LEARNING OUTCOMES–BASED CURRICULUM FRAMEWORK (LOCF)

in the

POSTGRADUATE PROGRAMME M.Sc., PHYSICS

FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2020 - 2021 BATCH ONLY

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICAS

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS)
(Affiliated to Bharathiar University and Accredited byNAAC)
COIMBATORE-641028
TAMILNADU, INDIA.
Phone: 0422-4440555
Website: www.hindusthan.net/hicas/

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PREAMBLE

Learning Outcome Based Curriculum Framework for Postgraduate Education in Master of Science in Physics

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

DEPARTMENT OF PHYSICS

VISION

To provide world class education to the students to face global challenges and to inculcate the latest trends in technological advancement. To cater the needs of the environmental and ethical values in the mind of students to become good citizens and entrepreneurs.

MISSION

The Mission of the college is to pursue a philosophy of perpetual acquisition of knowledge. The important policy is to provide value-based education and to bring out the hidden potentials in students that equip them to approach life with optimism.

Programme Educational Objectives (PEO)

PEO1: Apply knowledge and skill in the design and development of Physics to cater to the needs of science and excel in the research related to Physics and Materials characterization. **PEO2**: Become professionally trained in the area of materials characterization and laser. Demonstrate highest standards of actuarial ethical conduct and professional behavior, critical, interpersonal and communication skills as well as a commitment to life-long learning.

PROGRAM OUTCOME (PO)

PO1: Understand the basic concepts/laws in physical sciences.

PO2: Identify, formulate, research literature and analyze complex Physical Science problems.

PO3: Apply appropriate techniques including prediction for modeling complex Physical Science activities.

PO4: Design solution for cutting edge problems related to public health, safety, cultural, social and environmental considerations.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1: Analyze the essential concept of Physics components and systems.

PSO2: Competence in using electronic modern IT tools for design and analysis of complex Physics problems.

PSO3: Offers the professional skills necessary for the students to play a meaningful role in industrial and academic career at national and international level.

HINDUSTHAN COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)
COIMBATORE-641028
SCHEME OF EXAMINATIONS - CBCS & LOCF PATTERN

(For the students admitted from the Academic year 2020-2021 and onwards)

PG PROGRAMME

Programme: M.Sc., Physics

Course code	Course Type	Course Title	Lecture Hours /Week	Exam Duration (Hours)	I.E	E.E	Total	Credit points
			Semester – I					
20PHP01	GE	Mathematical Physics	5	3	30	70	100	5
20PHP02	DSC	Classical Mechanics	5	3	30	70	100	4
20PHP03	DSC	Computational Physics	5	3	30	70	100	4
20PHP04	DSC	Integrated Electronics	5	3	30	70	100	4
20PHP05	DSC	**Practical I:** General Physics – I	5	5	40	60	100	3
20PHP06	DSC	**Practical II:** General Electronics	5	5	40	60	100	3
20PHPV01	**ACC**	**VAC-I:**	2	1	50	-	50	1
20PHPJ01	**AEE**	**Aptitude / Placement Training**	2	1	50	-	50	Grade*
20PHPJ02	**AEE**	**Online Classes**	2	1	-	-	-	C/NC**
			Semester – II					
20PHP07	DSC	Electromagnetic Wave Theory	5	3	30	70	100	5
20PHP08	DSC	Crystal Growth and Thin Film Physics	5	3	30	70	100	4
20PHP09	DSC	Quantum Mechanics	5	3	30	70	100	4
20PHP10A	DSE	8051Microcontroller	5	3	30	70	100	4
20PHP10B		Experimental Techniques and Data Analysis						
20PHP11	DSC	**Practical III:** General Physics – II	4	5	40	60	100	2
20PHP12	DSC	**Practical IV:** Advanced Electronics	4	5	40	60	100	2
20GSP01	AECC	**Skill Based:** Cyber Security	2	–	100	-	100	2
20PHPV02	ACC	**VAC-II:**	2	1	50	-	50	1
20PHPJ03	AEE	**Aptitude / Placement Training**	2	1	50	-	50	Grade*
20PHPJ04	AEE	**Online Classes**	2	1	-	-	-	C/NC**
			Semester – III					
20PHP13	DSC	Nuclear and Particle Physics	5	3	30	70	100	5
20PHP14	DSC	Atomic and Molecular Spectroscopy	5	3	30	70	100	4
20PHP15	DSC	Communication Electronics	5	3	30	70	100	4
20PHP16A	DSE	Laser and Optics	5	3	30	70	100	4
20PHP16B		Plasma Physics						
20PHP17	DSC	**Practical V:** Advanced Physics	5	5	40	60	100	3
20PHP18	DSC	**Practical VI:** Communication Systems	5	5	40	60	100	3
20PHPV03	ACC	**VAC-III:**	2	1	50	-	50	1
20PHPJ05	AEE	**Aptitude / Placement Training**	2	1	50	-	50	Grade*

20PHPJ06	AEE	**Online Classes**	2	1	-	-	-	C/NC**
Semester – IV								
20PHP19A	DSE	Molecular Physics	6	3	30	70	100	6
20PHP19B		Thermodynamics and Statistical Methods						
20PHP20A	DSE	Medical Physics	6	3	30	70	100	5
20PHP20B		Condensed Matter Physics						
20PHP21A	DSE	Electronic Instrumentation	6	5	30	70	100	5
20PHP21B		Nano Electronics and Nano Systems						
20PHP22	SEC	Project Work	12	–	50	150	200	5
20PHPV04	ACC	**VAC-IV:**	2	1	50	-	50	1
20PHPJ07	AEE	**Aptitude / Placement Training**	2	1	50	-	50	Grade*
20PHPJ08	AEE	**Online Classes**	2	1	-	-	-	C/NC**
TOTAL CREDITS								**94**

- **VAC**-Value Added Course (Extra Credit Courses)
- **JOC**- Job Oriented Course
- **C / NC**** - Completed / Not Completed
- **I.E**-Internal Exam
- **E.E**-External Exam
- * Grades depends on the marks obtained

Range of marks	Equivalent remarks
80 and above	Exemplary
70 –79	Very Good
60 –69	Good
50 –59	Fair
Below 50	Not Satisfactory = Not completed

PASSING MINIMUM

- Passing Minimum for UG 40% and for PG 50%
- For UG : 35 % (25 marks) in EE and 40 % in Total Marks
- For PG 50 % (35 marks) in EE and 50 in Total Marks

List of Open Elective VAC	
Value Added Courses (VAC)	Courses offered by the Departments (Additional credit Course)
	a) Electronic Test Instruments
	b) Verilog HDL
	c) Bioelectronics
	d) Material Characterization
	e) IoT andits Applications
	f) Electric Vehicle Design
	g) Ocean Electronics
	h) Artificial Intelligence using Raspberry Pi

List of Elective Papers/ DSE (Can choose any one of the paper as electives)		
	Course Code	Title
Electives/ **DSE-I**	20PHP10A	8051Microcontroller
	20PHP10B	Experimental Techniques and Data Analysis
Electives/ **DSE-II**	20PHP16A	Laser and Optics
	20PHP16B	Plasma Physics
Electives/ **DSE-III**	20PHP19A	Molecular Physics
	20PHP19B	Thermodynamics and Statistical Methods
Electives/ **DSE-IV**	20PHP20A	Medical Physics
	20PHP20B	Condensed Matter Physics
Electives/ **DSE-V**	20PHP21A	Electronic Instrumentation
	20PHP21B	Nano Electronics and Nano Systems

Co-ordinator
Academic Audit Cell
Nandha College of Arts & Science
Coimbatore-641 021

ABSTRACT FOR SCHEME OF EXAMINATIONS

(For the Candidates admitted during the academic year 2020 - 2021 and onwards)

S.No.	Course (AEE/DSC/DSE/GE/ACC/SEC)	Papers	Credit	Total Credits	Marks	Total Marks
1.	DSC	15	5/4/3/2	54	100	1500
2.	DSE	5	6/5/4	24	100	500
3.	GE	1	5	5	100	100
4.	SEC	1	5	5	200	200
5.	AEE	8	-	-	50	200
6.	ACC	4	1	4	50	200
7.	AECC	1	2	2	100	100
	Total	35	-	94	-	2800

BOS-Chairman

(Dr. V. BALAPRAKASH)

Academic Council - Member Secretary

Dr. M. MAHALAKSHMI

Co-ordinator
Academic Audit Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

PG Courses- Scheme of Evaluation (Internal & External Components)

(For the students admitted during the academic year 2020-2021and onwards)

1. Internal Marks for all PG

Components	Marks
Test	5
Model Exam	10
Assignment	5
Attendance*	5
Seminar	5#
TOTAL	30

***Split-up of Attendance Marks for UG**

- 75-79 - 1 marks
- 80-84 - 2 marks
- 85-89 - 3 marks
- 90-94 - 4 marks
- 95-100 - 5 marks

(# (3+2)-3 for External & 2 for (Internal paper presentation or poster design)

2. a) Components for Practical I.E.

Components	Marks
Test –I	20
Test - II	20
Total	40

b) Components for Practical E.E.

Components	Marks
Experiments	50
Record	5
Viva	5
Total	60

3. Institutional/ Industrial Training, Mini Project and Major Project Work

Institutional /Industrial Training (I.E)		Mini Project (I.E)	Major Project Work		
Component	**Marks**	**Marks**	**Component**	**Marks**	**Total Marks**
Work diary	25	-	I.E a)Attendance	20	
Report	50	50	b)Review	30	50
Viva-voce	25	50			
Total	100	100	E.E* a) Final report	120	
			b)Viva-voce	30	150
				Total	200

*Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners

4. Components for Cyber Security Paper

Components	Marks
Two Tests (each 2 hours) of 40marks each [4 out of 7 descriptive type questions 4 x 10 = 40 Marks]	80
Two assignments (2 x 10)	20

5. Value Added Courses and Aptitude/Placement courses:

Components	Marks
Two Test (each 1 hour) of 25 marks each QP is objective pattern (25x1=25)	50
Total	50

Guidelines:

1. The passing minimum for these items should be 50%
2. If the candidate fails to secure 50% passing minimum, he / she may have to reappear for the same in the subsequent semesters
3. Item No's:4,5, are to be treated as 100% Internal papers.
4. For item No.5, Tests conducted through online modules (Google Form/any other)

PG PATTERN

QUESTION PAPER PATTERN FOR CIA EXAM

Reg.No:---------- **Q.P.CODE:**

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

------ DEGREE CIA EXAMINATIONS ----------20------

(--------Semester)

BRANCH: --------

Subject Name: ----------

Time: Two Hours **Maximum: 50 Marks**

Section-A (3 x 6=18 Marks)

Answer **ALL** Questions

ALL questions carry **EQUAL** Marks

(Q.No: 1 to 3 Either Or type)

Section-B (4 x 8=32 Marks)

Answer **ALL** Questions

ALL questions carry **EQUAL** Marks

(Q.No: 4 to 7 Either Or type)

QUESTION PAPER PATTERN FOR MODEL/ END SEMESTER EXAM

Reg.No:---------- **Q.P.CODE:**

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

----------DEGREE MODEL EXAMINATIONS ----------20------

(--------Semester)

BRANCH: --------

Subject Name: ----------

Time: Three Hours **Maximum: 70 Marks**

SECTION – A (5x6=30 marks)

Answer **ALL** Questions

ALL Questions carry **EQUAL** Marks

(Q.No 1 to 5 Either Or type)

(One question from each Unit)

SECTION – B (5x8=40 Marks)

Answer **ALL** Questions

ALL Questions carry **EQUAL** Marks

(Q.No 6 to 10 Either Or type)

(One question from each Unit)

Course Code:	20PHP01	Course Title						Batch:	2020-2021 & onwards
		MATHEMATICAL PHYSICS						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	5

COURSE OBJECTIVE

1. To review the Students to establish the special functions.
2. To understand about complex variable theory to study physics problems.
3. To highlight functions of linear space.
4. To develop concept of Fourier transform and Laplace transform in theoretical mechanics.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the concept of modern mathematical physics.	K1
CO2	Analyze the principles of complex variable theory and linear space.	K2
CO3	Apply the basic concept of Fourier transform and Laplace transform in theoretical mechanics and quantum mechanics.	K3
CO4	Evaluate the concepts of group theory in theoretical mechanics, quantum mechanics and electromagnetism.	K4

SYLLABUS

20PHP01	MATHEMATICAL PHYSICS	Sem: I
Unit No.	**Topics**	**Hours**
I	**Special Functions** Legendre's Polynomials and Functions- Differential Equations and Solutions - Generating Functions - Orthogonality-Relation between Legendre Polynomial and their DerivativesRecurrence Relations- Bessel's Function-Differential Equation and Solution Generating Functions-Recurrence Relations- Hermite function.	12
II	**Complex Variable Theory** Functions of a Complex Variable-Single and Multivalued Functions –Cauchy-Reimann Differential Equation-Analytical Line Integrals of Complex Function-Cauchy's Integral Theorem and Integral Formula-Derivatives of an Analytic Function-Taylor's Variables- Residue and Cauchy's Residue Theorem.	12
III	**Linear Space** Definition of Vector Space-Linear Dependence-Linear Independence-Basis-Dimension of a Vector Space-Representation of Vectors and Linear Operators with respect to Basis-Schmidt Orthogonalization Process-Inner Product	12

IV	**Fourier Series& Laplace Transforms** Fourier Series - Dirichlet's Theorem-Change of Interval-Complex Form-Fourier Series in the Interval (0, ∞) - Uses of Fourier Series-Laplace Transform: Definition–Properties Translation Property. InverseLaplaceTransform-Properties, example problems.	12
V	**Group Theory** Concepts of groups-The cyclic group, group multiplication table -The rearrangement theorem subgroups, cosets, conjugate elements and classes - The product of classes, Isomorphism and Homomorphism - The group symmetry of an equilateral triangle- group symmetry of a square – The character of representation- reducible, irreducible representation - orthogonality theorem-character tables.	12

Teaching methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. SatyaPrakash, "Mathematical Physics",Sultan Chand &Sons.

2. Arfken, Weber &Harris, "Mathematical methods for Physicists-II", Academic Press- 7th edition.

3.A.W. Joshi,"Elements of group theory for Physicists", Wiley Eastern, 2002.

REFERENCE BOOKS

1.B.D. Gupta, "Mathematical Physics", Vikas Publishing House, 3rd Edition, 2006.

2.B.S. Rajput, "Mathematical Physics", PragatiPrakashan, Meerut, 17th Edition, 2004.

3.P.K. Chattopadhayay, "Mathematical Physics", New Age International, New Delhi.

4.P.P. Gupta, Yadav & Malik, "Mathematical Physics", KedarnathRamnath-Meerut.

5.M.K. Venkataraman, "Numerical Methods in Science & Engineering", National Publishing, Chennai,1986.

6. A. Singaravelu, "Numerical Methods", MeenakshiPublishing.

WEB RESOURCES

Web Link: *https://nptel.ac.in/courses/115/106/115106086/*

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	M	L
CO2	S	S	M	L
CO3	S	M	M	L
CO4	S	M	L	L

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mrs. R. Vishalashi)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Coordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP02	Course Title						Batch:	2020-2021 & onwards
		CLASSICAL MECHANICS						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To learn the classical mechanics in Lagrangian formalism.
2. To study about Hamiltonian formalism.
3. To represent Hamilton-Jacobi Method of classical mechanics.
4. To develop math skills over two body problems.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember thelagrangian and hamiltonian formalism.	K1
CO2	Understand hamiltonianformalismand thephysicalparameters.	K2
CO3	Analyze the Hamilton -Jacobi Method and theoretical problems of classical mechanics.	K3
CO4	Evaluatetwo body problems and rigid body dynamics.	K4

SYLLABUS

20PHP02	CLASSICAL MECHANICS	Sem: I
Unit No.	Topics	Hours
I	**Lagrangian Formalism** Constraints and Degrees of Freedom- Generalized Coordinates: Generalized Displacement, Acceleration, Momentum, force & Potential- Variation techniques and Euler's Lagrange Differential equation- Hamilton's Variational principle- Lagrange's equation of motion from Hamilton's principle- Deduction of Newton's Second law of Motion from Hamilton "principle- Application of Lagrange's equation of motion: Linear Harmonic Oscillator- Simple Pendulum- Isotropic Oscillator.	12
II	**Hamiltonian Formalism** Phase space- Hamiltonian- Hamilton's Canonical Equation of Motion- Significance of H-Deduction of Canonical Equation from Variation principle- Application of Hamilton's equation of motion: Simple Pendulum, Isotropic Oscillator - Principle of Least Action and Proof- Canonical Transformations- Generating Function and different forms.	12

III	**Hamilton -Jacobi Method** Hamilton Jacobi Method, Solution of Harmonic Oscillator by HJ method- Particle falling freely- Kepler Problem- Damped Harmonic Oscillator- Lagrange's &Poisson's Brackets- Definition-Equation of motion in Poisson's Bracket form- Poisson Theorem (Jacobi Identity)- Angular Momentum and Poisson's Brackets.	**12**
IV	**Two Body Problem** Equivalent One body problem- General Features of central force, motion- Stability of orbits and Conditions for closure- Motion under Inverse Square Law- Shapes of orbits- Inertial / Non- inertial frames- Rotatory Coordinatorysystem- Effects of Coriolis force on the moving bodies.	**12**
V	**Rigid body dynamics** Euler theorem- Euler's angle- Angular velocity of a rigid body - Angular momentum of Rigid Body - Moments and Products of Inertia- Principle Axis of Transformation- Torque Free Motion of a Rigid Body- Poinsot Solutions- The motion of a Symmetric Top under action of Gravity- Stable and Unstable Equilibrium's.	**12**

Teaching methods: <Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity>

TEXT BOOKS

1. S.L.Gupta, V. Kumar &H.V.Sharma, "Classical Mechanics", PragatiPrakashan, Meerut,2003.

2. H. Goldstein, "Classical Mechanics", Addison Wesley,London,1996.

REFERENCE BOOKS

1. Kamal Singh & S.P. Singh, "Elements of Statistical Mechanics", S. Chand &Company,New Delhi,1999.

2. Gupta & Kumar, "Elements of Statistical Mechanics", PragatiPrakashan,Meerut.

3. J.C.Ubadhyaya, "Classical Mechanics", Himalaya Publishing House,2012.

WEBRESOURCES

Web Link:https://nptel.ac.in/courses/115/105/115105098/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	M	L
CO2	S	M	M	L
CO3	S	M	M	L
CO4	S	M	L	L

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mr. N. Suresh)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP03	Course Title						Batch:	2020-2021 & onwards
		COMPUTATIONAL PHYSICS						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To understand the concepts of numerical differentiation and integration
2. To provide the knowledge about the fundamentals of MATLAB
3. To learn about the methods of physical system using MATLAB software tool
4. To inculcate 2D and 3D graphics in MATLAB

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Identify modern programming methods to extent their limitations of computational methods in physics.	K1
CO2	Understand and apply the basic methodology of numerical differentiation and numerical integration to a broad range of physics problems.	K2
CO3	Examine MATLAB fundamentals and apply the knowledge in real time applications.	K3
CO4	Analyze and solve various problems using MATLAB programing constructs.	K4

SYLLABUS

20PHP03	COMPUTATIONAL PHYSICS	Sem: I
Unit No.	Topics	Hours
I	**Numerical Differentiation** Finding Roots of a Polynomial-Bisection Method-Newton Raphson Method-Solution of Simultaneous Linear Equation by Gauss Elimination Method-Solution of Ordinary Differential Equation by Euler, Runge-Kutta Fourth Order Method for solving first order Ordinary Differential Equations.	12
II	**Numerical integration** Newton's cotes formula-Trapezoidal rule-Simpson's 1/3 rule- Simpson's 3/8 rule- Boole's rule-Gaussian quadrature method-(2 point and 3-point formulae)-Giraffe's root square method for solving algebraic equation.	12
III	**Matlab Fundamentals** Introduction – Matlab Features-Desktop Windows: Command, Workspace, Command History, Array Editor and Current Directory – Matlab Help and Demos- Matlab Functions, Operators and Commands. Basic Arithmetic in Matlab-Basic Operations with Scalars, Vectors and Arrays-Matrices and Matrix Operations- Complex Numbers- Matlab Built-In Functions-Illustrative Examples.	12
IV	**Matlab Programming** Control Flow Statements: if, else, else if, switch Statements - for, while Loop Structures-break Statement- Input/output Commands-Script'm'Files-Function'm' Files-Controlling Output.	12

V	**Matlab Graphics** 2D Plots-Planar Plots, Log Plots, Scatter Plots, Contour Plots-Multiple Figures, Graph of a Function-Titles, Labels, Text in a Graph- Line Types, Marker types, Colors-3D Graphics-Curve Plots-Mesh and Surface Plots-Illustrative Examples	12

Teaching methods: <Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.>

TEXT BOOKS

1.M.K. Venkataraman, "Numerical methods in Science and Engineering", National Publishing Co. Madras,1996.

2.Rudra Pratap,"Getting Started with MATLAB", Oxford University Press, New Delhi, 2002.

REFERENCE BOOKS

1. Sergey E. Lyshevski, "Engineering and Scientific Computations Using MATLAB", John WileySons.

2. Brian Hunt, Ronald Lipsman, Jonathan Rosenberg, "A Guide to MATLAB for Beginners & Experienced Users", Cambridge UniversityPress.

3. Timothy A. Davis & Kermit Sigmon, "MATLAB Primer", Chapman & Hall, CRC Press, London.

WEB RESOURCES

Web Link:https://nptel.ac.in/courses/115/106/115106118/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	M	S
CO3	S	M	M	S
CO4	S	S	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mr. N. Suresh)	(Dr. V. Bodapratash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20PHP04	Course Title						Batch:	2020-2021 & onwards
		INTEGRATED ELECTRONICS						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To give an insight about fundamental concepts of Semiconductor Devices.
2. To evaluate the linear and non-linear applications of operational amplifiers.
3. To provide the knowledge on analog and digital Communication electronics.
4. To provide a good understanding on the design of flip flops.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO 1	Understand the basic concepts of semiconductor devices and itsfabrication.	K1
CO 2	Evaluate the characteristics of Operational Amplifiers for linear and non-linear applications.	K2
CO 3	Analyze the working of various Analog and Digital modulation schemes.	K3
CO 4	Examine the behavior of various combinational and sequential logic circuits.	K4

SYLLABUS

20PHP04	INTEGRATED ELECTRONICS	Sem: I
Unit No.	Topics	Hours
I	**Semiconductor Devices & IC Fabrication** Semiconductor diodes – Characteristics – Ideal diode – Clippers and clampers circuits Special diodes Zener, Schottky and Tunnel diodes: Applications – Junction transistors – JFET, MOSFET, UJT and SCR – applications – Principle of Integrated Circuits – fabrication process – Linear and Digital Integrated Circuits.	12
II	**Operational Amplifier (Op-Amp) and its Applications** Op-Amp characteristics – DC & AC characteristics – basic applications – linear Op-Amp circuits – Analog Multiplier and Divider – FrequencyDoubling-ElectronicAnalog Computation – Activefilters	12
III	**Communication Electronics** Modulation – Demodulation – Principle of Amplitude modulation, Frequency modulation– Simple circuits for AM and FM – Digital principles– Pulse modulation – APM, PPM, PWM and PCM.	12

IV	**Flip-Flops** Types of Flip-flops –RS Flip-flops, Clocked RS Flip-flops, Clocked D Flip-flops, PositiveEdge-Triggered RS Flip-flops, Negative-Edge-Triggered RS Flip-flops, Edge-Triggered D Flip-flops, Positive-Edge-Triggered JK Flip-flops, Flip-flop timing, JK Master-Slave Flipflops.	**12**
V	**Registers and Counters** Types of Registers: Serial in-Serial out, Serial in-Parallel out, Parallel in-Serial out, Parallel in-Parallel out. Types of Counters: Asynchronous (Ripple) counters, Synchronous counters, Decade counters.	**12**

Teaching methods: <Lecturing, PowerPoint Projection through LCD, Assignment, Discussionand Activity>

TEXT BOOKS

1. J. Millman& C. C. Halkias, "Electronic Devices and Circuits", Tata McGraw Hill, New Delhi, 1985.

2. G. Kennedy, "Electronic Communication Systems", Tata McGraw Hill, New Delhi, 3rd Ed.,1994.

3.D. R. Choudhury& S. Jain, "Linear Integrated Circuits", New Age International, New Delhi,2001.

4. S.Chattopadhyay,"Text book of Electronics", New Central Book Agency (p) Ltd, Kolkata, 2006.

REFERENCE BOOKS

1.D.Pleach , A.P.Malvino and G. Saha, "Digital Principles and Applications", Tata McGraw- Hill EducationPvtLtd, New Delhi, 6th Edition, 2009.

2.A.B. Bhattacharya, "Electronics Principles & Application", New Central Book Agency (P) Ltd., Kolkata, 2007.

WEB RESOURCES

Web Link:https://nptel.ac.in/courses/108/108/108108111/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	S	S
CO3	S	M	M	S
CO4	S	M	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Dr. V. Balaprakash)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP05	Course Title						Batch:	2020-2021 & onwards
		PRACTICAL I: GENERAL PHYSICS – I						Semester:	I
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVE

1. To make the students to gain a practical knowledge on general Physics.
2. To demonstrate knowledge on Practical Physics.
3. To expand experiments in modern physics for day to day requirements.
4. To connect each physical discovery with its history contents.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the basics of experimental physics.	K1
CO2	Interpret the concepts of young's modules and semiconductordevices.	K2
CO3	Analyze strong laboratory skills and enhance the knowledge level to present-day requirements in industries, researchfields.	K3
CO4	Develop the design knowledge of general physics.	K4

SYLLABUS

Course Code:	PRACTICAL I: GENERAL PHYSICS I	SEMESTER
20PHP05	Topics	I

(Any 10 Experiments)

1. Young's Modulus-Elliptical Fringes.
2. Determination of wavelength of laser source using grating.
3. Determination of Particle size of Lycopodium powder using laser source
4. Determination of Numerical aperture and acceptance angle using optical fibre.
5. Determination of band gap of a Semiconductor using p-n junctiondiode.
6. Thickness of Wire by Air Wedge Diffraction.
7. Determination of Ultrasonic velocity in a given liquid for fixedfrequency.
8. Young's Modulus-HyperbolicFringes.
9. Viscosity of a Liquid-Mayer'sOscillating Disc.
10. Electronic Specific Charge,e/m by Thomson's Method.
11. Characteristic study of SolarCell.
12. Determination of thermal conductivity in forbe'smethod.
13. Matlab Programming-Roots of a Quadratic Equation & Solution of aSystem of LinearEquations.
14. Matlab Programming -Solution of Ordinary Differential Equations – First Order.
15. Matlab Programming -Runge-Kutta Method.

Teaching methods: <Practical Demonstration>

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/115/106/115106090/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	M	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mr. N. Suresh)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

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Co-ordinator
Curriculum Development Cell
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Coimbatore-641 028.

Course Code:	20PHP06	Course Title						Batch:	2020-2021 & onwards
		PRACTICAL II: GENERAL ELECTRONICS						Semester:	I
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVE

1. To gain a practical knowledge on general electronics.
2. To understand analog and digital systems and their applications
3. To analyze the performance of various analog circuits.
4. To identify design trade-off of analog electronic circuit design.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the basic knowledge of simple electronics circuits.	K1
CO2	Interpret the theoretical concepts by doing experiments.	K2
CO3	Apply the characteristics knowledge and systematically study the behavior of BJT and power electronics components.	K3
CO4	Develop and enhance the design knowledge towards real time applications.	K4

SYLLABUS

CourseCode	PRACTICAL II: GENERAL ELECTRONICS	Semester
20PHP06	**(Any 10 Experiments)** 1. Characteristics of PN junction diode 2. Characteristics of Zener diode 3. Characteristics of LED 4. Characteristics of SCR 5. Characteristics of JFET 6. Characteristics of UJT 7. Frequency response characteristics Op-Amp inverting and non-inverting amplifier 8. First order and second order low pass filter design using Op-Amp 9. First order and second order high pass filter design using Op-Amp 10. Wide band pass filter design using Op-Amp 11. Notch filter design using Op-Amp 12. Zero crossing detector and Schmitt trigger design using Op-Amp 13. Wein-Bridge and phase shift oscillator design using Op-Amp 14. 8x1 multiplexer design 15. RS & JK flip-flop	I

Teaching methods: <Practical Demonstration>

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/108/108/108108111/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	M	M
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Dr. V. Balaprakash)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

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Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
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Course Code:	20PHP07	Course Title						Batch:	2020-2021 & onwards
		ELECTROMAGNETIC WAVE THEORY						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	5

COURSE OBJECTIVE

1. To learn fundamentals of electromagnetic waves.
2. To enable the students to have a sound knowledge about Propagation of electromagnetic waves.
3. To study the concepts of Oscillators and Radiations systems.
4. To solve the problems in interactions of electromagnetic waves.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the fundamentals of Electromagnetics and magnetostatics.	K1
CO2	Predict the transverse behavior of electromagnetic waves.	K2
CO3	Analyze the concept of electromagnetic waves using Maxwell's Equations.	K3
CO4	Solve problems in electrostatic, magneto static, and electromagnetic fields	K4

SYLLABUS

20PHP07	ELECTROMAGNETIC WAVE THEORY	Sem: II
Unit No.	Topics	Hours
I	**EM Wave Theory** Introduction to Microwaves: History – Region and Band Designations– Advantages – Applications – Maxwell's Equations: Ampere's Law – Faraday's Law – Gauss Law–Wave Equations – TEM / TE / TM / HE Wave Definitions –Transmission Lines - Two wire parallel transmission lines – Voltage and current relationship on transmission lines.	10
II	**Propagation of EM Waves** TypesofWaveguides–Propagation ofWavesinRectangularWaveguides– TE and TM Modes–Propagation of TM WavesinRectangular Waveguide–TM Modes in Rectangular Waveguides.	10
III	**Oscillators and Radiating Systems** Klystrons: Two Cavity Klystron Amplifier–Multicavity Klystron– Reflex Klystron–Traveling Wave Tube (TWT): Construction– Operation– Backward Wave Oscillator – Magnetrons: Cavity Magnetron Operation–Sustained Oscillations in Magnetron– Applications Oscillating electric dipole - Radiation from an Oscillating dipole – Radiation from small current element – Radiationfromalinearantenna(Halfwave)andAntennaArrays(Qualitative treatment).	15

IV	**Interaction of EM Waves with Matter** Boundary Conditions at the interface between two media – Reflection and refraction of electromagnetic waves - Kinematic and dynamic properties – Fresnel's formula – Brewster's law and Polarisation of electromagneticwaves– Total internal reflection and critical angle – Reflection from metallicsurface	15
V	**Relativistic Electrodynamics** Four Vectors-Transformation Relation for Charge and Current Densities-Transformation of for Electromagnetic Potentials A and Φ– Lorentz condition in Covariant Form –Invariance(covariance) of Maxwell's field equations in terms of four vectors- Lorentz transformations of electric and magnetic fields-Covariance of Electromagnetic Field Tensor.	10

Teaching methods: <Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity>

TEXT BOOKS

1. *Dr. Kulkarni. M, "Microwave and Radar Engineering"*, Umesh Publications, *FifthRevised Edition,2015.(UnitI-III)*
2. *Chopra & Agarwal, "Electromagnetic Theory", Nath& Co.,1984.*
3. *Satyaprakash, "Electromagnetic Theory& Electrodynamics" Kedarnath Ramnath & Co., Meerut.*

REFERENCE BOOKS

1. *Gupta, Kumar & Singh, "Electrodynamics", PragatiPrakashan-Meerut.*
2. *J.D. Jackson, "Classical Electrodynamics", Wiley Eastern, 3rdEdition,2004.*
3. *M. Schwartz, "Principles of Electrodynamics",McGrawHill.*
4. *Carson &Lorraine, "Introduction to EM Fields & Waves".*
5. *David J Griffiths, "Introduction to Electrodynamics", Pearson, 4th edition,2012.*

WEB RESOURCES

Web Link:https://nptel.ac.in/courses/108/104/108104087/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	M	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mr. N. Suresh) Name & Signature of the Staff	(Dr. V. Balaprakash) Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20PHP08	Course Title						Batch:	2020-2021& onwards
		CRYSTAL GROWTH AND THIN FILM PHYSICS						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To enable the theory involved in crystal growth nucleation process
2. To understand the formation of crystal growth techniques
3. To study the melt growth and vapour growth techniques
4. To inculcate the material characterization techniques

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the fundamental terminology and characteristics of crystal growth and thin films.	K1
CO2	Analyze the basis of various thin film preparation methods.	K2
CO3	Examine the working of various thin film deposition technique.	K3
CO4	Apply the acquired knowledge in different characterization techniques	K4

SYLLABUS

20PHP08	CRYSTAL GROWTH AND THIN FILM PHYSICS	Sem: II
Unit No.	Topics	Hours
I	**Nucleation theory** Importance of crystal growth – Classification of crystal growth methods – Nucleation Theory – Kinds of nucleation – Homogeneous nucleation – Heterogeneous nucleation – secondary nucleation –Classical theory of nucleation: Gibbs Thomson equations for vapour and solution – Kinetic theory of nucleation – Energy of formation of a spherical nucleus and cylindrical nucleus.	10
II	**Solution Growth Techniques** **Growth from low temperature solutions:** Selection of solvents andsolubility – Meir's solubility diagram – Saturation and super saturation – Metastable zone width – Growth by restricted evaporation of solvent, slow cooling of solution and temperature gradient methods – Gel Growth Technique: Principle – Various types – Structure of gel – Importance of gel– Experimental procedure – Chemical reaction method – Single and double diffusion method – Chemical reduction method – Complex and decomplexion method – Advantages of gelmethod. **Growth from high temperature solutions:** Flux growth – Hydrothermal growth method.	15

III	**Melt Growth Techniques** Basics of melt growth - Bridgman method – Growth apparatus: Crucibles, Heater, measurement and control of temperature – growth process –Applications of Bridgman method; Czochralski technique – Growth apparatus– seed preparation – pulling rate – shape of crystal melt interface– Growth process.	12
IV	**Vapour Growth Techniques** Physical Vapour Transport (PVT) – Processes of sublimation and condensation – principle – crystal growth in closed and semi-open ampoules– Chemical Vapour Transport – Criteria for the choice of transport reaction – Transported materials and transporting agents – Temperature variation method for crystal growth: Stationary temperature profile, Linearly time varying temperature profile and Oscillatory temperature profile.	13
V	**Characterization Techniques** X-Ray Diffraction (XRD) – Powder and single crystal – Fourier transform Infrared – Raman – analysis (FT-IR) – TG-DTA /DSC – UV-Visiblespectrometer – Vickers Micro hardness – Chemical Etching.	10

Teaching methods: <Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity>

TEXT BOOKS

1. *GovindhanDhanaraj, KullaiahByrappa, Vishwanath Prasad, Michael Dudley (Eds.), "Hand book of Crystal Growth", Springer Heidelberg Dordrecht London New York,2010.*
2. *J. C. Brice, "Crystal Growth Processes", John Wiley and Sons, New York,1986.*

REFERENCE BOOKS

1. P. SanthanaRagavan and P. Ramasamy, "Crystal Growth Processesand Methods", KRU Publications, Kumbakonam,2001.

2. B.R. Pamplin, "Crystal Growth", Pergamon Press, Oxford,1975.

WEB RESOURCES

Web Link:https://nptel.ac.in/courses/113/104/113104075/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	M	S	M
CO4	S	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mr. N. Suresh)	Dr. V. Balaprakash	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP09	Course Title						Batch:	2020-2021 &onwards
		QUANTUM MECHANICS						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To develop mathematical methods of quantum mechanics to solve physics problems.
2. To learn the basics of quantum mechanical concepts using Schrödinger equation.
3. To study basics of approximation methods.
4. To acquire knowledge Time Dependent Perturbation Theory to solve simple problems.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Identify the mathematical foundations of quantum mechanics.	K1
CO2	Understand the Schrödinger equation using various approximation methods.	K2
CO3	Apply Time Dependent Perturbation Theory to solve simple problems.	K3
CO4	Evaluate the concept of Angular Momentum.	K4

SYLLABUS

20PHP09	QUANTUM MECHANICS	Sem: II
Unit No.	Topics	Hours
I	**Introduction & General Formalism** Inadequacy of classical Physics-Spectral Distribution in Black-Body Radiation- Einstein's Derivation of Radiation law Through A and B Coefficients –Momentum Wave function –Free particle – particle in one dimension - Wave packets – Gaussian wave packet –spread of wave packet with time- the principle of casualtyun certainty relations-Schrodinger wave equation and probabilistic interpretation, Simple one-dimensional problems.	10
II	**Applications of Schrodinger wave equation** State Vectors-Hilbert Space-Dirac Notation-Dynamical Variables as Operators- Change of Basis-Unitary Transformation - Equation of Motion in Schrodinger Picture, Heisenberg Picture & Dirac Picture.	15
III	**Approximate Methods** Time Independent Perturbation Theory in Non-Degenerate Case-Ground State of Helium Atom- Degenerate Case-Stark Effect in Hydrogen-Variation Method & its Application to Hydrogen Molecule- WKBApproximation.	10
IV	**Time Dependent Perturbation Theory** Time Dependent Perturbation Theory-First and Second Order Transitions-Transition to Continuum of States-Fermi Golden Rule-Constant and Harmonic Perturbation-Transition Probabilities-Selection Rules for Dipole Radiation- Collision-AdiabaticApproximation.	15

V	**Angular Momentum** Orbital Angular Momentum-Spin Angular Momentum-Total Angular MomentumOperators-CommutationRelationsofTotalAngularMomentum with Components- Ladder Operators-Commutation Relation of Jz with J+and J-- Eigen Values of J2, Jz - Matrix Representation of J2, Jz, J+and J-—Addition of Angular Momenta –Clebsch-Gordon Coefficients-Properties.	10

Teaching methods: <Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity>

TEXT BOOKS

1. Gupta, Kumar &Sharma, "Quantum Mechanics", 23rd Edition, 2003-2004.
2.Aruldhas, "Quantum Mechanics",2002.

REFERENCE BOOKS

1. QuantumMechanics-Satyaprakash
2. Quantum Mechanics-L.I. Schiff- McGraw Hill, 3rd Edition, 1968.
3.Quantum Mechanics-E. Merzbacher-Wiley and Sons, 3rd Edition,2004.

WEB RESOURCES

Web Link:https://nptel.ac.in/courses/122/106/122106034/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	M	S
CO3	S	M	S	S
CO4	S	M	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mrs. R. Vishalashi) Name & Signature of the Staff	(Dr. V. Balaprakash) Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP10A	Course Title						Batch:	2020-2021& onwards
		8051MICROCONTROLLER						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To enable the students to learn the instruction set of 8051Microcontroller.
2. To study the 8051 Assembly language.
3. To learn the programming in C.
4. To know the various functional units of 8051 microcontroller.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the architecture of 8051 Microcontroller.	K1
CO2	Analyze the addressing mode and Instruction set.	K2
CO3	Apply the use of Interrupts and Communication in various real time problems.	K3
CO4	Create various embedded systems products for consumer and industrial applications.	K4

SYLLABUS

20PHP10A	8051MICROCONTROLLER	Sem: II
Unit No.	Topics	Hours
I	**Overview of 8051** Introduction to Computing – Microprocessor and Microcontrollers – Microcontrollers and Embedded Processors – Overview of 8051 Family – 8051 Architecture – Timers – Registers and Memory Organizations.	12
II	**8051 Assembly Language Programming** Inside the 8051 – Pin Out – Instruction Set: Addressing Modes – DataTransfer Instruction – Logical Instruction– Arithmetic Instructions – Jump and Call Instructions –Bit Oriented Instructions – Flags and Stack.	12
III	**Programming with C** Data Types – Time Delay Programming – I/O Programming – Logic Operations – Arithmetic Operations – Timer Programming – CounterProgramming.	12
IV	**8051 Interrupts & Peripherals** 8051 Interrupts – Programming External Hardware Interrupts – 8051 Serial Communication Programming – Programming with Serial Communication Interrupts – Peripheral and Interrupt Programming in C.	12

V	**Real World Applications and Case Studies** LCD Interfacing – Keyboard Interfacing – Parallel and Serial ADC Interfacing – DAC Interfacing – Sensor Interfacing and Signal Conditioning– RTC Interfacing – Relays and Opto–Isolator Interfacing – Stepper Motor Interfacing – DC Motor Interfacing and PWM.	12

Teaching methods: <Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity>

TEXT BOOKS

1. *Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. Mc Kinlay, "The 8051Microcontroller and Embedded Systems Using Assembly and C" by PHI, 2nd Edition, 2006.*

REFERENCE BOOKS

1. *Kenneth J. Ayala, "The 8051 Microcontroller", Delmar Cengage Learning, 3rd Edition, 2004.*

WEB RESOURCES

Web Link:https://nptel.ac.in/courses/117/104/117104072/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	M	S	S
CO4	S	M	M	S

S-Strong, M- Medium, L –Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Dr. V. Balaprakash) Name & Signature of the Staff	Dr. V. Balaprakash Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP10B	Course Title						Batch:	2020-2021 & onwards
		EXPERIMENTAL TECHNIQUES AND DATA ANALYSIS						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To understand the basics of experimental methods
2. To provide the knowledge about transducers
3. To study the functions of wave analyzers
4. To inculcate the applications of electronic measuring instruments

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the basics of experimental techniques.	K1
CO2	Understand the concepts of passive and active transducers, amplifiers and signal conditioning circuits.	K2
CO3	Analyze the concept of CW, AM, FM and PM waves.	K3
CO4	Create new applications using of various electronic measuring instruments.	K4

SYLLABUS

20PHP10B	EXPERIMENTAL TECHNIQUES AND DATA ANALYSIS	Sem: II
Unit No.	Topics	Hours
I	**Introduction** Introduction- Measurement of errors: accuracy, precision, resolution, sensitivity - absolute and relative errors-Types of errors - gross error, systematic error and random error- standards of measurements - classification of standards, time and frequency standards, electrical standards.	12
II	**Electrical Transducer Classification** Active and Passive transducers- resistive, inductive, capacitive, thermocouple and Piezoelectric transducers – LVDT – RVDT-Digital transducers.	12
III	**Amplifiers and Signal Conditioning** Instrumentation amplifiers- Isolation amplifiers- Chopper amplifiers- Voltage to frequency and voltage to current converters- Frequency multipliers- logarithmic amplifiers, S/H Circuits Active Filters-Low pass, High pass, Band pass and Band stop filters.	12

IV	**Analysis** Wave Analyzers-Audio frequency Wave analyzer- Heterodyne wave analyzer- Harmonic distortion analyzers-Resonant harmonic distortion analyzer-Heterodyne harmonic distortion analyzer- Fundamental suppression harmonic distortion analyzer- Spectrum analyzer- Spectra of CW, AM, FM and PM waves.	12
V	**Electronic Measuring Instruments:** Q-meter- Vector impedance meter- Digital frequency meter – Digital voltmeter - Phase meter- RF power and voltage measurement - Power factor meter-Vector voltmeter. Display and Recording: X-Y Recorders-Magnetic Tape recorders- Storage Oscilloscope.	12

Teaching methods: <Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity>

TEXT BOOKS

1. *Electrical & Electronics Measurement &Instrumentation -A.K.Sawhney*
2. *Electronic Instrumentation – H.S. Kalsi,TMH*

REFERENCE BOOKS

1. *Modern Electronic Instrumentation and Measurement Techniques - A.O. Hefnick and W.D. Cooper., Prentice Hall India Publications.*
2. *Instrumentation Devices and Systems - C.S. Rangan, G.R. Sharma and VSV Mani, Tata Mc Graw Hill Publications.*
3. *Introduction to Instrumentation and Control - A.K. Ghosh - Prentice Hall India Publications.*

WEB RESOURCES

WebLink: https://nptel.ac.in/courses/108/105/108105064/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mr. N. Suresh)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20PHP11	Course Title						Batch:	2020-2021& Onwards
		PRACTICAL III: GENERAL PHYSICS–II						Semester:	II
Hrs/Week:	4	L	-	T	-	P	4	Credits:	2

COURSE OBJECTIVE

1. To gain practical knowledge on general Physics.
2. To demonstrate the techniques used to carry out experimental physics.
3. To provide an experimental foundation for the theoretical concepts.
4. To learn how to write scientific information in a clear and concise manner.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the basics of experimental physics.	K1
CO2	Understand the working of LASER.	K2
CO3	Evaluate the working of microwave test benches (Klystron, Gunn Diode Oscillator etc.)	K3
CO4	Create the knowledge of theories involved in physics using practical experiments.	K4

SYLLABUS

Course Code	PRACTICAL III: GENERAL PHYSICS–II	Semester
20PHP11	Topics	II

(Any 10 Experiments)

1. Determination of thermal conductivity of bad conductor – Lee's disc method
2. Determination of the velocity and compressibility of the given liquid using ultrasonic interferometer.
3. Determination wavelength of spectral lines using grating
4. Determination of optical absorption coefficient and determination of refractive index of the liquids using He-Ne –Laser.
5. To study the characteristics of photo voltaic cell.
6. Determination co-efficient of viscosity of given liquid - Poiseuille's method
7. Determination of Refractive Index of transparent solids and liquids using Laser source
8. DeterminationofCauchy'sconstantanddispersivepowerofagivenprismbymeasuring refractive index for different wavelengths.

9. Determination of the polarizability of the given liquid by measuring the refractive index at different wavelengths.
10. Determination of band gap and resistivity of semiconductor at different temperatures by Four Probe Method.
11. Determination of Refractive index of liquids using – Diode Laser.
12. Matlab Programming -Newton-Raphson Method
13. Matlab Programming-Mean, Median & Standard Deviation
14. Matlab Programming-Curve Fitting &Interpolation
15. Matlab Programming-Matrix Summation, Subtraction and Multiplication.

Teaching methods: <Practical Demonstration>

WEB RESOURCES

Web Link:https://nptel.ac.in/courses/115/105/115105120/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	M	S
CO3	S	M	S	S
CO4	S	M	S	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mrs. R. Vishalashi) Name & Signature of the Staff	(Dr. V. Balaprakash) Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP12	Course Title						Batch:	2020-2021& onwards
		PRACTICAL IV: ADVANCED ELECTRONICS						Semester:	II
Hrs/Week:	4	L	-	T	-	P	4	Credits:	2

COURSE OBJECTIVE

1. To study the fundamentals of Timer and interfacing various devices with 8051 Microcontroller.
2. To learn the linear and non-linear applications of operational amplifiers.
3. To introduce the applications of analog multipliers and PLL
4. To learn the theory of ADC and DAC.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recall the fundaments of Timer.	K1
CO2	Understand the basic principles of Microwave Engineering.	K2
CO3	Examine the operation of 8051 Microcontroller.	K3
CO4	Develop various products for real time applications using 8051 Microcontroller.	K4

SYLLABUS

Course Code	PRACTICAL IV: ADVANCED ELECTRONICS	Semester
20PHP12	Topics	II

(Any 10 Experiments)

1. Monostable multivibrator design using timer
2. Astable multivibrator design using timer
3. Voltage controlled oscillator design using timer
4. Study of microwave components and instruments
5. Reflex klystron characteristics and frequency measurement of Reflex Klystron
6. Attenuator Characteristics of Reflex Klystron
7. Arithmetic and Logical operations using 8051 Microcontroller
8. Addition of array of 8-bit data using 8051 Microcontroller
9. Square wave generation using internal timer of 8051 Microcontroller
10. Stepper motor interfacing with 8051 Microcontroller
11. DAC interfacing with 8051 Microcontroller
12. ADC interfacing with 8051 Microcontroller
13. Matrix keyboard interfacing with 8051 Microcontroller
14. RTC interfacing with 8051 Microcontroller
15. DC motor interfacing with 8051 Microcontroller

Teaching methods: <Practical demonstration>

WEB RESOURCES

1. https://nptel.ac.in/courses/117/104/117104072/
2. https://nptel.ac.in/courses/108/101/108101094/
3. https://nptel.ac.in/courses/117/101/117101054/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Dr. V. Balaprakash) Name & Signature of the Staff	(Dr. V. Balaprakash) Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science,
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP13	Course Title						Batch:	2020-2021 Batch Only
		NUCLEAR AND PARTICLE PHYSICS						Semester:	III
Hrs/Week:	5	L	5	T	-	P	-	Credits:	5

COURSE OBJECTIVES:

1. To impart basic knowledge of nuclear structure.
2. To provide the basic concept of nuclear forces.
3. To inculcate the types of nuclear reactions.
4. To understand the concept of Radioactive decay, principle of particle detector, elementary particles.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the ground state properties of the nucleus to studythe nuclear structure behavior.	K1
CO2	Outline the structure of the nucleus, radioactive decay, nuclearreactions and the interaction of nuclear radiation with matter.	K2
CO3	Apply the deuteron physics concepts for the better understandingof nuclear forces in Nucleon- Nucleon scattering.	K3
CO4	Justify the interactions between elementary particles.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP13	NUCLEAR AND PARTICLE PHYSICS	Sem: III.
Unit No.	Topics	Hours
I	**Nuclear Structure** Nuclear size, shape and distribution of charge – spin and magnetic moment – determination of nuclear mass – Binding Energy – Semi empirical mass formula – Nuclear stability – Mass parabolas – Nuclear Shell model- Bohr wheeler theory – Liquid drop model – Optical Model – Collective Model.	12
II	**Nuclear forces** Exchange forces – Yukawa's meson theory – Yukawa potential – Ground stateof deuteron – Low energy n-p scattering – effective range – Scattering length, phase shift – spin dependence and charge independence of nuclear forces.	12
III	**Nuclear Reactions** Types of reactions and Energetics of nuclear reactions – conservation laws – Q–value – Scattering and reaction cross sections – Compound nucleus Reciprocity theorem –Breit and Wigner Dispersion formula – stripping and pickup reactions. Expression in terms of Green's function – Born approximation and its validity – Screened Coulomb potential – Alpha particle scattering – Rutherford's formula.	12

IV	**Neutron theory and Detectors** Basic properties of neutron –classification of neutrons –neutron resources-neutron detectors-neutron collimator. Basic principles of particle detectors – Ionization chamber – Proportional counter – and G.M counters – Solid-state detectors – Scintillation and semiconductor.	12
V	**Elementary Particles** Introduction elementary particles-Types of interactions between elementary particles – Leptons – Hadrons – Mesons – Hyperons –Pions–Gell– Mann Okubo mass formula for octet and decaplet–SU(2) – SU(3) Multiplet– Quark model – Color and flavor – weak and strong interactions.	12

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *S.B. Patel, Nuclear Physics: An introduction, Wiley- Eastern, New Delhi (1991).*
2. *D.C. Tayal, Nuclear Physics, Himalaya Publishing house, New Delhi (2004).*
3. *R.P. Roy and B.P. Nigam, Nuclear Physics, Age International Ltd, New Delhi (2005).*

REFERENCE BOOKS

1. *B.L. Cohen, Concepts of Nuclear Physics, Tata McGraw Hill, New Delhi (1983).*
2. *H. Semat, Introduction to Atomic and Nuclear Physics, Chapman and Hall, New Delhi(1983).*
3. *W.S.C. Williams, Nuclear and particle Physics Claredon Press, London (1981).*
4. *K.S. Krane, Introductory Nuclear Physics, John Wiley, New York (1987).*
5. *D. Griffiths, Introduction to Elementary particles, Wiley International Edition, New York (1987).*

WEB RESOURCES

WebLink: https://nptel.ac.in/courses/115/103/115103101/

MAPPING WITH PROGRAM OUTCOMES

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science
Coimbatore-641 028.

Course Code:	20PHP14	Course Title						Batch:	2020-2021 Batch Only
		ATOMIC AND MOLECULAR SPECTROSCOPY						Semester:	III
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To impart knowledge of IR spectroscopy
2. To become familiar with the principle of Raman spectroscopy and non-linear spectroscopy.
3. To understand the concepts of band systems and electronic excitation of diatomic species.
4. To understand the experimental technique of NMR and NQR spectroscopy, ESR and Mossabauer spectroscopy.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Acquire knowledge about Infrared Spectroscopy.	K1
CO2	Classify the types of Spectroscopy.	K2
CO3	Interpret the interior depth of Spectroscopy.	K3
CO4	Analyze the concepts of Spectroscopy.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP14	ATOMIC AND MOLECULAR SPECTROSCOPY	Sem: III
Unit No.	Topics	Hours
I	**Infrared Spectroscopy** Principle and theory of Infrared spectroscopy – Far and Near IR absorption spectroscopy –Mid and Near IR reflectance spectroscopy- Photo acoustic IR spectroscopy – Dispersive IR spectrometer – IR Imaging – FTIR spectroscopy – Vibrational frequencies and qualities analysis – sampling methods – Instrumentation- Applications.	12
II	**Raman Spectroscopy** FT Raman spectroscopy – degree of depolarization – structure determination using IR and Raman spectroscopy – Resonance Raman spectroscopy – Coherent anti – Stokes Raman spectroscopy – Inverse Raman and surface Enhanced Raman spectroscopy – principles, techniques and applications – nonlinear Raman spectroscopy.	12
III	**Florescence and Phosphorescence Spectroscopy**	12

	Electronic Excitation of Diatomic Species – Vibrational Analysis of Band Systems of Diatomic Molecules –Deslandre's Table – Intensity Distribution– Franck Condon Principle – Rotational Structure of Electronic Bands – Resonance and Normal Fluorescence – Intensities of Transitions – phosphorescence Population of Triplet State and Intensity – Experimental Methods – Applications of Florescence and Phosphorescence.	
IV	**NMR and NQR Spectroscopy** NMR Spectroscopy: Quantum Mechanical and Classical Description – Bloch Equation – Relaxation Process – Experimental Technique – Principle and Working of High-Resolution NMR Spectrometer – Chemical Shift. NQR Spectroscopy: Fundamental Requirements – General Principle – Experimental Detection of NQR Frequencies – Interpretation and Chemical Explanation of NQR Spectroscopy.	12
V	**ESR and Mossabauer Spectroscopy** ESR Spectroscopy: Basic Principles – Experiments – ESR Spectrometer – Reflection Cavity and Microwave Bridge – ESR Spectrum – Hyperfine Structure. Mossabauer Spectroscopy: Mossabauer Effect – Recoilless Emission and Absorption – Doppler velocity shift –Mossabauer Spectrum– Experimental Methods – Hyperfine Interaction – Chemical Isomer Shift– Magnetic Hyperfine and electric Quadrupole Interaction.	12

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *C.N. Banwell, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill (1994).*
2. *G. Aruldas, Molecular Structure and Spectroscopy, Prentice Hall of India Pvt. Ltd., New Delhi (2001).*
3. *Raymond Chang, Basic Principles of Spectroscopy, McGraw Hill, Kogakusha, Tokyo (1980).*

REFERENCE BOOKS

1. *B.P. Straughan and Walkar, Spectroscopy, Vol. 1, Chapman and Hall (1976).*
2. *B.P. Straughan and Walkar, Spectroscopy, Vol. 2, Chapman and Hall (1976).*
3. *D.N. Sathyanarayana, Vibrational Spectroscopy and Applications, New Age International Publications(2004).*
4. *D.A. Long, Raman Spectroscopy, McGraw Hill, New York (1977).*
5. *A. Beiser, Concepts of Modern Physics, McGraw Hill, New York (1995)*

WEB RESOURCES

WebLink: https://nptel.ac.in/courses/115/101/115101003/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Ms. R. Amirthavalli)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP15	Course Title						Batch:	2020-2021 Batch Only
		COMMUNICATION ELECTRONICS						Semester:	III
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To gain the knowledge of radio waves.
2. To learn the generation of optical fiber communication.
3. To acquire basic knowledge of satellite network.
4. To know how to apply operation of cellular systems and wireless LAN application.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the Propagation of Radio waves in free space.	K1
CO2	Analyze the applications of optical fiber communication systems.	K2
CO3	Interpret the purpose of satellite communications.	K3
CO4	Apply the various network systems for information transfer.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP15	COMMUNICATION ELECTRONICS	Sem: III
Unit No.	Topics	Hours
I	**Propagation of Radio waves** Modes of propagation – Structure of atmosphere – Ground wave propagation – Tropospheric propagation – Duct propagation –Troposcatter propagation – Sky wave propagation – Virtual height- critical frequency – Maximum usable frequency - Skip distance- Fading – Multi hop propagation.	12
II	**Optical Fiber Communication** Introduction – Optical Fiber – Numerical aperture – Step index and graded index fiber- Scalar wave equation and the modes of a fiber – Modal analysis for a step index fiber – Modal analysis of parabolic index medium – Pulse dispersion – Single mode fibers and Multimode fibers with optimum profiles –Splice loss – First and second generation optical fiber communication systems.	12
III	**Satellite Communication** Satellite parameters and configurations – Satellite orbits – GEO – MEO – LEO – frequency bands – transmission impairments – Satellite foot print – atmospheric attenuation – satellite network – configuration – capacity allocation	12

	– multiplexing: FDM and TDM.	
IV	**Cellular wireless networks** Introduction – Significance of Cellular Mobile systems – Frequency spectrum allocation – Trunking efficiency – Basic Cellular system – Performance criteria – Operation of Cellular systems – Hexagonal shaped cells – Planning a Cellular system – Elements of Cellular system design – Frequency Reuse – Co-channel interference reduction factor – Hand-off mechanism – Cell splitting – Components of Cellular systems.	**12**
V	**Wireless LANS** Overview: Wireless LAN applications – wireless LAN requirements – wireless LAN technology – Infrared LANS –spread spectrum LANS – narrow band microwave LANS – IEEE 802 architecture – IEEE 802.11 architecture.	**12**

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *Antennas and Wave Propagation K.D Prasad, Satya Prakashan, New Delhi. (Unit - I).*
2. *Optical Fiber Communication – Gerd Kaiser, TMH (Unit – II).*
3. *Timothy Pratt, Charles Bostian& Jeremy Allnutt, "Satellite Communications" John Wiley & Sons, 2nd Edition 2003(Unit – III).*
4. *Behrous A. Forouzan, "Data Communication and Networking", Tata McGraw Hill, 4th Edition, 2000 (Unit – IV&V).*

REFERENCE BOOKS

1. *Wireless communications and Networks – William Stallings – Pearson education – Asia (2002).*
2. *Electronic communications, modulation and transmission – Robert J. Schoen beck, PHI, (1999).*
3. *Telecommunication switching and networks – P. Gnanasivam, PHI (2004).*
4. *Optical Fiber Communication – Gower, PHI.*
5. *Optical Fiber Communication – J. M. Senior, PHI.*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/117/102/117102059/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Senthil) Name & Signature of the Staff	(Dr. V. Balaprakash) Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20PHP16A	Course Title						Batch:	2020-2021 Batch Only
		LASERS AND OPTICS						Semester:	III
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To gain knowledge about the laser properties.
2. To learn the concepts of optical pumping process and Q switch.
3. To acquire basic knowledge of holography.
4. To impart the knowledge of laser in science and non-linear optics.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the fundamentals of optics.	K1
CO2	Understand the classifications of pumping sources.	K2
CO3	Interpret the interior depth of lasers in science.	K3
CO4	Analyze the knowledge about the laser in industry.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP16A	LASERS AND OPTICS	Sem: III
Unit No.	**Topics**	**Hours**
I	**Introduction** Review of elementary quantum physics, Schrodinger equation, Properties of Laser Beams- mono chromativity, temporal and spatial coherence, Directionality, Brightness, Radiation Trapping Super radiance, Super fluorescence, Amplified Spontaneous Emission, Non-radiative delay. Absorption, spontaneous emission and stimulated emission processes, relation between Einstein's A and B coefficients, population inversion, pumping, gain, optical cavities.	12
II	**Pumping process** Optical pumping and pumping efficiency - Electrical pumping and pumping efficiency. Passive Optical Resonators, Rate Equations, Three -level Laser, Four-level Laser, Methods of Q- switching: Electro optical shutter, mechanical shutter, Acousto - optic Q-switches, Mode locking.	12
III	**Main components of Laser** Introduction to general lasers and their types -CW and Pulsed Lasers, atomic, ionic,	

	molecular, excimer, liquid and solid state Lasers and systems, short pulse generation and measurement. Spatial Frequency Filtering – Holography – Applications of holography – HNDT (Holographic Non - Destructive Testing) holographic storage – optical disk storage – Laser speckle and speckle meteorology – SNDT (Speckle Non- Destructive Testing).	12
IV	**Lasers in Science** Saturation spectroscopy – excited state spectroscopy – nonlinear spectroscopy – time domain and its applications – stimulated Raman Emission – Laser fusion – Isotope separation – Medical applications, photo- chemical applications. Materials processing – drilling, cutting, welding – alloying – glazing – oblation– Laser chemical Vapor Deposition (LCVD) –Laser thermal deposition – hardening, annealing – Laser Tracking - Lidar.	12
V	**Non-linear Optics** Wave propagation and Momentum Conservation – Linear Medium – Non-linear Polarization – Second Harmonic Generation – Phase Matching – Sum and Diffraction Frequency Generation – Parametric Oscillation – Self- Focusing of Light – Stimulated Raman Scattering.	12

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *K.R. Nambiar, Lasers Principles, Types and Applications, New Age International Publishers (2004).*
2. *S. A. Ahmad, Laser concepts and Applications, New Age International (2013).*
3. *K. Thyagarajan and A.K. Ghatak, Lasers Theory and Applications, Mcmillan (1981).*
4. *Brij Lal, M. N. Avadhanulu, and N. Subrahmanyam, A Text Book of Optics, S.Chand Publications (2004)*

REFERENCE BOOKS

1. *B.B. Laud, Lasers and Non-linear Optics, New Age International, New Delhi (2007).*
2. *K. Koebner, Industrial Applications of Lasers, Wiley (1984).*
3. *J.T. Cuxon and D.E. Parker, Industrial Lasers and their Applications, Prentice Hall (1985).*
4. *B.Culshaw,Optical Fiber Sensing and Signal Processing, Peter Peregrinus Ltd.,(1984).*
5. *F.C. Appard, Fiber Optics Handbook for Engineers and Scientist, McGraw Hill (1989).*

WEB RESOURCES

Web Link: https://onlinecourses.nptel.ac.in/noc21_ph01/preview/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Senthil)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP16B	Course Title						Batch:	2020-2021 Batch Only
		PLASMA PHYSICS						Semester:	III
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To provide a good foundation in plasma parameters.
2. To impart a knowledge of the motion of charged particle in electric and magnetic field.
3. To inspire interest for the knowledge of concepts is fluid equation of plasma and equilibrium.
4. To acquire the knowledge of waves in plasma and kinetic theory for plasma.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the concept of plasma.	K1
CO2	Analyze the behavior of charged particles in electric andmagnetic waves.	K2
CO3	Relate the concepts of waves in plasma.	K3
CO4	Evaluate the kinetic theory of plasma.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP16B	PLASMA PHYSICS	Sem: III
Unit No.	**Topics**	**Hours**
I	**Plasma parameters** Introduction- Occurrence of Plasmas in Nature, Definition of Plasma, Concept of temperature, Debye shielding, the plasma parameter, Criteria forplasmas, Applications of plasma physics	11
II	**Motion of charged particles in electric and magnetic fields** Uniform E and B fields, Non uniform E and B fields, magnetic mirrors, time varying E and B fields, adiabatic invariants, first, second and third.	12
III	**Fluid equations for plasma, equilibrium and stability** Relation of plasma physics to ordinary electromagnetic, the fluid equations for plasma, fluid drifts perpendicular and parallel to B, the plasma approximation. Hydro magnetic equilibrium, the concept of â diffusion magnetic field into a plasma, classification of instabilities, two stream and gravitational instabilities.	12

IV	**Waves in plasma** Representation of waves, group velocity, plasma oscillations, electron plasma waves, sound waves, ion waves, validity of plasma approximation, comparison of ion and electron waves, electrostatic electron oscillations perpendicular to B, electrostatic ion waves perpendicular to B, the lower hybrid frequency, electromagnetic waves with B0=0, experimental applications, electromagnetic waves perpendicular to B0 cutoffs and resonances, the CMA diagram, hydromagnetic waves, Alfven waves and their measurement.	13
V	**Kinetic theory for plasma** The meaning of the distribution function f(v), equation of kinetic theory, Vlasov equation, Fokker-Plank equation-Plank equation, derivation of fluid equation, plasma oscillations, plasma oscillation and landau damping, the meaning of Landau damping, kinetic energy of a beam of electron, BGK and Van Kampen modes, experimental verifications, Plasma diagnostics: Electrical methods, Langmuir profits spectroscopic methods	12

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *F.F.Chen: Introduction to Plasma Physics and Controlled Fusion: Volume I Plasma Physics, Plenum Press, New York, 1984.*
2. *I M podgomyl : Topics in plasma diagnostics (plenum press)*
3. *Nocholas A. Krail and Alvin W. Trivelpiece – Principles of plasma physics (McGraw Hill Kogkush Ltd.)*

REFERENCE BOOK

1. *Richard H Huddlestone and Stanely Leonard – Plasma diagnostics techniques (Academic press)*

WEB RESOURCES

Web Link: https://nptel.ac.in/cpurses/108/105/108105064/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(R. Amirthavalli) Name & Signature of the Staff	(Dr. V. Balaprakash) Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20PHP17	Course Title						Batch:	2020-2021 Batch Only
		PRACTICAL V: ADVANCED PHYSICS						Semester:	III
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES:

1. To provide a good foundation in measurements.
2. To provide a knowledge of the behavior of instruments.
3. To inspire interest for the knowledge of concepts regarding measurements.
4. To inculcate the ability on scientific and mathematical calculations.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the experimental foundation for the theoretical concepts introduced in the lectures.	K1
CO2	Analyze the basic principles of photo cells.	K2
CO3	Observe and analyses the laboratory instrumental techniques andgain the practical knowledge.	K3
CO4	Introduce new concepts and techniques which have a wide application in experimental science.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

COURSE CODE	PRACTICAL V: ADVANCED PHYSICS	Semester
20PHP17	Topics	III

(Any 10 Experiments)

1. Development of Copper/Brass/Iron Arc spectra – Constant Deviation Spectrograph
2. Magnetic field Strength determination – Search Coil method
3. Bulk modulus and Compressibility of the solid – Ultrasonic interferometer
4. Determination of bandgap and resistivity of semiconductor at different temperatures by Four Probe Method
5. Determination of specific charge 'e/m' – Magnetron method.
6. Determination of specific charge 'e/m' – Helical method.
7. Determination of Planck's constant - Photo Cell and LED method.

8. Fiber optic Experiments - Determination of Numerical aperture, acceptance angle and Fiber Loss of an optical fiber
9. Determination of λ of a monochromatic light and angle of biprism using Optical bench – Biprism method.
10. Elastic constants of the material – Elliptical Fringes.
11. Elastic constants of the material – Hyperbolic Fringes
12. Determination of coercivity, retentivity and saturation magnetization of the given material using hysteresis loop tracer.
13. Determine the ionizing radiation from the given source using GM counter experiment.
14. Susceptibility of a given solid – Guoy's method.
15. Solar Spectrum – Rydberg constant.
16. Determination of Hall coefficient, mobility and number of charge carriers – Hall setup.
17. Determination of wavelength of laser source – Transmission and Reflection grating.

Teaching Methods: <Practical Demonstration>

WEB RESOURCES

Web Link: https://www.vlab.co.in/ba-nptel-labs-physical-sciences/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	M	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Senthil) Name & Signature of the Staff	(Dr. V. Balaprakash) Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP18	Course Title						Batch:	2020-2021 Batch Only
		PRACTICAL VI: COMMUNICATION SYSTEMS						Semester:	III
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES:

1. To provide a good foundation in Analog and Digital Modulation Schemes.
2. To provide a knowledge various Analog Integrated Circuits.
3. To inspire interest for the knowledge of concepts regarding Modulation & Demodulation.
4. To inculcate the ability on scientific and mathematical calculations.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recall and apply basic laws of modulation.	K1
CO2	Understand the working of various modulator anddemodulator.	K2
CO3	Analyze the working of various digital modulation scheme.	K3
CO4	Evaluate the working of Analog and Digital fiber optics link.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

Course Code	PRACTICAL VI: COMMUNICATION SYSTEMS	Semester
20PHP18	Topics	III

(Any 10 experiments)

1. Amplitude Modulation and Demodulation.
2. Frequency Modulation LM565/NE565.
3. PAM Modulation and Demodulation.
4. PWM Modulation and Demodulation.
5. PPM Modulation and Demodulation.
6. Voltage Controlled Oscillator using Timer.
7. ASK Generation and Detection.
8. FSK Generation and Detection.
9. PSK Generation and Detection.
10. BPSK & DPSK Generation and Detection.
11. QAM Generation and Detection.
12. Pulse Code Modulation and Demodulation.
13. Delta & Adaptive Delta Modulation and Demodulation.

14. Establishment of Analog Fiber Optic Link. 15. Establishment of Digital Fiber Optic Link.

Teaching Methods: <Practical Demonstration>

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/115/105/115105120/
https://nptel.ac.in/courses/115/105/115105120/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Balaprakash)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP19A	Course Title						Batch:	2020-2021 Batch Only
		MOLECULAR PHYSICS						Semester:	IV
Hrs/Week:	6	L	6	T	-	P	-	Credits:	6

COURSE OBJECTIVES:

1. To acquire knowledge and apply it to study the structure of molecular and bonding.
2. To know the formation of molecular symmetry.
3. To analyze the interaction in molecular.
4. To motivate the students to analyze the molecular reaction dynamics and electronic structure.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the concepts of molecular structures and bonding.	K1
CO2	Understand the principles of interactions in molecule.	K2
CO3	Predict the concepts of molecular dynamics.	K3
CO4	Evaluate and interpret electron transfer, electronic structure andspectra.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP19A	MOLECULAR PHYSICS	Sem: IV
Unit No.	**Topics**	**Hours**
I	**Molecular structure and bonding** Chemical bonding - The VSEPR model - Valence bond theory – The hydrogen molecule - Homonuclear diatomic molecules - Polyatomic molecules - Molecular orbital theory –Homonuclear diatomic molecules – Heteronuclear diatomic molecules – Bond properties - Polyatomic molecules – Molecular shape in terms of molecular orbitals - Molecular structure, properties and conformations.	14
II	**Molecular symmetry** Symmetry elements and operations – The symmetry classification of molecules – Some immediate consequences of symmetry – Applications to molecular orbital theory – Character tables and symmetry labels – Vanishing integrals and orbital overlap - Vanishing integrals and selection rule.	14
III	**Molecular interactions and mechanics** Electric properties of molecules - Electric dipole moments - Polarizabilities - Relative permittivity's - Interactions between dipoles - Repulsive and total interactions - Molecular interactions in gases - Potential energy (force field) in	14

	molecular mechanics – Various energy terms in force field – Newtonian and Hamiltonian dynamics – Phase space trajectories.	
IV	**Molecular reaction dynamics** Collision theory – Diffusion controlled reactions – Reactive collisions – Potential energy surfaces – Transition state theory – The Eyring equation – Thermodynamic aspects - Microscopic–macroscopic connection - Zero-point Vibrational energy - Molecular electronic, rotational, Vibrational and translational partition functions.	15
V	**Electron transfer, electronic structure and spectra** The rates of electron transfer processes – Theory of electron transfer processes – Crystal-field theory - Ligand-field theory - Electronic spectra of atoms - Electronic spectra of complexes - Charge-transfer bands - Selectionrules and intensities – Luminescence.	15

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *Physical chemistry- P.Atkins and J. Depaula, Oxford University Press, 2009*
2. *Inorganic chemistry - P. Atkins, T. Overton , J. Rourke and M. Weller, Oxford University Press. 2009.*

REFERENCE BOOK

1. Essential of Computational Chemistry - Theories and Models, Christopher J. Cramer, John Wiley & Sons, 2nd Edition, 2004.

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/115/102/115102020/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Ms. R. Amirthavalli) Name & Signature of the Staff	(Dr. V. Balaprakash) Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20PHP19B	Course Title						Batch:	2020-2021 Batch Only
		THERMODYNAMICS AND STATISTICAL METHODS						Semester:	IV
Hrs/Week:	6	L	6	T	-	P	-	Credits:	6

COURSE OBJECTIVES:

1. To acquire knowledge and apply it to various law of thermodynamics.
2. To apply the develop the problem solving ability of ensembles.
3. To motivate the students to apply the concepts of quantum statistics.
4. To inculcate the concepts of Fermi energy and Fermi momentum and phase transition.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand Equilibrium of thermodynamics.	K1
CO2	Interpret the quantum statistics.	K2
CO3	Apply the concepts of Fermi Energy in thermodynamics.	K3
CO4	Analyze the applications of statistical physics.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP19B	THERMODYNAMICS AND STATISTICAL METHODS	Sem: IV
Unit No.	Topics	Hours
I	**Equilibrium Thermodynamics, Classical Statistics** Review of Classical Thermodynamics – Zeroth Law, First Law, Second Law and Third Law and Its Consequences – Thermodynamic Potentials – Maxwell's Relations – Dulong Petit's Law – Microstates – Macrostates – Phase Space- μ-Space and Γ-Space – Liouville's Theorem, Proof and its Consequences – Postulates of Statistical Mechanics – Thermodynamic probability - Classical Statistics –Maxwell Boltzmann Distribution – Root mean Square Speed – Average Speed – Boltzmann entropy relation	14
II	**Ensemble Approach** Introduction to Ensembles – Microcanonical, canonical and grand canonical ensembles – Definition of partition function in the ensembles – Determination of thermodynamic quantities from Partition function – Demonstration of ensemble approach – First example – Classical ideal gas in micro canonical, canonical and grand canonical ensemble – Gibbs paradox and correct formula	14

	for entropy – Second example – Linear harmonic oscillator in micro canonical, canonical and grand canonical ensemble –Demonstration of equipartition of energy through canonical distribution	
III	**Quantum Statistics** Quantum Statistics-Indistinguishability and quantum statistics-Bose Einstein Distribution-Fermi Dirac Distribution-Symmetric and antisymmetric wave functions-Difference between Bose-Einstein and Fermi-Dirac statistics-Bosons and Fermions-Calculating the partition function for Bosons and Fermions-Free electron model and Electronic emission -Liquid Helium-Onsagar relations-Enthalpy-Bragg William Approximation-Quantum Ideal gas.	14
IV	**Fermi energy** Weakly degenerate Bose and Fermi gas – Determination of thermodynamic quantities and equation of state – Strongly degenerate Bose gas – Bose- Einstein Condensation – Thermodynamic quantities – Black body radiation – Planck's distribution law – Heat capacity of solids – Einstein and Debye's theory of Specific heat of solids – Thermionic emission.	15
V	**Phase transitions** Introduction to phase transition - van der Waals equation – First order phase transitions – Phase diagram – Critical point – Clausius – Clapeyron equation - Critical exponents – Landau theory of Phase transitions – Ising model in one dimension – Exact solution of Ising model in one dimension.	15

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *S. C. Garg, R. M. Bansal and C. K. Gosh, Thermal Physics: with Kinetic Theory, Thermodynamics and StatisticalMechanics (McGraw Hill Education, 2nd edition, 2017).*
2. *B. K. Agarwal and M. Eisner, Statistical Mechanics (New Age International Publishers, 3rd edition, 2013).*
3. *F. Reif, Fundamentals of Statistical and Thermal Physics (Waveland Press, 2010).*

REFERENCE BOOKS

1. *D. A. McQuarrie, Statistical Mechanics (Viva Books India, Viva Student Edition, 2018).*
2. *R. K. Pathria and P. D. Beale, Statistical Mechanics (Academic Press, 3rd edition, 2011).*
3. *W.Greiner, L. Neise and H. Stocker, Thermodynamics and Statistical Mechanics (Springer Verlag, New York, 1st edition, 1995).*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/115/103/115103113

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(R. Amirthavalli) Name & Signature of the Staff	(Dr. V. Balaprakash) Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP20A	Course Title						Batch:	2020-2021 Batch Only
		MEDICAL PHYSICS						Semester:	IV
Hrs/Week:	6	L	6	T	-	P	-	Credits:	5

COURSE OBJECTIVES:

1. To acquire knowledge and apply it to study the bio electric potentials.
2. To know the production of X –Rays.
3. To impart knowledge of functional MRI
4. To analyze the nuclear medicine and biological effects of radiation and medical instrumentations.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the bio-electric Potentials and electrodes.	K1
CO2	Demonstrate the working of Digital X-ray imaging and Computed Tomography.	K2
CO3	Evaluate the working of magnetic resonance imaging.	K3
CO4	Investigate the working of Medical Imaging Instrumentation.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP20A	MEDICAL PHYSICS	Sem: IV
Unit No.	**Topics**	**Hours**
I	**Bio-Electric Potentials** Resting and action potentials - Propagation of action potentials – Bioelectric potentials–Bio- potential Electrodes– Types of electrodes – Microelectrodes – Body surface electrodes – Depth and Needle electrodes – Chemical electrodes – Distortion in measured bioelectric signals using electrodes – Electrode paste Electrocardiogram(ECG)Electroencephalogram(EEG)–Electromyogram(EMG)–Electrooculography (EOG).	14
II	**Digital X-ray imaging and Computed Tomography** Production of X-rays – Types of X-ray tubes – Generators – Interaction of X and Gamma rays with matter – Image formation and image quality – CR and DR – the image intensifier – fluoroscopy – Equipment for computed tomography scanning – Image reconstruction – Helical and multi-slice scanning – Image quality and artifacts – CT dose index.	14

III	**Imaging with Ultrasound and MRI** Piezoelectric effect – Interference – Different types of transducers – Modes of scanning – Image quality and artifacts – Doppler methods – Hemodynamic data – The spinning proton – the MR signal – Spin echo sequence – Spatial encoding – Other pulse sequences – functional MRI – Image quality andartifacts – Magnets and coils –Hazards and safe practice –Thermography– Endoscopy.	14
IV	**Physics of Nuclear Medicine and Biological effects of Radiation** Radioactivity - Radioactive transformation – Radiopharmaceuticals – Hot lab– Gamma camera – Planner imaging – tomography with radionuclide – PET scanner – Characteristics and quality assurance of images –Precautions necessary in handling open radioactive sources – Ionizing radiation interactions with tissues – Radiation dose and units – Effects of radiation – Principles of radiation protection – ICRP, BARC and AERB –ELORA– Practical aspects of radiation protection.	15
V	**Medical Imaging Instrumentation** Radiation therapy – Surgery – Chemotherapy – Hormone therapy – Immunotherapy and Radionuclide therapy – Begin and malignant disease – Methods of spread of malignant disease – Staging and grading systems, Treatment intent – Curative and Palliative – Teletherapy and Brachy therapy – Co-60 and other radioactive sources used in the treatment of cancer – Linear accelerator – Modern treatment techniques –Treatment planning – Non-Photon ionizing radiation treatments and challenges.	**15**

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *T.Rajalakshmi, Bio Medical Instrumentation, First Edition, 2008.*
2. *M.Arumugam, Bio Medical Instrumentation, Anuradha Agencies, Fourth reprint, 2000.*
3. *R.S.Khandpur, Handbook of Biomedical Instrumentation, Tata McGraw Hill, 2007.*

REFERENCE BOOKS

1. *Penelope Allsiy, Rpberts, Jerry R.Villiams, Saunders,Farr's Physics for Medical Imaging, Elsevier, Second Edition, 2008.*
2. *FiazM.Khan, The Physics of Radiation Therapy, 2006.*
3. *Ramesh Chandra, Nuclear Medicine Physics, , Lea and Febiger. 5th Edition*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/108/105/108105091/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mrs. R. Vishalashi)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHP20B	Course Title						Batch:	2020-2021 Batch Only
		CONDENSED MATTER PHYSICS						Semester:	IV
Hrs/Week:	6	L	6	T	-	P	-	Credits:	5

COURSE OBJECTIVES:

1. To acquire knowledge of bonding and crystallography.
2. To know about lattice vibration of monoatomic.
3. To motivate the students in order to apply the principles of semiconductor crystals.
4. To impart the knowledge of Diamagnetism, Paramagnetism and Ferro magnetism Ferroelectrics and Superconductivity.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the basics of Bonding and Crystallography.	K1
CO2	Remember the vibration and thermal properties of matter.	K2
CO3	Apply the knowledge of free electron model and band structurein metals.	K3
CO4	Analyze the behavior of magnetic, dielectric and superconducting materials.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP20B	CONDENSED MATTER PHYSICS	Sem: IV
Unit No.	**Topics**	**Hours**
I	**Bonding and Crystallography** Bonding : Ionic bonding – calculation of lattice energy-calculation of madelung constant in ionic crystals – Born Haber cycle – Crystals of inert gases –Vanderwaal's interaction – London interaction – Compressibility and bulk modulus. Crystallography : Reciprocal lattices – Vector development of reciprocal lattice – Properties of the reciprocal lattice – Reciprocal lattice to bcc lattice and fcc lattice –Bragg's condition in terms of reciprocal lattice – Brillouin zones – Ewald sphere – atomic scattering factor –Geometrical structure factor.	14
II	**Lattice Vibrations and Thermal properties** Vibration of monatomic lattices – Lattices with two atoms per primitive cell – Quantization of lattice vibrations – Phonon momentum – Inelastic scattering of neutrons by phonons – Lattice heat capacity – Einstein model – Density of mode in one-dimension and three Dimension – Debye model of the lattice heat	14

	capacity.	
III	**Free Electron theory, Energy Bands and Semiconductor Crystals** Band theory of solids – Bloch theorem –Kronig - Penney model – Effective mass – Free electron gas in one dimension – Energy levels and density of states Free electron gas in three dimensions – Fermi energy – Heat capacity of the electron gas – Thermal conductivity of metals – Wiedemann – Franz law – Hall effect – Intrinsic carrier concentration.	14
IV	**Diamagnetism, Paramagnetism and Ferro magnetism** Diamagnetism and Anti ferromagnetism – Langevin classical theory of Diamagnetism – Weiss theory – Quantum theory of Para magnetism – Demagnetization of a paramagnetic salt –Determination of susceptibility of para and diamagnetism using Gouy's method – Ferromagnetism – Spontaneous magnetization in ferromagnetic materials – Quantum theory of ferromagnetism – Curie-Weiss law – Weiss Molecular field – Ferromagnetic domains – The Domain Model – Domain theory – Antiferromagnetism– Ferrimagnetism – Structure of Ferrite.	15
V	**Dielectrics, Ferroelectrics and Superconductivity** Macroscopic electric field – Local electrical field at an atom – Dielectricconstant and Polarizability – Clausius-Mossotti equation – Ferroelectric crystals Polarization Catastrophe –Ferroelectric domains – Superconductivity –Meissner effect – Thermodynamics of Superconducting transition – London equation – Coherence length – BCS theory – Flux Quantization – Type-I and Type-II Superconductors–Josephson tunneling effect – DC and AC Josephson effect – SQUID – Superconductivity –High temperature superconductors (HTSC)- Recent developments in high Temperature Superconductivity – Application of superconductors.	15

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *Solid State Physics, S.L.Gupta and V.Kumar, Pragati Prakashan (2002).*
2. *Fundamentals of Solid State Physics, B.S.Saxena, R.C.Gupta and P.N.Saxena,Pragati Prakashan, Meerut (2010).*
3. *Solid State Physics, S.O. Pillai, New Age International Pvt. Ltd., New Delhi (1999).*

REFERENCE BOOKS

1. *Solid State Physics, N.W. Asherof and N.D. Mermin, Harcourt Asia Pvt. Ltd, Singapore (2001).*
2. *Solid State Physics, J. S. Blakemore, Second edition, Cambridge University Press, Cambridge, London (1974).*
3. *An Introduction to X-ray Crystallography, M.M. Woolfson, Cambridge University Press, Cambridge, London (1991).*
4. *Introduction to High-Temperature Superconductors, Thomas P. Sheahen, Plenum Press, New York (1994).*
5. *Introduction to Solid State Physics, C. Kittel, Fifth Edition, Wiley Eastern, New Delhi (1977).*

WEB RESOURCES

Web Link: https://nptel.ac.in/115/106/115106061/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh)	Dr. V. Balaprakash	
Name & Signature of the Staff	Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20PHP21A	Course Title						Batch:	2020-2021 Batch Only
		ELECTRONIC INSTRUMENTATION						Semester:	IV
Hrs/Week:	6	L	6	T	-	P	-	Credits:	5

COURSE OBJECTIVES:

1. To provide a good foundation in measurements.
2. To provide a knowledge of the behavior of instruments.
3. To inspire interest for the knowledge of concepts regarding measurements.
4. To study the instrument with its principle and observe the method their functioning.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the principles of measurements and transducers.	K1
CO2	Analyze the functions of analog instruments.	K2
CO3	Evaluate the working of digital instruments.	K3
CO4	Investigate the functions of oscilloscope and signal generator.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP21A	ELECTRONIC INSTRUMENTATION	Sem: IV
Unit No.	**Topics**	**Hours**
I	**CHARACTERISTICS OF INSTRUMENT, MEASURMENTS AND TRANSUDERS:** Introduction - Errors in measurements transducers, Classification of transducers- Selecting a transducers - strain gauge - Gauge factor – Resistive - capacitive and inductive transducers - Variable differential transformer – LVDT - RVDT - Photoelectric transducers - Piezoelectric transducers - Temperature transducer- photoelectric effect -Hall effect -piezoelectric effect - thermoelectric effect and their applications.	14
II	**BRIDGE MEASURMENT:** Introduction - Maxwell's bridge - Capacitance bridge - Hay's bridge – Anderson's bridge - Owen's bridge – Measurement of incremental inductance - Wheatstone bridge - Schering bridge.	14
III	**ANALOG AMMETERS, VOLTMETERS AND OHMMETERS:** Introduction- Types of instruments- Errors in ammeters and voltmeters -Permanent magnet moving coil instruments(PMMC) – Ammeter – multi range ammeter - Voltmeter-	14

	Multirange DC voltmeter - Ohmmeters-Series type voltmeter- Shunt type ohmmeter- Multimeter	
IV	**DIGITAL INSTRUMENTS:** Introduction-Digital Multimeter-digital frequency meter-digital measurement of time – Digital measurement of mains frequency-Digital tachometer- Digital Ph meter – Digital phase meter Digital capacitance meter.	15
V	**OSCILLOSCOPE AND SIGNAL GENERATORS :** Cathode Ray Tube - Vertical and Horizontal Deflection Systems- Delay lines -Probes and Transducers - Specification of an Oscilloscope - Oscilloscope measurement Techniques - Special Oscilloscopes – Storage Oscilloscope -Sampling Oscilloscope - Signal Generators: Sine wave generator - Synthesized Signal Generator - Sweep frequency Generator – Pulse and square wave generators -Function Generators.	15

Note: Distribution of marks: Problems %, Theory %

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *Electrical and Electronic Measurements and Instrumentation - A.K. Sawhney, Dhanpat rai & co, Educational andTechnical Publishers.*
2. *Electronic Instrumentation – H.S. Kalsi – Third edition, Tata MCGraw Hill.*

REFERENCE BOOKS

1. *Modern Electronic Instrumentation and Measurement techniques by A. Helfrick, W. Cooper (PHI)*
2. *Measurement Systems, Applications & Design – E. O. Deoblin*
3. *Principles of Industrial Instrumentation: D.Patronbis,*
4. *Electronics Measurement and Instrumentation: Oliver and Cage.*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/108/105/108105153/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Senthil)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20PHP21B	Course Title						Batch:	2020-2021 Batch Only
		NANO ELECTRONICS AND NANO SYSTEMS						Semester:	IV
Hrs/Week:	6	L	6	T	-	P	-	Credits:	5

COURSE OBJECTIVES:

1. To learn the impact of solid state physics.
2. To provide the determination of particle size and method of measuring.
3. To know the concept of properties of Individual Nanoparticles.
4. To impart the knowledge of CNT and application of Nanomachine and Nanodevices.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the principles of solid-state physics.	K1
CO2	Interpret the measuring properties of nanostructure.	K2
CO3	Analyze the principle of Carbon and Bulk Nanostructure materials.	K3
CO4	Applications of Self-Assembly, Nanomachines & Nanodevices	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHP21B	NANO ELECTRONICS AND NANO SYSTEMS	Sem: IV
Unit No.	**Topics**	**Hours**
I	**Introduction to Physics of Solid State** Size Dependence Properties – Crystal structure – Face centered cubic nanoparticle – Tetrahedrally bonded semiconductor structure – Lattice vibrations. Energy Bands:Insulator, Semiconductor and Conductor – Reciprocal space - Energy bonds and gaps of semiconductor – Effective Masses – Fermi surfaces. Localized particles: Donors, Acceptors and Deep Traps – Mobility – Excitons.	14
II	**Methods of Measuring Properties** Introduction – Atomic structures – Crystallography – Particle size determination – Surface structure. Microscopy: TEM – Field Ion Microscopy – Scanning Microscopy. Spectroscopy: IR and Raman spectroscopy – Photoemission – X-ray spectroscopy – Magnetic resonance.	14
III	**Properties of Individual Nanoparticles** Metal Nanoclusters: Magic number – Theoretical modeling of nanoparticles – Geometric structure – Electronic structure – Reactivity – Fluctuations – Magnetic	14

	clusters – Bulk Nanotransition. Semiconductor nanoparticles – Rare gas molecular clusters – Methods of synthesis: RF plasma – Chemical methods – Thermolysis – Pulsed Laser method.	
IV	**Carbon and Bulk Nanostructure Materials** Carbon molecules – Carbon Clusters – Carbon Nanotubes: Fabrication – Structure – Properties. Application of CNT: – Field emission and shielding – Computers – Fuel cells –Chemical sensors – Catalysis – Mechanical reinforcement - Solid disordered nanostructure –Nanostructured crystals.	15
V	**Self-Assembly, Nanomachines & Nanodevices** Self-Assembly: Process of self-assembly – Semiconductor Islands– Monolayers. Micro Electro Mechanical Systems - Nano Electro Mechanical Systems: Fabrication – Nanodevices and Nanomachines – Molecular and Supramolecular Switches	15

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOK

1. Introduction to Nanotechnology – Charles P. Poole Jr. and Frank J. Owens – Wiley Inter science (2003).

REFERENCE BOOKS

1. Goser. K, Glosekotter. P and Dienstuhl .J, "Nanoelectronics and Nanosystems", Springer International Edition, First IndianReprint, 2005.
2. Ratner M.A and Ratner. D, "Nanotechnology; a Gentle Introduction to the Next Big Idea", Prentice Hall, 2002.

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/117/108/117108047/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Senthil)	(Dr. V. BalaPrakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	Course Title						Batch:	2020-2021 Batch Only
		VAC: Electronic Test Instruments						Semester:	IV
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES:

1. To provide a good foundation in measurements.
2. To provide a knowledge of the behavior of instruments.
3. To inspire interest for the knowledge of concepts regarding measurements.
4. To study the instrument with its principle and observe the method of their functioning.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember fundamentals of analog DC and AC typemeters	K1
CO2	Understand the working of signal sources anddigital meters	K2
CO3	Analyze the working of Oscilloscopes and Digital meters	K3
CO4	Ability to design new electronic test instrumentsfor industrial needs	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	VAC: Electronic Test Instruments	Sem: I/II/III/IV
	Topics	Hours
I	**Analog Meters** **DC Meters:** Voltmeter – Ammeter. **AC Meters:** Analog Mutimeter. Voltmeter–Ammeter.	6
II	**Signal Sources** Audio Frequency Generator – Function Generator – Wave Analyzer Spectrum Analyzer.	6
III	**Oscilloscopes** **General Purpose Oscilloscope** – CRT – Single and Dual Trace – Storage Oscilloscope – Digital CRO.	6
IV	**Digital Meters** Digital Mutimeter – Digital Frequency Meter – Measurement of Time –	6

	Digital Tachometer – Digital pH Meter.	
V	**Recorders** X-Y Recorder – Magnetic Recorder – Digital Data Recording – Digital Memory Waveform Recorder.	6

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. Albert D. Herlfrick & William D. Cooper, "Modern electronic Instrumentation & Measurement Techniques" Prentice Hall of India,2002. (Unit –I to III).

2. H S Kalsi, "Electronic Instrumentation"Tata McGraw-Hill, Second Edition, 2006. (Unit–IV & V)

REFERENCE BOOK

1. Joseph, J.Carr, "Elements of Electronic Instrumentation & Measurements" III edition,Pearson Education,2003.

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/108/105/108105153/

https://swayam.gov.in/ndl_noc19_ee4/preview

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	S
CO3	S	S	M	S
CO4	S	S	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mrs. R. Vishalashi)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	Course Title						Batch:	2020-2021 Batch Only
		VAC: Verilog HDL						Semester:	IV
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES:

1. To enable the students to acquire the knowledge in Verilog construct to gate.
2. To acquire knowledge and apply it to Verilog data types.
3. To apply the develop Verilog Operators.
4. To motivate the students to implement the arrays of primitives and modules and Boolean equations.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the functionality of digital systems	K1
CO2	Analyze and synthesize digital modules and circuits for awide application range	K2
CO3	Interpret the special features of Verilog HDL	K3
CO4	Design and implement simple digital systems usingVerilog	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	VAC: Verilog HDL	Sem: I/II/III/IV
	Topics	**Hours**
I	Basics: Synthesis – Design Process – Logic Value System – Verilog Constructs To Gates: Continuous Assignment Statement – Procedural Assignment Statement.	6
II	Always – If – Case – Loop Statements – Functions – Tasks – Verilog Data Types – Nets – Register – Variables – Constants – Array Of Nets Or Registers –	6
III	Verilog Operators – Arithmetic – Bitwise – Reduction –Logical –Relational –Shift Conditional – Concatenation – Expressions And Operands – Operator Precedence	6
IV	Additional Features of Verilog – Arrays of Primitives and Modules – Hierarchical Dereferencing – Parameters Substitution – Procedural Continuous – Intra Assignments	

	– In Determinant Assignments and Race Condition – Wait Statements – Fork Join Statements.	6
V	Modeling Examples – Modeling Combinational Logic – Modeling sequential logic – modeling a memory – writing Boolean equations – Modeling a counter	6

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOK

1. J.Bhasker, " Verilog HDL Synthesis, A Practical Primer" , BS Publication, Ist Indian Edition.(Unit–I to V)

REFERENCE BOOK

1. Micheal D. Ciletti, "Advanced Digital Design With The Verilog HDL", PHIpublications, Indian reprint.

WEB RESOURCES

Web Link:

1. https://nptel.ac.in/courses/106/105/106105165/
2. https://nptel.ac.in/courses/106/105/106105083/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	S
CO3	S	S	M	S
CO4	S	S	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mrs. R. Vishalashi)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	Course Title						Batch:	2020-2021 Batch Only
		VAC: Bioelectronics						Semester:	IV
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES:

1. To acquire knowledge of basic principles of bioelectronics.
2. To apply the development of Natural nano conductors.
3. To motivate the students to apply the principles of energy conversion scheme in the generation of the cells.
4. To know about Biomimeticversions of natural nano conductors and medical applications.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the principles of Bioelectronics	K1
CO2	Analyze the cellular components of human body	K2
CO3	Interpret the features of bio nano machines	K3
CO4	Evaluation of various bioelectronics equipments	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	VAC: Bioelectronics	Sem: I/II/III/IV
	Topics	Hours
I	Overview of bioelectronics - the interactions between electronics and biomedical science -The fundamental properties of ions in the solution	6
II	The electrical properties of cellular components: lipid bilayer and membrane proteins - Natural nano conductors: ion channels and pumps	6
III	Energy conversion scheme in the bioelectricity generation of the cell - Single channel recording: measurement and noise	6
IV	Patch clamp amplifier - Electronics of low noise current detection - Biomimetic versions of natural nano conductors - Functional bio nano machines.	6
V	Medical applications of bioelectronics: ECG – EEG – EMG - Pre-clinical and clinical testing of bio electronic technology	6

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *Bertil Hille, "Ion Channels of Excitable Membrane", Sinauer Associates, Inc., 2001.*
2. *Chandran Karunakaran, Kalpana Bhargava, Robson Benjamin, "Biosensors andBioelectronics" 1st Edition.*

REFERENCE BOOK

1. *Wolfgang Hanke and W. R. Schlue, " Planar Lipid Bilayers: Methods and Applications",Academic Press, 1994.*

WEB RESOURCES

Web Link:

https://nptel.ac.in/courses/106/105/106105165/
https://nptel.ac.in/courses/106/105/106105083/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	S
CO3	S	S	M	S
CO4	S	S	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mrs. R. Vishalashi)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
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Course Code:	20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	Course Title						Batch:	2020-2021 Batch Only
		VAC: Materials Characterisation						Semester:	IV
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES:

1. To enable the students to acquire the knowledge of material characterization.
2. To acquire knowledge of thermal analysis techniques.
3. To know the method of spectroscopic Techniques for chemical analysis.
4. To motivate the students in order to apply the diffraction method and surface characterization.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Students can understand the importance & Classificationof Characterization Techniques	K1
CO2	Student can describe the use of Vacuum systems in Material Characterization techniques	K2
CO3	Student can explain the working of ThermalAnalysis techniques	K3
CO4	Student can apply microscopy techniques to observethe Microstructure	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	VAC: Materials Characterisation	Sem: I/II/III/IV
	Topics	Hours
I	Introduction to materials and methods – Fundamentals of Materials Characterization – Basic operation – Sample preparation and interpretation of data. Basic failure analysis of materials using different characterization equipment.	4
II	Thermal Analysis techniques: Principle - Working and application of DTA – TGA - TMA - DSC.	6
III	Spectroscopic Techniques for chemical analysis: UV-Visual (UV-VIS) – IR - FTIR - EDS – WDS - X-ray Fluoroscopy (XRF) - Atomic absorption spectrometer (AAS).	6

IV	Diffraction method: Brags Law - X-ray diffraction methods - Determination of crystal structure - lattice parameter - crystallite size - merits and demerits.	7
V	Surface characterization: XPS (ESCA) – UPS - Auger Electron Spectroscopy - Electron Probe Micro Analysis (EPMA) - LEED.	7

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *F. Weinberg Editor, Tools & Techniques in Physical Metallurgy, Vol. I & II, Marcel Dekker*
2. *John P. Sibilia, A guide to Material Characterization & Chemical Analysis, VCH Publishers, 1988.*

REFERENCE BOOK

1. *J.M. Walls, Editor, Methods of Surface Analysis: Techniques & Applications, Cambridge University Press, 1990.*
2. *B.D. Cullity, Elements of X-ray diffraction, Addison-Wesley Publishing Company, INC.*

WEB RESOURCES

Web Link: https://www.energy.gov/eere/education/eere-energy-101-video-series

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	M	S
CO4	S	M	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

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Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	Course Title						Batch:	2020-2021 Batch Only
		VAC: IOT AND ITS APPLICATIONS						Semester:	IV
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES:

1. To give description for the students in order to learn about Internet of Things(IoT).
2. To acquire the basic knowledge of M2M value chains.
3. To understand the action of architecture reference model.
4 To get a deep knowledge of application of IoT applications for industry FP7 projects, privacy and trust in IoT.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the concept of of Internet of Things (IoT)	K1
CO2	Analyze the communication protocols for IoT	K2
CO3	Determine the most appropriate IoT Devices and Sensors based on Case Studies. Setup the connections between the Devices and Sensors	K3
CO4	Design and implementation various applications	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	VAC: IOT AND ITS APPLICATIONS	Sem: I/II/III/IV
	Topics	**Hours**
I	The Internet of Things Today – Time for Convergence – Towards the IoT Universe – Internet of Things Vision – IoT Strategic Research and Innovation Directions – IoT Applications – Future Internet Technologies – Infrastructure – Networks and Communication.	6
II	M2M Value Chains – IoT Value Chains – An emerging industrial structure for IoT – M2M to IoT – An Architectural Overview – Building an architecture – Main design principles and needed capabilities.	6
III	State of the Art – Introduction State of the art – Architecture Reference Model – Introduction – Reference Model and architecture – IoT reference Model – IoT Reference Architecture – Functional View – Information View – Deployment and Operational View.	6
	Introduction IoT applications for industry: Future Factory Concepts – Brownfield IoT –	

IV	Smart Objects – Smart Applications – IoT for Retailing Industry – Opinions on IoT Application – Home Management – E-Health.	6
V	Overview of Governance – Privacy and Security Issues – Contribution from FP7 Projects – Security – Privacy and Trust in IoT – Data-Platforms for Smart Cities.	6

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOK

1.Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (Unit–I to V)

REFERENCE BOOK

*1.*Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything", 1 st Edition, Apress Publications, 2013

WEB RESOURCES

Web Link:

https://github.com/connectIOT/iottoolkit/
https://www.arduino.cc/
http://www.zettajs.org/

MAPPING WITH PROGRAM OUTCOMES

PO / CO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	M	S
CO4	S	M	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh)	Dr. V. Balaprakash	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	Course Title						Batch:	2020-2021 Batch Only
		VAC: ELECTRIC VEHICLE DESIGN						Semester:	IV
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES:

1. To study the electric vehicle system with its principle and observe the method their functioning.
2. To inspire interest for a good foundation in Vehicle Kinetics.
3. To provide a knowledge of the behavior of DC and AC machines.
4. To know the functioning of Vector control of AC motors – SR motor drives and Hybrid Electric Vehicle

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember fundamentals of Vehicle mechanics and Lawsof Motion	K1
CO2	Understand the Dynamics of Vehicle Motion	K2
CO3	Analyze the working of DC and AC machines	K3
CO4	Design Hybrid Electric Vehicle for commercial needs	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	VAC: ELECTRIC VEHICLE DESIGN	Sem: I/II/III/IV
	Topics	Hours
I	Electric vehicle system – Components of an Electric vehicle system – Historical perspective of EV system – EV Advantages – EV Market. Vehicle mechanics – Laws of Motion.	6
II	Vehicle Kinetics – Dynamics of Vehicle Motion – Propulsion power – Velocityand Acceleration – Propulsion system design. Energy Source: Battery – Alternative Energy Sources.	6
III	Motor and engine ratings – EV and HEV motor requirements – DC machines – AC machines and their types – PM and SR machines – Switched Reluctance Machines.	6
IV	AC drives – Vector control of AC motors – SR motor drives – Electric Vehicle Drivetrain – EV transmission configurations – Ideal Gear box – EVmotor sizing.	6

V	Hybrid Electric Vehicle – Types – Internal combustion engines – Design of an HEV – Hybrid Drivetrains – Rated Vehicle velocity – Initial Acceleration – Maximum velocity – Maximum Gradability.	6

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOK

1. Iqbal Husain, "Electric and Hybrid Vehicles Design Fundamentals", CRC Press, 2003. (Unit –I to V).

REFERENCE BOOKS

1. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004.

2. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, 2003.

WEB RESOURCES

Web Link:

https://nptel.ac.in/courses/108/102/108102121/
https://nptel.ac.in/courses/108/103/108103009/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	S
CO3	S	S	M	S
CO4	S	S	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science

Course Code:	20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	Course Title						Batch:	2020-2021 and Onwards
		VAC: Ocean Electronics						Semester:	IV
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES:

1.To acquire knowledge and apply it to study the concepts of Remote Sensing Vs SONAR.
2. To know the formation of Scanner Sensor system and Marine Observation Satellite Sensors (MOS).
3.To inculcate the knowledge of Oceanographic wireless sensor networks
4.To motivate the students to analyze the Oceanographic Instruments and Marine magnetometer.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the concept of Remote sensing	K1
CO2	Analyze and synthesize the characteristics ofsensor systems	K2
CO3	Interpret the features of underwater communication andwireless sensor networks	K3
CO4	Design and implement Oceanographic Instruments	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	VAC: Ocean Electronics	Sem: I/II/III/IV
	Topics	**Hours**
I	Introduction to Remote Sensing – Remote Sensing Vs SONAR – Applications of Remote Sensing – NADIR Radar System – Microwave Radiometer – Applications of Telemetry	6
II	Introduction to Sensors – Scanner Sensor Systems – Spatial Resolution, pixel size andscale – Marine Observation Satellite Sensors (MOS) – Measurement of Ocean Colour – Surface Currents	6
III	Underwater wireless Communication – Acoustic Communication – Optical Communication – LASER sensor architecture – MEMS approach – Under water mobile communication	6
IV	Oceanographic wireless sensor networks – Common WSN Architecture – General sensor node – Energy Harvesting – Wireless underwater sensor network – Acoustic sensor network	6
	Oceanographic Instruments – Instruments and measured parameters –	

V	Oceanographic Instrumentation – Marine magnetometer – Submersible Incubation Device – Deep Ocean Tsunami Detection Buoy	6

Teaching Methods: Lecturing, PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOK

1. S.R. Vijayalakshmi & S. Muruganand, "Ocean Electronics", Overseas India Private Limited, 1st Edition. (Unit–I to V)

REFERENCE BOOK

1. V.Chander & P.R.S. Pillai, "Ocean Electronics", Allied Publishers Private Limited, 1st Edition.

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/114/105/114105002/
https://freevideolectures.com/subject/ocean-engineering/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	S	S
CO3	S	M	S	M
CO4	S	S	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
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Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
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Course Code:	20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	Course Title						Batch:	2020-2021 & Onwards
		VAC: Artificial Intelligence using Raspberry Pi						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVE

1. To recall the programming concepts of Artificial Intelligence
2. To get thorough knowledge in understanding of Raspberry Pi.
3. Can able to determine the features of Raspberry Pi
4. To design and implement various applications.
5. Can able to evaluate machine learning algorithm.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the concept of artificial Intelligence	K1
CO2	Describe neural networks used in Raspberry Pi	K2
CO3	Classify the features of Office database used in animal identification	K3
CO4	Design and examine various algorithms used in machine learning	K4
CO5	Evaluate Hopfield network used in realtime applications	K5

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

20PHPV01 / 20PHPV02 / 20PHPV03 / 20PHPV04	VAC: Artificial Intelligence using Raspberry Pi	Sem: I / II / III / IV
Unit No.	**Topics**	**Hours**
I	AI Historical Origins –Intelligence - Strong AI vs. Weak AI, Broad AI vs. Narrow AI - Reasoning -AI Categories - AI and Big Data.	6
II	Boolean Algebra -Expert Systems -Raspberry Pi Configuration - Installing Prolog on a Raspberry Pi -Introduction to Fuzzy Logic -Problem Solving - Machine Learning -Neural Networks -Evolutionary Computing.	6

III	Office Database - Animal Identification - tic-tac-toe - Cold or Flu Diagnosis - Expert System with Raspberry Pi GPIO Control : Installing PySWIP - Hardware Setup -Rpi.GPIO Setup - Expert System with LED Control.	**6**
IV	Machine Learning: -Demo: Color Selection –Algorithm -Roulette Wheel Algorithm -Demo: Autonomous Robot: Autonomous Algorithm -Test Run - Additional Learning.	**6**
V	Hopfield Network –Demo: Numerical Figure Recognition Demonstration - Autonomous Robot Car Using ANN -Python Control Script for the Obstacle-Avoiding -Robot Car -Light-Seeking Robot.	**6**

Teaching methods: Power Point Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. Beginning Artificial Intelligence with the Raspberry Pi, Authors, Donald J. Norris, Barrington,New Hampshire, USA ISBN-13 (pbk): 978-1-4842-2742-8,Apress. *(Unit–I to V)*

REFERENCE BOOKS

1. Francis X. Govers , "Artificial Intelligence for Robotics: Build intelligent", First Edition, 2018.
2. Russell, "Artificial Intelligence: A Modern Approach", Pearson Education, Third Edition, 2015.

WEB RESOURCES

Web Link: https://www.raspberrypi.org/raspberry-pi-store/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	M	S
CO4	M	M	S	S

S-Strong, M- Medium, L- Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mr. N. Suresh)	Dr. V. Balaprakash	
Name & Signature of the Staff	Name & Signature	Name & Signature

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Coimbatore-641 028.

Coordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
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