPrakashan–Meerut	1999	Twenty third Edition
2	Practical Physics	S.L.Gupta &V.Kumar	PragatiPrakashan–Meerut	1999	Twenty third Edition
3	Advanced level Practical Physics	M.Nelkon & J.M.Ogborn	Heinemann Educational Books.Ltd–London.	1967	-
4	A textbook of Practical Physics	H.S.Aller &H.Moore	MacmillanandCo&Limited.	1941	-

COURSE OUTCOMES

By the end of this course, Students will be able to

Course Outcome No.	Course Outcome
CO 1	Determine the velocity and compressibility of the liquid usingultrasonic interferometer.
CO 2	Practical knowledge of various measurement methods using lasers and opticalfibers.
CO 3	Determination of Wavelength and thickness of a film using Michelson'sInterferometer using sodium vapour lamp and Laser as a source.
CO 4	Determination of Magnetic Susceptibility of liquid by Guoy's and Quinke's Method
CO 5	Write and execute programs for solving simple problems using 8085microprocessors.

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CREDIT: 5 **SUBJECT CODE: P21PH2C6**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc., PHYSICS – II SEMESTER – CORE COURSE –VI

(For the candidates admitted from the year 2021-22 onwards)

MATHEMATICAL PHYSICS –II

COURSE OBJECTIVES:

1. To provide knowledge on Fourier's series, integral and transform
2. To expose students to learn about Laplace transforms and uses
3. To provide knowledge on various analytical methods used for solving differential equations.
4. To teach students about the special type of differential equations with their properties and their solution.
5. To expose students to solve practical problems associated partial differential equations

UNIT – I	**FOURIER SERIES, INTEGRALS AND TRANSFORM** Definition of Fourier series (odd and even functions)– Dirchlet's theorem – Complex form of Fourier series – Properties of Fourier series – Fourier integral (odd and even functions) – Complex form of Fourier integral - Fourier transform – Infinite and finite Fourier sine and cosine transforms - properties – Solving linear partial differential equations.
UNIT – II	**LAPLACE TRANSFORM AND GREEN'S FUNCTIONS** Laplace transform – properties of Laplace transforms – solution of second order ordinary differential equations – convolution theorem – green's functions – properties – methods of solutions in one dimension – applications.
UNIT –III	**SOLVING OF DIFFERENTIAL EQUATIONS** Homogeneous linear equations of second order with constant coefficients and their solutions – ordinary second order differential with variable coefficients and their solution by power series and Frobenius methods – extended power series method for indicial equations.
UNIT –IV	**SPECIAL DIFFERENTIAL EQUATIONS AND THEIR SOLUTIONS** Legendre's differential equation: Legendre polynomials – Generating functions – Recurrence Formulae – Rodrigue's formula–Orthogonality of Legendre's polynomial; Bessel's differential equation: Bessel's polynomial –Generating functions–Recurrence Formulae–Orthogonal properties of Bessel's polynomials; Hermite differential equation– Hermite polynomials – Generating functions – recurrence relation; Laguerre's differential equation: Laguerre's polynomial – generating function–Recurrence Formulae–Orthogonal properties of Laguerre's polynomials.
UNIT-V	**PARTIAL DIFFERENTIAL EQUATIONS (PDES)** Second order PDEs and their types – Solutions of PDEs – Methods for solving PDEs – Laplace, diffusion and wave equations in Cartesian and polar coordinates – Solution of two and three dimensional Laplace, diffusion and wave equations using separation of variable method- Solving simple practical problems.

TEXT BOOKS

1. Mathematical methods for Physics, G. Arfken Elsevier, 6th edition, 2010
2. Mathematical Physics, B.D.Gupta, Vikas Publishing House, 4th edition, 2010
3. Topics in Mathematical Physics, Parthasarathy H Ane Books Pvt. Ltd 2007

REFERENCE BOOKS

1. Mathematical Physics,, Rajput, PragatiPrakasam, 17th Edition, 2004
2. Advanced Engineering mathematics, Erwin Kreyszig, Wiley Eastern Limited, 7 thEdition, 1993.

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods

Lecture (Chalk and talk/OHP/LCD), Flipped learning/blended class room-E-content, Videos, Problem solving, Group Discussion, Peer learning, Seminar.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

Course Outcome No	Course Outcome	Knowledge Level
CO 1	Solve differential equations using Fourier's series and transform	K1-K5
CO 2	Solve both differential equations using Laplace transform	K1-K5
CO 3	Solve differential equations with various analytical methods	K1-K5
CO 4	Solve differential equations using special functions	K1-K5
CO 5	Solve partial differential equations associated with Physics	K1-K5

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	Score
CO 1	4	4	4	4	4	4	4	4	4	4	4.0
CO 2	4	4	4	4	4	4	4	4	3	3	3.8
CO 3	4	3	4	3	4	3	4	4	4	4	3.6
CO 4	3	4	3	4	3	3	4	4	4	4	3.6
CO 5	4	4	5	4	4	4	4	4	4	4	4.1

H-High **M-Medium** **L-L**

COURSE DESIGNER: Dr.T.SEETHALAKSHMI

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **SUBJECT CODE: P21PH2C7**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc., PHYSICS – II SEMESTER — CORE COURSE – VII

(For the candidates admitted from the year 2021-22 onwards)

QUANTUM MECHANICS

COURSE OBJECTIVES

To make the Students

1. To study the basic concepts of Quantum Mechanics
2. To understand the different approximation methods used in Quantum Mechanics
3. To know the central field approximation and chemical bonding
4. To understand the scattering theory and angular momentum
5. To have an idea to apply relativity into Quantum Mechanics

UNIT - I	**MATRIX FORMULATION AND REPRESENTATION THEORY** Dirac's bra and ket notation – Hilbert space - Dynamical Variables and linear Operators; Projection operators, Unitary operator, Matrix representation of an operator – Unitary transformation: Change of basis – Significant properties of unitary transformations–Matrix theory of Harmonic oscillator–Schrodinger, Heisenberg and Interaction pictures.
UNIT - II	**TIME INDEPENDENT, TIME DEPENDENTPERTURBATION THEORY ANDWKB APPROXIMATION** Non-degenerate energy levels - Effect of electric field on the ground state of hydrogen-Stark effect - Zeeman effect - Transition to continuum state - Fermi's Golden rule-Selection rules-WKB method –Validity of WKB method.
UNIT- III	**MANY ELECTRON ATOMS AND CHEMICAL BONDING** Indistinguishable particles - Pauli principle-inclusion of spin-spin functions for two and three electrons- Central field approximation-Thomas –Fermi model of the atom-Hartee equation-Hartee-Fock equation-Born –Oppenheimer approximation – Molecular orbital method- Heitler –London theory of hydrogen molecule
UNIT- IV	**SCATTERING THEORY AND ANGULAR MOMENTUM** Scattering amplitude – Born approximation and its validity –Orbital angular momentum-Spinangular momentum-Totalangular momentum- Operators commutation relations of total angular momentum with components - Ladder operators – Commutation relation of J_Z with J+and J-– Eigen values of J^2 and JZ– Addition of angular momenta – Clebsh–Gordanco-efficients(Basic ideas only), Pauli's spinmatrices
UNIT – V	**RELATIVISTIC QUANTUM MECHANICS** Klein–Gordan equation for free particle – Equation of continuity, probability density and probability current density for Klein – Gordan equation – Dirac's relativistic wave equation for free particle – Dirac Matrices – Plane wave solution of Dirac's relativistic wave equation – Negative energy states – Equation of continuity, probability density and probability current density for Dirac equation – spin–orbit coupling- spin angular momentum.

TEXT BOOKS

1. P.M.Mathews&K.Venkatesan,*ATextBookofQuantumMechanics*TMH, NewDelhi–2008
2. G.Aruldas,*QuantumMechanics*,PHI,NewDelhi-2006.
3. Satyaprakash,*QuantumMechanics*,KedarNathRamNath&Co,Meerut,2006.
4. B.S.Rajput*Advanced Quantum Mechanics*,PragatiPrakashan,Meerut,2008.
5. ManasChanda,*AtomicStructuresandchemicalbond*–TMH,NewDelhi,1991
6. Peter W. Atkins, Ronald S Friedman, *Molecular Quantum Mechanics*, Oxford UniversityPress,IVEdition, 2007

REFERENCE BOOKS

1. SujaulChowdhury, *Quantum Mechanics*–NarosapublishingHouse,NewDelhi,2014
2. V.Devanathan,*QuantumMechanics*–Narosa publishingHouse,NewDelhi,2011
3. V.K.Thankappan, *Quantum Mechanics*, New Age International publishers, New Delhi,2006.
4. LenordISchiff, *QuantumMechanics*,TMH, NewDelhi, IIIEdition,2010.

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
ChalkandTalkLectures,Tutorials,VideoLectures

COURSE OUTCOMES

By the end of this course, Students will be able to

Course Outcome No	Course Outcome	Knowledge Level
CO1	Acquire the knowledge of preliminary mathematical tools required in quantum mechanics and capacity to solve simple One-dimensional systems and their time evolution.	K1
CO2	The ability to use different methodologies for perturbed systems.	K2
CO3	Understand the central field approximation and chemical bonding.	K3
CO4	To apply non-commutative algebra for topics such as angular and spin angular momentum and to solve scattering problems for different types of scatterers and compare theoretical and experimental results.	K4
CO5	To apply the relativity equations in Klein-Gordan, Dirac's equation for a free particle and plane wave solution.	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING COURSE OUTCOME WITH PO AND PSO

Outcome	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	POS6	POS7	POS8	TOT	SCORE
CO1	**3**	**3**	**2**	**-**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**32**	**2.5**
CO2	**3**	**3**	**3**	**3**	**-**	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**33**	**2.5**
CO3	**3**	**2**	**-**	**3**	**1**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**28**	**2.1**
CO4	**3**	**3**	**3**	**1**	**2**	**3**	**3**	**3**	**3**	**-**	**3**	**2**	**2**	**31**	**2.4**
CO5	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**30**	**2.3**
Mean overall score															**2.4**

Result: The core for this course is 2.4 (High relationship)

Note:

Strength level	Low	Medium	High
Value	1	2	3

Values Scaling

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

$$\text{Mean Score of COs} = \frac{\text{Total of Value}}{\text{Total No. of Pos\& PSOs}} \qquad \text{Mean overall score for COs} = \frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$$

COURSE DESIGNER: Dr.V.KATHIRAVAN

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **SUBJECT CODE : P21PH2C8**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc. PHYSICS – II SEMESTER -– CORE COURSE – VIII

(For the candidates admitted from the year 2021-22 onwards)

ELECTRO MAGNETIC THEORY

COURSE OBJECTIVES

To make the Students

1. To study the fundamentals of electrostatics and magneto-statistics.
2. To solve Boundary value problems.
3. To learn and understand the basic laws and their applications associated with Magnetostatics.
4. To study Electromagnetic equations.
5. To study the propagation of electromagnetic waves.

UNIT - I	**INTRODUCTION TO ELECTROSTATICS** Coulomb's law – Electric field – Gauss law – Scalar potential – Poisson and LaplaceEquation – Green's theorem – Dirichlet and Neumann boundary conditions – Electrostaticboundary value problems: Solution using Green's function – Method of images illustrations:point charge in the presence of (i) a grounded conducting sphere, (ii) a charged, insulated andconducting sphere, (iii) near a conducting sphere at fixed potential and (iv) conducting spherein a uniform electric field – Green's function for the sphere.
UNIT - II	**ELECTROSTATICS OF MACROSCOPIC MEDIA** Multipole expansion – Boundary value problems with dielectrics – Illustrations: (i) point charge embedded at a distance away from a dielectric interfaced, (ii) dielectric sphere in a uniform electric field and (iii) spherical cavity in a dielectric medium with applied electric field – Molecular Polarizability and Electric Susceptibility – Electrostatic energy in dielectric media.
UNIT- III	**MAGNETOSTATICS** Biot and Savert's law –Divergence and Curl of Magnetic Induction- Force between current carrying conductors – Differential equationsofMagnetostatics– Magnetic Vector potential –Magnetic field of a localized current distribution –Magnetic moment and force on a current distribution in an external field – Magnetostatic energy- Magnetic Field of boundaryconditions on B and H – Methods of solving boundary value problems in Magnetostatics –Uniformly magnetized sphere.
UNIT - IV	**ELECTROMAGNETIC INDUCTION** Faraday's law of induction – Maxwell's displacement current – Maxwell equations – Maxwell equations in terms of vector and scalar potentials – Gauge transformation – Lorentzgauge- Coulomb gauge – Poynting's theorem – Conservation of energy and momentum for a system of charged particles and electromagnetic fields.
UNIT – V	**PLANE ELECTROMAGNETIC WAVES AND WAVE PROPAGATION** Plane waves in a non-conducting medium – Linear and circular polarization, Stokesparameters – Reflection and refraction of electromagnetic waves at a plane interface betweendielectrics – Propagation of electromagnetic waves in hollow metallic cylinders - cylindrical and rectangular wave guides – TM and TE modes.

TEXT BOOKS

1. David J Griffths-Introduction to Electromagnetics- III edition, Prentice Hall of India Pvt., Ltd.,- New Delhi (2000).
2. Classical Electrodynamics – John David Jackson-III Edition, John Wiley & co., (2000).
3. Electromagnetic theory – SathyaPrakash- KedarnathRamnath Publishing Co.,
4. Electromagnetic theory – Chopra Agarwal – K.Nath& Co.,(1984).

REFERENCE BOOKS

1. N.NarayanaRao- Basic Electromagnetics with Applications- , Prentice Hall of India Pvt., Ltd., - New Delhi (2002).

2.UmeshSinha-Electromagnetic theory and applications- Technology India Publications, New Delhi, (2000).

3. Edward C. Jordan and Keith G. Balmain- Electromagnetic Waves and radiating systemsIII Edition-, Prentice Hall of India Pvt., Ltd., - New Delhi (2000).

4. John R. Reitz- Foundations of Electromagnetic Theory- VI Edition, Narosa Publishing House, New Delhi

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Lecture Method, ICT, Seminar, Assignment, Quiz.

COURSE OUTCOMES

By the end of this course, Students will be able to

Course Outcome No.	Course Outcome	Knowledge Level
CO1	To understand the fundamental laws of Electrostatics.	K1
CO2	Acquiring the knowledge of Multipoleexpansion and Boundary value problems.	K2
CO3	Analyze and study the applications associated with Magnetostatistics.	K3
CO4	Ability to derive Electromagnetic field equations	K4
CO5	To Study the various modes of propagation of Electromagnetic Waves in waveguides	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING COURSE OUTCOME WITH PO AND POS

Outcome	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	POS6	POS7	POS8	TOT	SCORE
CO1	3	3	2	-	3	3	3	3	3	2	3	3	2	33	2.5
CO2	3	3	3	3	-	2	3	3	2	3	3	2	2	32	2.4
CO3	3	2	-	3	1	2	3	2	2	3	1	2	1	25	1.9
CO4	3	3	3	1	2	3	3	3	3	-	3	2	2	31	2.9
CO5	3	2	3	2	2	3	2	2	3	2	2	2	2	30	2.3
Mean overall score															2.4

Result: The core for this course is 2.4 (High relationship)

Note:

Strength level	Low	Medium	High
Value	1	2	3

Values Scaling

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

$$\text{Mean Score of COs} = \frac{\text{Total of Value}}{\text{Total No.of Pos\& PSOs}} \qquad \text{Mean overall score for COs} = \frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$$

COURSE DESIGNER:V.SUBHA

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **SUBJECT CODE: P21PH2E2**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc. PHYSICS – II SEMESTER – ELECTIVE COURSE - II

(For the candidates admitted from the year 2021-22 onwards)

8051 MICROCONTROLLER AND ITS APPLICATIONS

COURSE OBJECTIVES

To Make the Students

1. To acquaint students with architectures of microprocessors, microcontrollers
2. To familiarize the students with assembly language programming in 8051 microcontroller
3. To design and implementation of peripherals interfacing of the 8051 microcontroller
4. To introduce the students to the code converters interfacing and sensors interfacing with 8051 microcontroller

UNIT- I	**INTRODUCTION TO MICROCONTROLLERS** Introduction-Microcontrollers and Microprocessors- History of Microcontrollers and Microprocessors- 8 bit and 16 Bit Microcontrollers-CISC and RISC Processors-Harvard and Von Neumann Architectures -8051 Micro controllers-Introduction-MCS-51 Architecture-Registers in MCS-51-8051 Pin description - 8051 Connections -8051 Parallel /O ports-Memory organization-Data types and directives
UNIT- II	**MCS-51 ADDRESSING MODES AND INSTRUCTIONS** 8051 Addressing modes –Register addressing –Direct addressing-Register addressing – Immediate addressing Base register plus index register index addressing – MCS-51 Instruction set-Data transfer instructions – Arithmetic instructions –Logical instructions-Boolean variable manipulation instructions-Program branching instructions – 8051 instructions and simple programs
UNIT- III	**MCS-51 INTERRUPTS** Interrupts in MCS -51 –Initializing 8051 interrupts – Interrupts priorities-Timers and counters –Timer/Counter modes – Mode0 - Mode1 - Mode2 -Mode3 –Serial Communication Serial communication modes – Mode0 -Mode1 - Mode2 - Mode3
UNIT – IV	**ASSEMBLY LANGUAGE PROGRAMS** 16 bit Addition- 16 bit subtraction-16 bit BCD addition -8 bit multiplication – 8 bit division – Sum of the series –Average of N numbers –Data transfer from one block to another –Find factorial of a number - Find the largest and smallest number in the given data array - Arrange the given numbers in ascending order and descending order.
UNIT- V	**INDUSTRIAL APPLICATIONS OF MCS51** Interfacing display- seven segment display –Multiplexed display-ALP to display message – Interfacing LCD display –Interfacing DAC 0804 to 8051 – Square wave – Triangular wave – Sine wave - Interfacing ADC 0808 to 8051 – ALP to convert Analog inputs to their digital outputs –Stepper motor interface –ALP to control stepper motor – Interfacing traffic light control system – ALP to control traffic lights.

BOOKS FOR STUDY

1. Ajay V Deshmukh -Microcontrollers –Theory and applications –Tata McGraw Hill education private limited New Delhi -Nineteenth reprint 2012 (**For I,II and III units**)
2. A.P.Godse and D.A.Godse, Microprocessors and its applications (First edition), Technical Publications, Pune, 2006. (**For IV and V units**)

BOOKS FOR REFERENCE

1. Muhammad Ali Mazidi, Janice GillispieMazidi - The 8051 Microcontrollerand Embedded Systems, Pearson Education, Delhi, Seventh IndianReprint 2004
2. The 8051 Microcontroller Architechture Programming and Applications Kenneth J.Ayla
3. A.NagoorKani, Microprocessors & Microcontrollers, 1st edition, RBAPublications, Chennai,2006

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Methodology:
Chalk and Talk Lectures, ICT, Seminars, Quiz, Group Discussions

COURSE OUTCOMES:

At the end of the course, the students will able to

Course Outcome No.	Course Outcome	Knowledge Level
CO1	Understand the pin description and internal architecture of 8051 microcontroller;	K2
CO2	Identify the various addressing modes and different types of instructions used;	K3
CO3	Interpret the program by using timer/counters, interrupts and serial I/O ports;	K2
CO4	Enhance skills to write assembly language programs for mathematical operations;	K2
CO5	Analyze industrial applications of 8051 microcontroller	K3

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING COURSE OUTCOME WITH PO AND POS

Course Outcome (COs)	Programme Outcomes(POs)					Programme Specific Outcome (PSOs)						Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	
CO1	3	2	2	2	3	2	3	3	2	2	-	2.4
CO2	3	3	2	3	2	3	2	2	3	2	-	2.6
CO3	3	2	3	2	3	3	3	2	2	2	-	2.5
CO4	2	3	1	3	2	3	2	3	3	2	-	2.4
CO5	2	3	2	3	2	2	3	3	2	3	-	2.5
	Mean overall score											2.48

Result: The Score for this course is 2.48 (High Relationship)

Note:

Strength level	Low	Medium	High
Value	1	2	3

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

COURSE DESIGNER: S.SAHUL HAMEED

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT : 5 **COURSE CODE: P21PH3C9**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc. PHYSICS - III SEMSTER – CORE COURSE - IX

(For the candidates admitted from the year 2021-2022 onwards)

THERMODYNAMICS AND STATISTICAL MECHANICS

COURSE OBJECTIVES

To Make the Students

1. Acquire knowledge about different laws of thermodynamics
2. Knowledge about Liouville's theorem and Boltzmann's theorem and its importance
3. Basic concepts in quantum statistical mechanics

UNIT– I	**THERMODYNAMICS** Thermodynamic coordinates - First law of thermodynamics: Applications - Adiabatic and Isothermal processes - Application of second law of thermodynamics: Carnot's theorem, Entropy disorder, Nernst's heat theorem - Clausius inequality - Entropy changes in irreversible and reversible process - Application of third law of thermodynamics: Gibbs - Helmholtz equation - Expression for C_V and C_p - Mayer's relation - Clausius - Clapeyron Equation.
UNIT– II	**CLASSICAL STATISTICAL BASIS OF THERMODYNAMICS** Phase space - Volume in Phase space, Number of phase cell in given energy range of harmonic oscillator and 3D free particles - Ensembles - Uses - Statistical postulates - Boltzmann's theorem - Liouville's Theorem - Ideal gas Bose - Einstein - Energy and pressure gas – Degeneracy
UNIT– III	**CLASSICAL STATISTICAL DISTRIBUTION LAW** Macroscopic and Microscopic states - Stirling's approximation - Classical Maxwell Boltzmann distribution law - Function - Velocities in ideal gas - Partition function for a gas molecule - Partition function and thermodynamic quantities - Translational, rotational, Vibrational partition function - Equation of Canonical and Micro Canonical Ensembles - Grand Canonical partition function and thermo dynamical quantities.
UNIT– IV	**QUANTUM STATISTICAL MECHANICS** Ideal Bose - Einstein gas - energy and pressure of gas - gas degeneracy - Bose - Einstein condensation - Thermal properties of Bose - Einstein gas - Ideal Fermi Dirac gas - Energy and Pressure of gas - Liquid helium - London theory.
UNIT– V	**APPLICATIONS OF QUANTUM STATISTICAL MECHANICS** Black body and Planck's radiation - Photons - Specific heat of solids - Pauli's Paramagnetism - Ising and Heisenberg models - Transport properties - Boltzmann transport equation for electrons and Lorentzsolutions.

TEXT BOOKS

1. Elementary Statistical Mechanics – Gupta and Kumar, PragatiPrakashan, Meerut, 8th Edition.
2. StatisticalandThermalphysics–F.Reif,,McGrawHill,InternationalEdition, Singapore(1979)
3. Statistical Mechanics – B.K. Agarwaland M. Eisner, New Age International Publishers, 2nd Edition.

REFERENCE BOOKS

1. Fundamentals of Statistical Mechanics – B.B.Laud, New Age International Publishers, New Delhi, 2007.
2. Statistical Mechanics – Kerson Huang, Wiley eastern Ltd., New Delhi,1983.

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Chalk and Talk Lectures, Video Lectures, Seminars, Group Discussions

COURSE OUTCOMES

By the end of this course, Students will be able to

Course Outcome No.	Course Outcome	Knowledge Level
CO1	Know about statistical nature of concepts and laws in thermodynamics	K2
CO2	Get knowledge about using the statistical physics methods, such as Boltzmann distribution, Gibbs distribution and Bose – Einstein distributions to solve problems in some physical systems	K3
CO3	Get knowledge about basic concepts and relations including phase space and ensembles	K2
CO4	Get knowledge about Quantum statistical mechanics of ideal Bose Einstein gas and ideal Fermi Dirac gas, slight and strong degeneracy of quantum systems, including Fermi gases and Bose Einstein condensation	K2
CO5	Get knowledge about Applications of Quantum statistical mechanics	K3

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING COURSE OUTCOME WITH PO AND POS

Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**TOT**	
CO1	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**2**	**2**	**2**	**22**	**2.2**
CO2	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**24**	**2.4**
CO3	**3**	**3**	**3**	**1**	**1**	**3**	**3**	**2**	**2**	**2**	**23**	**2.3**
CO4	**3**	**1**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**23**	**2.3**
CO5	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**20**	**2.0**
Mean overall Score											**112**	**2.24**

Result: The core of the course is **2.24 (High relationship)**

Note:

Strength level	Low	Medium	High
Value	1	2	3

Value Scaling

Mapping	1 - 33%	34 - 66%	67 - 100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1- 3.0
Quality	Poor	Moderate	High

$$\text{Mean Score COs} = \frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean overall score for COs} = \frac{\text{Total of Mean Score}}{\text{Total No. of Cos}}$$

COURSE DESIGNER: Dr.S.LALITHA

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **SUBJECT CODE : P21PH3C10**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc. PHYSICS – III SEMESTER – CORE COURSE – X

(For the candidates admitted from the year 2021-22 onwards)

NUCLEAR AND PARTICLE PHYSICS

COURSE OBJECTIVES

To make the students

1. Understand the basic principles of nuclear forces
2. Distinguish between the theories of Alpha decay, Beta decay and Gamma decay
3. Acquire knowledge in different nuclear models
4. Understand the concepts of different nuclear reactions
5. Acquire the knowledge of Particle Physics

UNIT – I	**NUCLEAR PROPERTIES AND FORCE BETWEEN NUCLEONS** Nuclear radius, mass and abundance of nuclides - Binding energy - Nuclear angular momentum and parity- Nuclear electromagnetic moments- Nuclear excited state –Van- Waizacker's semi empirical mass formula- Deutron - Nucleon – Nucleon scattering - Proton– Proton and neutron-Neutron interaction - Properties of nuclear forces -Yukawa hypothesis.
UNIT – II	**NUCLEAR DECAY** Alpha Decay: properties– Gamow's Theory of α -Decay – Geiger-Nuttal law – α -ray Energies – Fine Structure of α- rays – α-disintegration Energy – long range α- particle - Beta decay: Properties– General feature of β ray Spectrum – Neutrino theory of Beta Decay – Fermi's Theory of β- Decay – forms of interaction and selection rule - Gamma Decay : Properties-Absorption of ν-rays by matter – interaction of ν rays with matter- Measurement of ν-ray Energies – internal conversion.
UNIT– III	**NUCLEAR MODELS AND ACCELERATORS** Nuclear Models: Liquid Drop model: Bohr-Wheeler Theory of fission – Condition for spontaneous fission - Shell model: Explanation of magic numbers – Prediction of nuclear spin and parity – Nuclear statistics – Magnetic moment of nuclei – Nuclear isomerism optical model- Collective model: Explanation of quadruple moment - Particle accelerators and Detectors: Semiconductor detector.
UNIT– IV	**NUCLEAR REACTIONS** Kinds of nuclear reactions and conservation laws – Q-value - Energy of nuclear reactions – Continuum theory of reaction – Resonance – Breit-Wigner dispersion formula – Stages of a nuclear reaction – Statistical theory of nuclear reaction – Kinematics of stripping and pick up reaction.
UNIT-V	**PARTICLE PHYSICS** Building blocks of nucleus – Nucleons, Leptons , Mesons, Baryons, Hyperons, Hadrons, strange particles – Classification of fundamental forces and elementary particles – Basic conservation laws – Additional conservation laws : Baryonic , Leptonic , Strangeness and Isospin charges /Quantum numbers– Gell-Mann – Nishijima formula – Multiplets – invariance under time reversal (t) charge conjugation (c) and parity (p) – CPT theorem – parity - non conservation in weak interaction - CP violation –Parity violation – Quarkmodel.

TEXT BOOKS

1. D.C.Dayal – NuclearPhysics.
2. R.C. Sharma – NuclearPhysics
3. T.C Tayal – Nuclear Physics-UmeshPrakashan –Gujarat
4. D.C.Cheng and G.K.O'Neil – Elementary Particle Physics.

REFERENCE BOOKS

1. K.S. Krane – Introductory Nuclear Physics – John – Wiley, New York-1897
2. Griffths – Introduction to Elementary ParticlePhysics.
3. R.D.Evans- Atomic nucleus, McGraw – Hill, NewYork-1955.
4. Kaplan- Nuclear Physics, Narosa, New Delhi- 1989.
5. B.L.Cohen -Concepts of Nuclear physics, TMH, NewDelhi-1971.

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Lecture method, ICT, Seminar, Quiz, Group discussion.

COURSE OUTCOMES

By the end of this course, Students will be able to

Course Outcome No.	Course Outcome	Knowledge Level
CO1	Have a basic knowledge of structure of nucleus and also the characteristics of nuclear force in details,	K1
CO2	Understand the theory behind γ-ray and matter interaction	K2
CO3	Gain Knowledge about various nuclear models and potentials associated	K3
CO4	Develop and communicate analytical skills in sub atomic level	K4
CO5	Understand the properties of elementary particles, their decay and the interactions to utilize the particles in different medical devices	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING COURSE OUTCOME WITH PO AND POS

Outcome	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	POS6	POS7	POS8	TOT	Score
CO1	**3**	**2**	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**-**	**3**	**2**	**2**	**29**	**2.3**
CO2	**3**	**2**	**2**	**3**	**2**	**3**	**3**	**-**	**2**	**3**	**3**	**2**	**3**	**31**	**2.6**
CO3	**3**	**2**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**2**	**34**	**2.6**
CO4	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**3**	**2**	**2**	**2**	**33**	**2.5**
CO5	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**3**	**2**	**32**	**2.5**
Mean overall score															**2.5**

Result: The core for this course is 2.5 (High relationship)

Note:

Strength level	Low	Medium	High
Value	1	2	3

Values Scaling

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

$$\text{Mean Score of COs} = \frac{\text{Total of Value}}{\text{Total No.of Pos\& PSOs}} \qquad \text{Mean overall score for COs} = \frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$$

COURSE DESIGNER: Dr.S.SHANTHI

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **COURSE CODE: P21PH3C11**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
M.Sc. PHYSICS – III SEMESTER –CORE COURSE – XI

(For the candidates admitted from the year 2021-22 onwards)

COMMUNICATION ELECTRONICS

COURSE OBJECTIVES

To make the students

1. To learn the standard techniques of modern communication systems
2. To study the working of radio transmitters and receivers
3. To learn various modulation techniques
4. Learning to implement different digital carrier modulation techniques
5. To learn the basics of Information theory.

UNIT - I	**ANTENNAS & WAVE PROPAGATION** Radiation field and radiation resistance of a short dipole antenna- Grounded λ/4 antenna- unground λ/2 antenna- Antenna arrays- Broadside and end side arrays- Antenna Gain- Directional high frequency antennas- Ionosphere-Eccles and Larmor Theory- Magneto ionic theory- Ground wave propagation.
UNIT - II	**ANALOG AND DIGITAL COMMUNICATION** Modulation-definition- types of modulation – Expression for amplitude modulated voltage- AM transmitter: Block diagram and explanation–Expression for amplitude modulated voltage - Pulse Modulation: definition, types- Pulse amplitude modulation- Pulse Code Modulation - Delta modulation – Data transmission: ASK, FSK, PSK - Multiplex transmission - Frequency and Time Division Multiplexing.
UNIT- III	**MICROWAVES AND RADAR COMMUNICATION** Generation of microwaves – Klystron- Reflex Klystron - Magnetron - Detection of microwaves: TWT, IMPATT, TRAPATT and Gunn diodes - Radar – Principle- Radar equation – Pulse and CW Radar - MTI and Automatic Tracking Radar -uses.
UNIT - IV	**OPTIC FIBER COMMUNICATION** Fiber optics - Different types of fiber: Step index and graded index fibers - Signal degradation fibers: Absorption, attenuation, scattering losses and dispersion - Optical sources and detectors (Quantitative only) - Power launching and coupling: Source to fiber launching - Fiber joints - Splicing techniques - General optical communication system.
UNIT – V	**SATELLITE AND CELLULAR COMMUNICATION** Satellite links - Eclipses - Orbits and Inclination - Satellite construction - Satellite communication frequencies - Different domestic satellites-INTELSAT system - MARISAT satellites - Telemetry cellular concept - Multiple access cellular systems - Cellular systems operation and planning general principles - Analog cellular systems - Digital cellular mobile systems - GSM - CDMA cellular standards.

BOOKS FOR STUDY

1. Dennis Reddy and John Coolen, Electronic Communication - Fourth Edition, PHIPrivate Ltd.,(1999).
2. Hand book of Electronics by Gupta & Kumar-2008Edition
3. *G.* Kennedy and Davis, Electronic Communication System, TMH, New Delhi 1999.
4. Gerd Keiser, Optical Fiber Communication Third Edition, McGraw - Hill, Singapore 2000. 5.Raj Pandya, Mobile and Personal Communication Services and System, Prentice Hall of India, Private Ltd, New Delhi, 2003.

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Chalk and Talk Lectures, Tutorials, Video Lectures

COURSE OUTCOMES:

On completion of this course, the student will able to

Course OutcomeNo.	Course Outcome	Knowledge Level
CO 1	Know the various type of antenna such as half-wave dipole antenna, loop antenna etc, used for transmitting and receiving of information.	K1
CO 2	Know digital modulation techniques such as Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK) and Digital Transmission schemes such as Pulse Code Modulation (PCM), Adaptive Delta Modulation, Time Division Multiplexing etc.	K2
CO 3	Know the Generation and detection of Microwaves, principles of Radar and Automatic Tracking Radar.	K3
CO 4	Understand the basics of fibre optics such as configuration of optic fibre cables, modes of propagation of light and the losses suffered in them.	K4
CO 5	Understand the function of satellite communication system and different domestic satellite like INTELSAT, MARISAT etc., and Different analog and digital cellular systems.	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and Skill		Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING COURSE OUTCOME WITH PO AND PSO

Outcome	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	TOT	Score
CO1	2	3	2	2	3	3	3	3	2	4	27	**2.7**
CO2	3	2	4	2	3	2	3	4	2	3	28	**2.8**
CO3	2	3	4	2	2	3	2	4	3	3	29	**2.9**
CO4	4	3	2	1	4	2	3	3	3	1	26	**2.6**
CO5	2	4	3	3	2	3	2	2	4	3	28	**2.8**
Mean overall score												**2.76**

Result: The Score for this course is **2.76** (High relationship)

Note:

Strength level	Low	Medium	High
Value	1	2	3

Values Scaling

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

$$\text{Mean Score of COs} = \frac{\text{Total of Value}}{\text{Total No.of Pos \& PSOs}}$$

$$\text{Mean overall score for COs} = \frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$$

COURSE DESIGNER:

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT : 5 **SUBJECT CODE : P21PH3E3**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc. PHYSICS – III SEMESTER –ELECTIVE COURSE –III

(For the candidates admitted from the year 2021-22 onwards)

CRYSTAL GROWTH AND THINFILM PHYSICS

COURSE OBJECTIVES:

To strengthen the students with crystal growth, thin film theory syntheses and characterization techniques.

UNIT – I	**CRYSTAL GROWTH THEORY** Introduction to crystal growth - nucleation – Gibbs-Thomson equation - kinetic theory of nucleation – limitations of classical nucleation theory - homogeneous and heterogeneous nucleation – different shapes of nuclei – spherical, cap, cylindrical and orthorhombic – Temkins model – physical modeling of BCF theory.
UNIT – II	**CRYSTAL GROWTH TECHNIQUES** Bridgman technique - Czochralski method - Verneuil technique - Zone melting – Gel growth – Solution growth methods – Low and high temperature solution growth methods – Vapour growth - Epitaxial growth techniques- LPE – MOCVD – MPE
UNIT –III	**METHODS OF SYNTHESIS OF THIN FILMS** Introduction-Thin Film Growth Process- Physical Deposition Techniques - Thermal Evaporation - Electron Beam Evaporation - Ion Plating - Pulsed Laser Deposition (PLD) Method- Sputtering- Chemical Deposition Techniques- Chemical Bath Deposition (CBD) - Successive Ionic Layer Adsorption and Reaction (SILAR) –Spray Pyrolysis
UNIT –IV	**NUCLEATION, GROWTH AND STRUCTURE OF FILMS** Theories of nucleation – capillarity theory – statistical or atomistic theory – sticking coefficient – growth process – influence of deposition parameters – kinetic energy effect – oblique deposition – electro static effect – crystallite size – surface roughness – density of thin films – lattice constants – Size effect, surface pseudo morphism – structural defects in thin films
UNIT-V	**CHARACTERIZATION TECHNIQUES** X – Ray diffraction (XRD) - Powder and Single crystal – Fourier transform Infrared (FT-IR) and Raman analysis - Energy dispersive X-ray analysis (EDAX) – Scanning Electron Microscopy (SEM) - UV-Vis-NIR spectrometer – Vickers's micro hardness study - Photoluminescence(PL) study - Thermal Gravimetric Analysis, Differential Thermal Analysis -dielectric study.

BOOKSFOR STUDY:

1. P.Ramasamy and P.Santhanaraghavan. Crystal growth processes and methods. KRU Publications, 2000.
2. H.E.Buckley. Crystal growth.John Wiely& sons, New York, 1981.
3. Instumental methods of chemical analysis, GurseepR.Chatwal, Sham K. Anand, Himalaya , Publishing house, 2007 reprint.

BOOKSFOR REFERENCE:

1. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, CBS, Publishers and Distributors, New Delhi.
2. M.William and D. Steve, Instrumental Methods of Analysis(CBS Publishers, New Delhi)

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Lecture (Chalk and talk/OHP/LCD), Flipped learning/blended class room-E-content, Videos, Problem solving, Group Discussion, Peer learning, Seminar.

COURSE OUTCOMES

By the end of this course, Students will be able to

Course Outcome No.	Course Outcome	Knowledge Level
CO 1	Learn and understand the crystal growth theories.	K1
CO 2	Acquire the knowledge in crystal growth techniques	K2
CO 3	Study the methods of synthesis of Thin Films	K3
CO 4	Understand Nucleation, Growth and Structure of Films	K4
CO 5	Learn the structural, elemental, optical and thermal properties of samples using analytical instrumentation Techniques	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING COURSE OUTCOME WITH PO AND POS

Outcome	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	POS6	POS7	POS8	TOT	
CO1	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**-**	**3**	**2**	**1**	**30**	**2.3**
CO2	**3**	**3**	**2**	**3**	**-**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**32**	**2.4**
CO3	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**-**	**3**	**2**	**1**	**3**	**31**	**2.3**
CO4	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**2**	**1**	**3**	**2**	**2**	**3**	**32**	**2.4**
CO5	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**3**	**3**	**34**	**2.6**
Mean overall score														**159**	**2.4**

Result: The core for this course is 2.4 (High relationship)

Note:

Strength level	Low	Medium	High
Value	1	2	3

Values Scaling

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

$$\text{Mean Score of COs} = \frac{\text{Total of Value}}{\text{Total No. of Pos\& PSOs}} \qquad \text{Mean overall score for COs} = \frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$$

COURSE DESIGNER: G.SANTHI

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT :4 **COURSE CODE:P21PH4C12P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS –IV SEMESTER – CORE PRACTICAL – III

(For the candidates admitted from 2021-22 onwards)

ADVANCED ELECTRONICS – LAB - I

(Any Fifteen Experiments)

COURSE OBJECTIVES:

To make the students to

1. Give hands on training in the construction of simple electronics circuits.
2. Make out the students understand practically the characteristics of Laser diode
3. Provide an exposure on digital to analog and analog to digital conversion, use of logic gates.

A. ADVANCED ELECTRONICS

1. Half Adder-Full Adder (using NAND gates).
2. Half Subtractor & Full Subtractor (using NAND gates).
3. Flip Flop – (RS, JK, D, T – F/F)
4. Study the function of Encoder and Decoder.
5. Study the function of Multiplexer and Demultiplexer.
6. D/A Converter: i) R-2R resistor network, ii) weighted resistor network
7. Digital Comparator using EX OR and NAND gates.
8. Study of the counter using IC 7490 (0 - 9 and 00 – 99)
9. 7 Segment display.
10. Laser diode characteristics.
11. Determination of wavelength of a laser source by using diffraction grating.
12. Diffraction of Light by single slit, Double slit and Grating using LASER.
13. Characteristic study ofLED, LDR and Photo Diode using Laser.
14. Determination of Bending Losses and Attenuation by Fiber Cut-Back Method using laser.
15. Absorption of Light on Various Filters.
16. Michelson's Interferometer using LASER source.
17. Gaussian Nature of the LASER beam & Evaluation of Beam spot size.
18. DIAC, TRIAC – characteristics and applications.
19. Shift register and ring counter.
20. BCD adder

Expected Course Outcomes:

Course Outcome No.	Course Outcome	Knowledge Level
CO 1	Construct simple electronics circuits	K3, K6
CO 2	Understand the theoretical concepts by doing experiments	K2, K5
CO 3	Make out the characteristics of DIAC, TRIAC	K2, K4
CO 4	Know the conceptual difference between analog and digital	K3, K6
CO 5	Able to construct SHIFT REGSISTORS and COUNTERS	K3, K6

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Creat

COURSE DESIGNER:

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT :4 **SUBJECT CODE : P21PH4C13P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
M.Sc. PHYSICS – IV SEMESTER – CORE PRACTICAL – IV

(For the candidates admitted from the year 2021-22 onwards)

8051 MICROCONTROLLER AND INTERFACING LAB

(Any Fifteen Experiments)

COURSE OBJECTIVES:

To make the students to

The aim of the course is to develop the practical skills by applying the laws and concepts in physics and electronics experiments

Writing assembly programme to

1. Add, subtract, multiply and divide the given 8 bit number (s)
2. Find the largest and smallest number in a string
3. Add two 16 bit numbers with carry
4. Convert from Decimal to Octal and Hexa systems.
5. Convert from Octal, Hexa to Decimal system
6. Convert a BCD number into a Binary and Binary number to BCD
7. Arrange the given set of numbers in ascending and descending order
8. Transfer a block of data from a set of memory locations to another set of memory locations.
9. Find the sum of the N numbers
10. Perform multibyte addition / subtraction
11. Interface – A/D and D/A converters.
12. Interface – LED.
13. Interface – Stepper Motor.
13. Display six letter word.
14. Roll a display.
15. Control traffic system.
16. Study of seven segment displays in an add-on board.
17. Generate of Square, Triangular, Sawtooth, Staircase, Ramp and Sine waves using DAC 0800.
18. Find the square root of a given number.
19. Find the factorial of a given number.
20. Check Parity

TEXT BOOKS

1. Practical Physics and Electronics - C. C. Ouseph, U. J. Rao, V.Vijeyendran, SV Printers and Publishers Pvt. Ltd., (2007).

2. Practical Physics, Prof.A.Ponnusamy and B.Amalanathan, Bright Publishers, (1996).

REFERENCE BOOKS

A text book of Practical Physics – M.N.Srinivasan and others, Sultan Chand and Sons, (2014).

Web Resources

www.practicalphysics.org/

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Evaluation Pattern	
Internal:	Weightage to CIA test I (15) + CIA test (15) + Attendance (10) = Total **40 Marks**
External:	Part A (20) + Part B (25) +Part C (30) = Total **60 Marks**

Course Outcomes

After completion of this course the students able to

Course Outcome No.	Course Outcome	Knowledge Level
CO1	A practical knowledge of the working principles of the microcontroller and draw a flowchart and execute the mnemonics of the assembly language program	K1
CO2	Understand the overview of 8051 microcontroller board	K2
CO3	Develop hardware	K3
CO4	Acquire profound knowledge on keyboard details.	K4
CO5	Develop assembly language programme	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

MAPPING COURSE OUTCOME WITH PO AND POS

Outcome	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	POS6	POS7	POS8	TOT	
CO1	**2**														
CO2															
CO3															
CO4															
CO5															
Mean overall score															

Result: The core for this course is 2.3 (High relationship)

Note:

Strength level	Low	Medium	High
Value	1	2	3

Values Scaling

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

$$\text{Mean Score of COs} = \frac{\text{Total of Value}}{\text{Total No.of Pos\& PSOs}} \qquad \text{Mean overall score for COs} = \frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$$

COURSE DESIGNER:

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 4 **COURSE CODE : P21PH4C14**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc., PHYSICS – IV SEMESTER – CORE COURSE –XIV

(For the candidates admitted from the year 2021-22 onwards

MOLECULAR SPECTROSCOPY

COURSE OBJECTIVES

To make the students to

1. To make the students understand the principles of microwave spectroscopy
2. To expose the students to fundamental of infrared spectroscopy of different types of molecules
3. To introduce students to the theory and application of Raman spectroscopy
4. To make the students understand the basic concepts of in nuclear spectroscopy.

UNIT – I	**PRINCIPLES OF SPECTROSCOPY** Electromagnetic radiation – Wave theory of e.m radiation - Interaction of e.m radiation with matter – Born-Oppenheimer approximation – Types of molecular spectra – characteristic features for absorption and emission of e.m radiation - Spectral band – Doppler broadening –Intensity of spectral lines and transition probability–Energy Dissipation from excited states.
UNIT – II	**MICROWAVE AND IR SPECTROSCOPY** Rotational spectra of Diatomic molecules: Effect of isotopic substitution –The spectrum of a Non- rigid rotator –Rotational spectra of polyatomic molecules: Linear, Symmetric top and Asymmetric top molecules –Experimental techniques –Vibrating diatomic Molecule: Diatomic vibrating rotator –Analysis techniques –Characteristic and group frequencies.
UNIT–III	**RAMAN SPECTROSCOPY AND ELECTRONIC SPECTROSCOPY OF MOLECULES** **Raman spectroscopy**: Raman effect–Quantum theory–Raman shift so fdiatomic molecules-Rotational and Vibrational spectra–Selection rules. **Electronic spectroscopy of molecules:** Electronic spectra of diatomic molecules –Franck–Condon principle dissociation energy and dissociation products rotational fine structure of electronic vibration transitions.
UNIT–IV	**RESONANCE SPECTROSCOPY** **NMR:** Basic principles –Classical and Quantum mechanical description–Bloch equations–Spin-Spin and Spin –Lattice relaxation time–Chemical shift and coupling constant –Experimental methods–Single coil and double coil methods–High resolution methods. **ESR:** Basic principles – ESR spectrometer – Nuclear interaction and Hyperfine structure - Relaxation effects–g-factor-characteristics–Free radical studies and biological applications.
UNIT-V	**NQR&MOSSBAUERSPECTROSCOPY** **NQR Spectroscopy:** Fundamental Requirements - Principle – Experimental detection of NQR Frequencies–Interpretation and chemical Explanation of NQR Spectroscopy. **Mossbauer Spectroscopy**: Mossbauer Effect –Recoilless Emission and Absorption – Mossbauer Spectrum - Experimental Methods – Hyperfine Interaction - Chemical Shift- Magnetic Hyper fine and Electric Quadrupole Interaction.

BOOKS FOR STUDY

1. C.N.Banwell–FundamentalsofMolecularSpectroscopy–TMH-4thEdition.
2. G.Aruldas–MolecularStructureandSpectroscopy –PrenticeHallofIndia.

BOOKS FOR REFERENCE

1. ArthurBeiser–ConceptofModern Physics-TataMcGrawHillPublication.
2. D.N.Satyanarayana–VibrationalSpectroscopyandApplications–NewAgeInternational.

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Lecture Method, ICT, Seminar, Assignment, Quiz.

COURSE OUTCOMES

At the end of the course

Course Outcome No.	Course Outcome statement	Knowledge Level
CO 1	The students should have a knowledge on the techniques and instrumentation of Microwave spectroscopy	K2
CO 2	Use the vibrational spectra for analyzing the different types of samples	K2
CO 3	Apply the principles of Raman spectroscopy and its applications is the different field of science and technology	K2, K3
CO 4	Discuss different resonance spectroscopy techniques and its applications in various fields	K4
CO 5	Compile different spectroscopic problems and interpret its results	K5

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

Mapping of COs-PSOs

Course Outcome (COs)	Programme Specific Outcome(PSOs)					MeanScoreofCOs
	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**2**	**2**	**3**	**3**	**2**	**2.4**
CO2	**3**	**3**	**2**	**2**	**3**	**2.6**
CO3	**3**	**2**	**3**	**3**	**2**	**2.6**
CO4	**3**	**3**	**2**	**3**	**3**	**2.8**
CO5	**2**	**3**	**3**	**2**	**3**	**2.6**
	Mean overall score					2.6

Low	Moderate	High
1	**2**	**3**

COURSE DESIGNER: G.MAHALAKSHMI

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **COURSE CODE : P21PH4E4**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
M.Sc. PHYSICS – IV SEMESTER – ELECTIVE COURSE – IV

(For the candidates admitted from the year 2021-22 onwards)

NANOSCIENCE AND NANOTECHNOLOGY

COURSE EDUCATIONAL OBJECTIVES

To make the students to

1. Learn the basic concept of nano science.
2. Analyze the nucleation on nano crystals.
3. Study of 0D, 1D, 2D and 3D nanometerials.
4. Analyze the properties of various nano materials.
5. Know the application of nano materials in various fields.

UNIT – I	**BACKGROUND TO NANO AND TYPES OF NANOMATERIALS** Scientific revolution-Atomic structure-Molecular atomic size- -Emergence of nanotechnology-Challalnges in nanotechnology-Effect of surface area to volume ratio on the properties of materials-Definition of nanosystem-One dimensional (1D)-Two dimensional (2D)-Three dimensional (3D) nanostructured materials-Quantum dots –Quantum wire –Quantum well- Excitons confinement in quantum dots.
UNIT – II	**PREPARATION OF NANO MATERIALS** Introduction-Top down and Bottom up approaches-Top down techniques:Ball milling-Etching-Lithography (Nano lithography, Photo lithography)-Bottom up techniques: Sol-gel synthesis-Hydrothermal synthesis-Electro chemical deposition - Combustion synthesis.
UNIT–III	**CARBON NANOSTRUCTURES** Carbon molecules and Carbon bond - Types of Fullerences - Difference between Single - Walled Carbon Nanotubes - (SWCNTs) and Multi-Walled Carbon Nanotubes (MWCNTs) - Properties of Carbon nanotubes - Synthesis of carbon nanotubes - Applications of CNT - Specific applications of CNTs-Nano hybrids.
UNIT –IV	**STRUCTURAL CHARACTERIZATION** Introduction-Principle of X-ray Powder diffraction –Determination of Structural parameters-Principle, experimental setup,Procedure and utility of Scanning electron microscopy(SEM), Transmission electron microscopy(TEM)-Scanning Tunneling Microscope(STM) and Atomic force microscope(AFM).
UNIT-V	**APPLICATIONS OF NANOMATERIALS** Molecular electronics-Nano electronics-Nano robotics-CNT emiiters-Gold nnaoparticles in Catalysis-Biomedical Apllications: Targeted drug delivery, Cancer therapy (Targeted Chemotherapy, Radiation therapy.

TEXT BOOKS

1. T.Pradeep et al., A Textbook of Nano science and Nanotechnology (Tata McGraw Hill, New Delhi, 2012)
2. R.W. Kelsall, I.W. Hamley and M. Geoghegan, Nanoscale Science and Nanotechnology(John-Wiley & Sons, Chichester, 2005).
3. G. Cao, Nanostructures and Nanomaterials(Imperial College Press, London, 2004).
4. C.P. Poole and F.J. Owens, Introduction to Nanotechnology(Wiley, New Delhi, 2003).

REFERENCE BOOKS

1. M.Wilson, K.Kannangara, G.Smith, M.Simmons, B.Raguse-Nanotechnology:Basic Science and Emerging technologies –Overseas press India Pvt Ltd.-New Delhi –First edition -2005
2. C.N.R Rao, A.Muller,A.KCheetahm (eds)-The chemistry of nanomaterials: Synthesis, properties and applications –Wiley VCH VerlagGmbh&Co. Weinheim-2004
3. Kenneth J.Klabunde (Eds)-Nanosclae material science –john Wiley &sons Inc-2001
4. C.S.S.R Kumar, J.Hormes, C.Leuschner-Nanofabrication towards biomedical applications-Wiley VCH VerlagGmbh&Co. Weinheim-2004
5. W.Rainer-Nanoelectronics and information technology-Wiley -2003
6. K.E.Drexler –Nano systems –Wiley-1992
7. G.Cao-Nanostructures and nanomaterials: Synthesis, properties and applications-Imperial college press-2004

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Lecture (Chalk and talk/OHP/LCD), Flipped learning/blended class room-E-content, Videos, Problem solving, Group Discussion, Peer learning, Seminar.

COURSE OUTCOMES

By the end of this course, Students will be able to

Course Outcome No.	Course Outcome statement	Knowledge Level
CO1	Outline the basic science of materials at the nanometre scale	K2
CO2	Learn the effect of nucleation on nanocrystals	K2
CO3	Utilize the properties of nanomaterials and the impact of nanomaterials on environment	K2, K3
CO4	Analyze different nanomaterials and their properties	K4
CO5	Assess and design the preparation strategies of nanomaterials suited for various yields.	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and Skill		Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING COURSE OUTCOME WITH PO AND POS

Outcome	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	POS6	POS7	POS8	TOT	
CO1	**3**	**2**	**2**	**1**	**2**	**3**	**2**	**2**	**2**	**1**	**3**	**2**	**2**	**27**	**2.1**
CO2	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**1**	**2**	**3**	**3**	**2**	**2**	**30**	**2.3**
CO3	**3**	**2**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	**2**	**31**	**2.4**
CO4	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**2**	**2**	**33**	**2.5**
CO5	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**3**	**2**	**32**	**2.5**
Mean overall score															2.36

Result: The core for this course is 2.3 (High relationship)

Note:

Strength level	Low	Medium	High
Value	1	2	3

Values Scaling

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

$$\text{Mean Score of COs} = \frac{\text{Total of Value}}{\text{Total No. of Pos\& PSOs}} \qquad \text{Mean overall score for COs} = \frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$$

COURSE DESIGNER:

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

CREDIT : 5 **COURSE CODE: P21PH4E5**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

M.Sc. PHYSICS – IV SEMESTER– ELECTIVE COURSE -V

(For the candidates admitted from the year 2021-22 onwards)

BIOMEDICAL INSTRUMENTATION

COURSE EDUCATIONAL OBJECTIVES

1. To understand and explain the different sytems of human body and medical amplifiers
2. To analyse and compare the various diagnostic devices
3. To study classify the specialised medical equipments for different ailments
4. To illustrate the advanced bio intrumentation in Laser and Thermography
5. To demonstrate and elloborate the MRI and ultrasound imaging systems

UNIT - I	**PHYSIOLOGICAL SYSTEMS AND BIOSIGNAL ACQUISITION** Introduction – Cells and their structures – Different systems of human bodies – Physiological signal amplifiers – Isolation amplifiers – Medical pre amplifier – Biosignal analysis.
UNIT - II	**DIAGNOSTIC DEVICES** Electrocardiography (ECG) – Analysis of recorded ECG signals – Electro encephalography (EEG) – Electromyography (EMG) – Electroretinography (ERG) – Electrooculography
UNIT- III	**SPECIALIZED MEDICAL EQUIPMENTS** Pacemaker – Methods of stimulation – Ventricular synchronous/asynchronous pacemaker – Blood cell counter – Photometers – Calorimeters – Filter photometer – Spectrophometer – Disorders of hearing – Audiometers
UNIT - IV	**ADVANCED BIOINSTRUMENTATION** Computer in medicine – Laser in medicine photo thermal applications of tomography – Tomography – Principle – Application of tomography – Thermography – IR and liquid crystal thermography.
UNIT - V	**MRI AND ULTRASOUND IMAGING SYSTEMS** Magnetic resonance imaging (MRI)- magnetic resonance phenomenon – Fourier transform NMR – Chemical shift – Imaging process and instrumentation – Ultrasonic imaging system – Ultrasonic scanning A mode – B mode and M-mode.

TEXT BOOKS

1. Biomedical Instrumentation – Dr.M.Arumugam – Anuradha publications – 2008 Reprint.
2. R.S.Khandpur – Handbook of Biomedical Instrumentation, Tata McGraw Hill Publication Co.,Delhi,1987.

REFERENCE BOOKS

1. John R. Cameron and James G. Skofronick, John Wiley &Sons –Medical Physics, Wiley – Interscience Publications,1978.

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

Teaching Learning Methods
Lecture Method, ICT, Seminar, Hospital visit

COURSE OUTCOMES

Course Outcome No.	Course Outcome	Knowledge Level
CO1	Understand the fundamental of human body and medical amplifiers	K2
CO2	Able to classify the different diagnostic devices	K3
CO3	Can compare the specialised medical devices	K3
CO4	Ability to explian instrumentation in Laser and Thermography	K2
CO5	Explore various types of MRI and imaging systems	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and Skill	✓	Employability Oriented	
Skill oriented		Entrepreneurship Oriented	

MAPPING COURSE OUTCOME WITH PO AND POS

Outcome	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	POS6	POS7	POS8	TOT	
CO1	**3**	**3**	**2**	**-**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**30**	**2.3**
CO2	**3**	**3**	**3**	**3**	**-**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**30**	**2.3**
CO3	**3**	**2**	**-**	**3**	**-**	**2**	**3**	**2**	**2**	**3**	**-**	**2**	**1**	**23**	**1.8**
CO4	**3**	**3**	**3**	**1**	**2**	**3**	**3**	**3**	**3**	**-**	**3**	**2**	**2**	**31**	**2.9**
CO5	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**1**	**29**	**2.2**
Mean overall score															**2.3**

Result: The core for this course is 2.3 (High relationship)

Note:

Strength level	Low	Medium	High
Value	1	2	3

Values Scaling

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

$$\text{Mean Score of COs} = \frac{\text{Total of Value}}{\text{Total No. of Pos\& PSOs}} \qquad \text{Mean overall score for COs} = \frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$$

COURSE DESIGNER: Dr.L.F.A. AMIRTHARAJ

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 7 **COURSE CODE: P21PH4PW**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-639005

M.Sc. MATHEMATICS – IV SEMESTER – PROJECT WORK

(For the candidates admitted from the year 2021-2022 onwards)

PROJECT WORK

SL.	Area of Work	Maximum Marks
I.	**PROJECT WORK**	
(i)	Plan of the Project	20
(ii)	Execution of the plan / Collection of data / Organization of materials/ Fabrication Experimental study / Hypothesis, Testing etc., and Presentation of there port.	45
(iii)	Individual Initiative	15
	Total	**80**
II.	**VIVA VOCE EXAMINATION**	**20**
	Total (I+II)	**100**

CHARIMAN - BOS **CONTROLLER OF EXAMINATIONS**