DHANALAKSHMI SRINIVASAN
COLLEGE OF ARTS &SCIENCE FOR WOMEN (AUTONOMOUS)
(Nationally **Reaccredited with "A++"Grade by NAAC)**
Affliated to Bharathidasan University, Tiruchirappalli
PERAMBALUR

M.Sc., PHYSICS CURRICULUM STRUCTURE

Choice Based Credit System - Learning Outcomes Based Curriculum Framework (CBCS - LOCF)
(Applicable to the candidates admitted from the Academic year 2024 - 2025 onwards)

SEMESTER	COURSE	COURSE TITLE	COURSE CODE	INSTRUCTION PERIOD PER WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
							INTERNAL	EXTERNAL	
SEM I	Core Course- I	Mathematical Physics	24PPH1C1	6	6	3	25	75	100
	Core Course -II	Classical Mechanics and Special Theory of Relativity	24PPH1C2	5	5	3	25	75	100
	Core Course-III	Special Electronics	24PPH1C3	5	5	3	25	75	100
	Core Practical-I	Physics Practical-I (General Practicals)	24PPH1C1P	6	3	4	40	60	100
	Core Elective Course-I	Numerical Methods & Programming in C++	24PPH1E1A	5	3	3	25	75	100
		Electronic Devices and Circuits	24PPH1E1B						
	Value Added Course - I	Material Science	24PPH1VAC	3	2	3	25	75	100
				30	**24**		**-**	**-**	**600**
SEM II	Core Course-IV	Quantum Mechanics	24PPH2C4	5	5	3	25	75	100
	Core Course-V	Atomic and Molecular Physics	24PPH2C5	5	5	3	25	75	100
	Core Course-VI	Thermodynamics and Statistical Physics	24PPH2C6	4	4	3	25	75	100
	Core Course-VII	Advanced Optics	24PPH2C7	4	4	3	25	75	100
	Core Practical-II	Physics Practical-II (Microprocessor and C Programming	24PPH2C2P	6	3	4	40	60	100
	Industrial Based Course	Laser Physics	24PPH2I	3	3	3	25	75	100
	Non Major Elective - I	Physics in Every Day Life	24PPH2N1A	3	2	3	25	75	100

		Environmental Pollution : Physical Aspects	24PPH2N1B						
	Self - Paced Learning I - Online Course				2*				
				30	**26**		**-**	**-**	**700**
SEM III	Core Course-VIII	Electromagnetic Theory	24PPH3C8	6	6	3	25	75	100
	Core Course - IX	Solid State Physics	24PPH3C9	5	5	3	25	75	100
	Core Course-X	Crystal Growth and Thin Film Physics	24PPH3C10	5	5	3	25	75	100
	Core Practical-III	Physics Practical-III (Advanced Electronics)	24PPH3C3P	6	3	4	40	60	100
	Core Elective Course-II	Microprocessor and Communication Electronics	24PPH3E2A	5	3	3	25	75	100
		Fiber Optic Communication	24PH3E2B						
	Non Major Elective - II	Renewable energy technologies	24PPH3N2A	3	2	3	25	75	100
		Solar energy and itsutilization	24PPH3N2B						
	Internship/Field Study/Industrial Visit		24P3IV		1				100*
	Self - Paced Learning II - Online Course				2*				
				30	**25**		**-**	**-**	**600**
SEM IV	Core Courese-XI	Nuclear and Particle Physics	24PPH4C11	6	6	3	25	75	100
	Core Elective Course-III	Nanoscience and Nanomaterial	24PPH4E3A	6	3	3	25	75	100
		Medical Physics	24PPH4E3B						
	Project Work	Project Work	24PPH4PW	18	6		40	60	100
				30	**15**		**-**	**-**	**300**
TOTAL				**120**	**90**				**2200**
EXTRA CREDIT COURSE				**90(4)***					**2200**

CORE COURSE-I
MATHEMETICAL PHYSICS

Semester	Course code	Title of the course	Hours	Credits
I	24PPH1C1	CC-1:MATHEMETICAL PHYSICS	6	6

Objective:

- To understand various mathematical techniques and concepts and to apply the techniques to solve Physics problems.

UNIT - 1: VECTOR ANALYSIS AND MATRIX THEORY (17 pds)

Vector Analysis: Linear dependence and independence of vectors - inner products - Schmitt's orthogonalization method – Gradient of a scalar field – Line, Surface and volume integrals – Divergence of a vector function – Gauss divergence theorem – Stoke's theorem - Green's theorem.

Matrix theory: Determinant and Matrices –Determination of Eigen values and Eigen functions – Orthogonal and Hermitian matrices - unitary matrices – diagonalization of matrices.

UNIT-II: Laplace Transforms (13pds)

Laplace transforms – Inverse transforms – Linearity and Shifting theorems – Laplace transform of derivative of a function – Laplace transform of integral of a function – *t*-shifting– Short impulses

UNIT-III: Special Functions I (15pds)

Beta, Gamma, Delta and Error functions – Bessel, Hermite, Legendre, Associated Legendre and Laguerre functions – Generating functions – Recurrence relations – Applications in physics– Series Solutions: Frobenius method and second solutions.

UNIT -IV: Special Functions II (15pds)

Hermite polynomials - Generating function - Orthogonality properties - Recurrence relations – Laguerre polynomials - Associated Laguerre polynomial - Properties - The error function and related functions

UNIT-V: Fourier series and Fourier integrals (15pds)

Fourier series – Fourier's series for periodic functions – Half range series – Fourier cosine and sine series, Fourier integral theorem – Fourier cosine and Sine integrals.

BOOKS FOR STUDY:

1. H. K. Dass and R. Verma, Mathematical Physics (S. Chand, New Delhi, 2022)
2. Sathya Prakash, Mathematical Physics with Classical Mechanics (S. Chand, New Delhi, 2021).
3. N. Saran, S. D. Sharma and T. N. Trivedi, Special Functions (Pragati Prakashan, Meerut, 2021).

BOOKS FOR REFERENCE:

1. D. G. Zill and M. R. Cullen, Advanced Engineering Mathematics (Narosa, New Delhi, 2020).
2. M. P. Deisenroth, A. A. Faisal and C. S. Ong, Mathematics for Machine Learning (Cambridge University Press, Cambridge, 2020).
3. C. Hurley and J. Mclean, Wavelet Analysis and Methods (Ed-Tech Press, London, 2018).

WEBLINK:

1. https://nptel.ac.in/courses/115103036
2. http://www.issp.ac.ru/ebooks/books/open/Mathematical%20Methods.pdf

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Acquire the essential mathematical skills to solve problems in various branches of physics.	**K4**
CO2	Understand the usefulness of vector integration theorems and their utility in solving physics problems arising in electromagnetic theory and other branches of physics.	**K4**
CO3	Know the usefulness of matrices and matrix operations in solving physics and engineering problems.	**K3**
CO4	Attain sound knowledge of special functions and their applications in quantum physics.	**K4**
CO5	Solve various kinds of Fourier series and Fourier Integrals that model a variety of natural system.	**K5**

Relationship matrix for Course outcomes, Programme outcomes/ Programme specific outcomes

Mapping with Programme Outcomes:

Semester	Course code	Title of the Course								Hours	Credits
I	24PPH1C1	CC-I: MATHEMETICAL PHYSICS								6	6
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	2	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	3	2	2	3	3	2	3	2	3	2.5
CO-4	3	3	2	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE COURSE- II
CLASSICAL MECHANICS AND SPECIAL THEORY OF RELATIVITY

Semester	Course code	Title of the course	Hours	Credits
I	24PPH1C2	CC-II: CLASSICAL MECHANICS AND SPECIAL THEORY OF RELATIVITY	5	5

Objective:

- To understand the fundamental principles of classical mechanics and their applications

UNIT- 1: Survey of the Elementary Principles (15 pds.)

Mechanics of a particle and system of particles - Constraints - Generalized coordinates - D' Alembert's principle and Lagrange's equation – Variation principle of Lagrange's equation - Simple application of the Lagrangian formulation - Motion of one particle - Atwood's machine – Particle rolling down an inclined plane.

UNIT -II: Canonical Transformations: (15 pds.)

The equation of canonical transformation - examples of Canonical Transformations - Liouville's theorem - Harmonic Oscillator - Hamilton-Jacobi equation for Hamilton's principle function - Action-angles variable in systems of one degree of freedom - Kepler's problem inverse square law of force.

UNIT-III: Hamiltonian Formulation: (15 pds.)

Hamilton's principle - Lagrange's equation of motion from Hamilton's principle – Cyclic coordinates and conservation theorems - Routh's procedure and oscillations about steady motion - - Poisson brackets and other canonical invariant's - Applications: Linear harmonic oscillator and projectile in space - Angular momentum Poisson brackets relation.

UNIT IV: Kinematics of Rigid body: (15 pds.)

Rigid body motion - The independent coordinates of a rigid body – Degrees of freedom - Orthogonal transformations –Euler's angles - Euler's theorem on the motion of a rigid body – Finite rotations – Infinitesimal rotations – Coriolis force - Motion of a symmetrical top under the action of gravity -Precession and notation.

UNIT V: Small Oscillations and special relativity (15 pds.)

Small oscillations, normal modes - Inertial and non-inertial reference frames - The Eigen value equation the principal axis transformation - frequencies of free vibrations and normal coordinates - free vibrations of a linear tri atomic molecule and some macroscopic applications – double pendulum -Special theory of relativity- Galilean & Lorentz transformation - Pseudo forces - Invariance of Maxwell's equations under Lorentz transformation

BOOKS FOR STUDY:

1. H. Goldstein, C. P. Poole and J. Safko, Classical Mechanics (Pearson, New Delhi, 2011).
2. G. Aruldhas, Classical Mechanics (Prentice Hall of India, New Delhi, 2015).
3. B. D. Gupta and Satya Prakash, Classical Mechanics (Kedar Nath Ram Nath, Meerut, 2020)

BOOK FOR REFERENCE:

1. N. Rana and P. Joag, Classical Mechanics (McGraw Hill, New Delhi, 2017).
2. H. V. Sharma, S. L. Gupta and V. Kumar, Classical Mechanics (Pragati Prakashan, New Delhi, 2019).
3. K. Prathapan, Analytical Problems in Classical Mechanics: Complete Solutions (Dreamtech, New Delhi, 2019).
4. R. G. Takwale and P. S. Puranik, Introduction to Classical Mechanics (McGraw Hill, New Delhi, 2017).

WEBLINK:

1. https://ocw.mit.edu/courses/8-09-classical-mechanics-iii-fall-2014/pages/lecture-notes/
2. https://nptel.ac.in/courses/115105098**COURSE OUTCOME**

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand reformulation of classical mechanics.	**K5**
CO2	Learn about change of canonical co-ordinates in the form of Hamiltonian's equations.	**K4**
CO3	Acquire knowledge the equation of motion of system in any set of coordinates.	**K4**
CO4	Learn about Kinematics of Rigid body	**K4**
CO5	Understand the Small Oscillations and special relativity.	**K5**

Relationship matrix for Course outcomes, Programme outcomes/ Programme specific outcomes

Mapping with Programme Outcomes:

Semester	Course code	Title of the Course					Hours	Credits			
I	24PPH1C2	CC-II: CLASSICAL MECHANICS AND SPECIAL THEORY OF RELATIVITY					5	5			
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	2	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	3	2	2	3	3	2	3	2	3	2.5
CO-4	3	3	2	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE COURSE – III
SPECIAL ELECTRONICS

Semester	Course code	Title of the course	Hours	Credits
I	**24PPH1C3**	**CC-III: SPECIAL ELECTRONICS**	**5**	**5**

- **Objective:**

- To understand various techniques and concepts in Electronics, apply these techniques in practical circuits to develop the skill in handling instruments.

UNIT I: Operational Amplifiers: (15 pds.)

Basics of differential amplifiers-Characteristics of ideal and practical op-amps-Applications; inverting, non-inverting, Summing, difference, integrating, differentiating amplifiers- Signal processing circuits; precision rectifiers, clipper, clamper, Signal generators: triangular and square wave generators, phase shift and Wien bridge oscillator using op-amps.

UNITII: Applications of Operational Amplifier & 555 timer (15 pds.)

Comparator - Phase shifter oscillator -Schmitt trigger -Astable multivibrator [squarewave generator] - Monostable Multivibrator [single shot] - Solving simultaneous equations-Solvingdifferentialequations-555timer internal structure - 555 timer as Astable and Monostable Multivibrators.

UNIT III: Digital Circuits: (15 pds.)

Adders, subtractors, Multiplexer-De-multiplexer, decoder and encoders -Shift registers: Serial-in serial-out, Serial-in parallel-out and Parallel-in serial-out shift registers, Counters: synchronous, asynchronous, Ring and up/down (using mod 10) counters.

UNIT IV: DAC, ADC and Timer Circuits: (15 pds.)

DAC and ADC -Introduction, Digital to analog converters-Weighted Resistor DAC – R-2R ladder DAC –Specifications for D/A converters. Sample and hold circuit, Analog to Digital converters. Timing circuits- Introduction, Applications of logic gates in timing circuits.

UNIT V: Opto-Electronics: (15 pds.)

Radiative and nonradiative transition, Light dependent resistor (LDR), Photodiodes, phototransistors, Photovoltaic (Solar) cell Materials, construction and operation of LED, Diode-laser; Ruby laser, Helium laser.

Books for study:

1. John Douglas Ryder, Electronic fundamentals and applications, 5th edition, Prentice - Hall (1976)
2. Mehta V.K., Principles of Electronics, S. Chand & Co., New Delhi (2007).
3. Donald P. Leach, Albert Paul Malvino Digital principles and applications, (McGraw Hill New Delhi 2006)
4. David A. Bell, Electronic devices and circuits, 3rd edn, Prentice Hall of India, New Delhi1999.
5. V. Vjayendran, Introduction to Integrated Electronics Digital and Analog (S. Viswanathan Printers and Publishers, Chennai, 2014).
6. Ramakant and Gayakwad ,Opamp Principles and Linear Integrated circuits,6th Edition, Prentice Hall of India Pvt., Ltd., New Delhi (2002).

Books for reference:

1. Roy Choudhury, D and Shall Jain, Linear Integrated Circuits, Wiley Eastern Ltd., New Delhi, 2005.
2. Thomas L. Floyd and R.P. Jain, Digital Fundamentals, Eighth Edition, Pearson Education Pvt., Ltd., 2008
3. Theraja B.L., Basic electronics (Solid State), S. Chand & Co., Ltd, Ram Nagar, New Delhi (2000).
4. Millman J. and Halkias C.C., Electronic devices and circuits, McGraw Hill (2006).
5. Robert Boylestad and Louis Nashelsky, Electronic devices and circuit theory, Prentice Hall (2001).

WEBLINK:

1. https://www2.mvcc.edu/users/faculty/jfiore/OpAmps/OperationalAmplifiersAndLinearICs_3E.pdf
2. https://nptel.ac.in/courses/108102112
3. https://nptel.ac.in/courses/108105132

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basic principle and the underlying concepts of electronic devices.	**K5**
CO2	Gain a clear understanding of the operations of electronic circuits.	**K4**
CO3	Design and analyze electronic circuits.	**K5**
CO4	Learn the applications of the operational amplifier and IC 555 and demonstrate them in timer.	**K4**
CO5	Realize the digital circuits and communication circuits	**K4**

Relationship matrix for Course outcomes, Programme outcomes/ Programme specific outcomes

Mapping with Programme Outcomes:

Semester	Course code	Title of the Course					Hours	Credits
I	24PPH1C3	CC-III: SPECIAL ELECTRONICS					5	5
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	2	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	3	2	2	3	3	2	3	2	3	2.5
CO-4	3	3	2	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE PRACTICAL-I
PHYSICS PRACTICAL-I (GENERAL PRACTICALS)

Semester	Course code	Title of the course	Hours	Credits
I	**24PPH1CIP**	**CP-I: PHYSICS PRACTICAL-I (GENERAL PRACTICALS)**	**6**	**3**

Objective:

- Experimental determination of certain physical constants and properties and verification of characteristics its applications.

LIST OF EXPERIMENTS:

1. Study of Hall Effect in a semiconductor.
2. Spectrometer – Determination of Dispersive power of a prism.
3. Determination of q, n, σ by elliptical fringes method.
4. Determination of L of a coil by Anderson's method.
5. Spectrometer – Determination of Wavelength of Hg source using Grating.
6. Determination of q, n, σ by hyperbolic fringes method.
7. Spectrometer i– d curve
8. LASER Grating – Determination of wavelength of laser.
9. LASER Grating – Determination of size of the microparticle.
10. Determination of e/m of an electron by Thomson's method.

BOOKS FOR REFERENCE:

1. Department of Physics, *Practical Physics*, (M.Sc Physics Main), St.Joseph's College, Tiruchirapalli 199

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Acquired knowledge about semiconductor	**K4**
CO2	Acquired knowledge about optics	**K5**
CO3	Acquired knowledge about electronics	**K4**
CO4	Acquired knowledge about electronics applications	**K4**
CO5	Acquired knowledge about construct the electronic circuit	**K4**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course					Hours	Credits			
I	24PPH1CIP	CP-I: PHYSICS PRACTICAL-I (GENERAL PRACTICALS)					6	3			
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	2	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	3	2	2	3	3	2	3	2	3	2.5
CO-4	3	3	2	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE ELECTIVE COURSE– I
NUMERICAL METHODS AND PROGRAMMING IN C++

Semester	Course code	Title of the course	Hours	Credits
I	24PPH1EIA	CEC-I: NUMERICAL METHODS AND PROGRAMMING IN C++	5	3

Objective:

- To understand different numerical methods and understand the different computational techniques for physics applications.

UNIT I: Curve fitting (15 pds.)

Curve fitting - Principle of lease squares - Fitting of polynomials -change of origin and scale for simplifying the calculations- Reduction of Non-linear to linear form. Plausible values - Errors and their types - Propagation of errors -Approximations and residuals

UNIT II: Numerical Solution of Algebraic Equation (15 pds.)

Numerical solution of algebraic and transcendental equations- The iteration method – The method of false position – Newton – Raphson method – Convergence and rate of convergence – C program for finding roots using Newton – Raphson method. Simultaneous linear algebraic equations - Gauss elimination method – Jordon's modification – Gauss – Seidel method of iteration.

UNIT III: Fundamentals of C++ Language (15 pds.)

Object Oriented Programming paradigm – Benefits of OOP - Applications of C++ - Structure of C++ program –Tokens: Keywords, Identifiers and Constants – Basic data types – User-defined data types – Scope resolution operator. Control structures: Decision making with simple if - if-else - nesting of if-else - switch - goto statement -Looping with while - do-while - for statements - break and continue statements-arrays -Library functions – User defined functions.

UNIT IV: Numerical integration (15 pds.)

Newton's forward and backward difference formula to compute derivatives – Numerical integration: the trapezoidal rule, Simpson's rule – Extended Simpson's rule – C program to evaluate integrals using Simpson's and trapezoidal rules.

UNIT V: Numerical solution and C++ Programme (15 pds.)

Numerical Solutions of ordinary differential equations - Nth order ordinary differential equations – Power series approximation – Point wise method – Solutions of Taylor series – Euler's method – Improved Euler's method – Runge-Kutta method – second and third order – Runge-Kutta method for solving first order differential equations - C program for solving ordinary differential equations using Runge-Kutta method.

BOOKS FOR STUDY

1. S.S. Sastry, Prentice ,Introductory Methods of Numerical analysis — Hall of India, New Delhi (2003) 3rd Edition.
2. Numerical Methods in Science and Engineering – The National Publishing Co. Madras (2001).
3. W.H. Press, B.P. Flannery, S.A. Teukolsky, W.T. Vetterling, Numerical Recipes in C, Cambridge University (1996).
4. S. Bjarne, The C++ Programming Language (Pearson, New Delhi, 2022).
5. E. Balagurusamy, Numerical Methods (McGraw Hill, Chennai, 2017).

BOOKS FOR REFERENCE :

1. K. B. Rajeev, Fundamentals of Numerical Methods (Narosa, New Delhi, 2018).
2. Veerarajan, Numerical Methods in C and C++, S.Chand, New Delhi (2006).
3. M. K. Jain Delhi,, S. R. K. Iyengar and R. K. Jain, Numerical Methods: Problems and Solutions (New Age International, New 2020).

WEBLINK:

1. https://nptel.ac.in/courses/122106033

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Learn about relationship between one or more predictors (independent variables) and a response variable (dependent variable), with the goal of defining a "best fit" model of the relationship.	**K5**
CO2	Acquire knowledge in two expressions formulated by applying to a set of variables the algebraic operations, namely, addition, subtraction, multiplication, division, rising to a power, and extraction of a root.	**K4**
CO3	Use C++ Language constructs for Numerical computation.	**K5**
CO4	Apply numerical methods to solve and visualize physical problems.	**K3**
CO5	Understand about calculate the numerical value of a definite integral.Acquire knowledge about method of writing programs.	**K4**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course					Hours	Credits
I	24PPH1CIP	CEC-I: NUMERICAL METHODS AND PROGRAMMING IN C++					5	3
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	1	3	2	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	3	2	1	3	3	2	3	2	3	2.5
CO-4	3	3	2	2	3	2	1	3	2	2	2.5
CO-5	3	3	1	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE ELECTIVE COURSE-I

ELECTRONIC DEVICES AND CIRCUITS

Semester	Course code	Title of the course	Hours	Credits
I	24PPH1E1B	CEC-I: ELECTRONIC DEVICES AND CIRCUITS	5	3

Objective:

- To understand the fundamentals of the electronic devices and their circuits.

UNIT I: Semiconductor Diodes: (15 pds.)

Introduction for junction diode- p-n junction diode, characteristics &Energy band diagram-V-I characteristics –Diode equivalent circuits - - Diode logic circuits and diode clipper circuits. Zener Diode: VI characteristics - Breakdown mechanism - Zener diode as a voltage regulator

UNIT II: Transistor Characteristics: (15 pds.)

PNP and NPN transistor & their operation- characteristics of BJT, common-base configuration, input and output characteristics, h parameter, common-emitter configuration, output characteristics, Common-collector configuration.

UNIT III: Transistor- low frequencies & Biasing and Stabilization: (15 pds.)

Two-port analysis of a transistor, -definition of h-parameters- Thevenin's and Norton's theorems and corollaries - Emitter follower, Linear analysis of a Transistor circuit, Miller' theorem and its dual, Simplified hybrid models of CE.

UNIT IV: Field Effect Transistor: (15 pds.)

Field effect transistor (FET): Classification of various types of FETs, constructional details of junction field-effect transistor, drain characteristics of JFET, biasing of JFET, operating regions, pinch-off voltage, idea of metal-oxide-semiconductor transistor (MOS transistor).

UNIT V: Amplifiers: (15 pds.)

Integrated circuit operational amplifiers- biasing operational amplifier-op- amp circuit band width and rise time, -differential amplifier

BOOKS FOR STUDY:

1. J. Millman, C. Halkias and C. D. Parikh, Integrated Electronics: Analog and Digital Circuits and Systems(McGraw Hill, New Delhi, 2017).
2. S. L. Gupta and V. Kumar, Hand Book of Electronics (Pragati Prakashan, Meerut, 2013).
3. S. Salivahanan, N. S. Kumar and A. Vallavaraj, Electronic Devices and Circuits (McGraw Hill, New Delhi, 2016).

Books for reference :

1. K. L. Kishore, Electronic Devices and Circuits (BS Publisher, Hyderabad, 2016). A. K. Maini and V. Agarwal, Electronic Devices and Circuits (Wiley, New Delhi, 2009).
2. B. V. Rao and K. R. Rajeswari, Electronic Devices and Circuits (Pearson, New Delhi, 2007).
3. G. S. N. Raju, Electronic Devices and Circuits (I.K. International Publications, New Delhi, 2008).

WEBLINK:

1. https://nptel.ac.in/courses/108108112
2. https://archive.org/download/ElectronicDevicesAndCircuitTheory/Electronic%20Devices%20and%20Circuit%20Theory.pdf

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Know the VI characteristics of semiconductor diodes in detail.	**K5**
CO2	Acknowledge the operation and characteristics of particular electronics devices with a specific purpose.	**K4**
CO3	Comprehend the characteristics, operation and stability of transistor.	**K5**
CO4	Understand the construction and operation of FET & UJT.	**K3**
CO5	Appreciate the small signal amplifier at low frequency.	**K4**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course					Hours	Credits			
I	24PPH1E1B	CEC-I: ELECTRONIC DEVICES AND CIRCUITS					5	3			
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	1	3	2	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	3	2	1	3	3	2	3	2	3	2.5
CO-4	3	3	2	2	3	2	1	3	2	2	2.5
CO-5	3	3	1	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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VALUE ADDED COURSE-I

MATERIAL SCIENCE

Semester	Course code	Title of the course	Hours	Credits
I	**24PPH1VAC**	**VAC-I MATERIAL SCIENCE**	**3**	**2**

UNIT I: Material science:

Properties of engineering materials – selection of materials for engineering applications- Haber cycle - Intermolecular bonds - Dispersion Bonds - Hydrogen bonds-Ion_Ion Interaction – Dipole _ Dipole Interaction.

UNIT II: Magnetic Materials:

Different types of Magnetic Materials – Diamagnetism and paramagnetism- Ferromagnetism – Domain theory of ferromagnetism – Hard and soft magnetic materials- temperature and frequency effects – electric breakdown

UNIT III: Modern Engineering Materials:

Polymer-ceramics-super strong Materials- cermets-High temperature materials- thermo electric materials – Electrets – Nuclear Engineering Materials- Aerogel materials – Meta materials and its Applications

Unit IV : New Materials

Metallic glasses – Fiber reinforced plastics – Metal matrix composites – Optical Materials– Materials for optical sources and detectors– Fiber Optic materials and their applications.

Unit V Magnetic Properties of Material

Magnetic permeabiliity - Magnetization - Diamagnetism - Classical theory of diamagnetism (Langevin theory) - Weiss theory of Paramagnetism - Paramagnetic susceptibility of solid substance - Terminology and classification.

BOOKS FOR STUDY:

1. Materials science- M Arumugam, Anuradha agencies
Reference Books
2. Materials Science and Engineering - V. Raghavan, Prentice Hall of India.

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basic Properties of engineering materials	**K5**
CO2	selection of materials for engineering applications	**K4**
CO3	Design and analyze the new materials	**K5**
CO4	Learn the applications of the modern Engineering Materials	**K4**
CO5	Learn and Realize the Magnetic Properties of material	**K4**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course							Hours	Credits
I	24PPHIVAC	VAC-I MATERIAL SCIENCE							3	2
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)				Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	1	3	2	3	1	3	2	2.5
CO-2	3	1	3	3	2	3	1	3	3	2	2.5
CO-3	3	3	2	1	3	3	2	3	2	3	2.5
CO-4	3	3	2	1	3	1	1	3	2	1	2.5
CO-5	3	3	1	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE COURSE -IV
QUANTUM MECHANICS

Semester	Course code	Title of the course	Hours	Credits
II	**24PPH2C4**	**CC-IV QUANTUM MECHANICS**	**5**	**5**

Objective:

- To understand basic idea of Quantum Mechanics, Apply the angular momentum concept and to understand particles and necessary relativistic modification in particle behavior

UNIT I: Schrödinger Equation and General Formulation: (12 pds.)

Postulates and conditions of Quantum mechanics – Physical meaning and conditions on the wave function -Schrödinger Equation (Time Dependent and Time Independent) – Expectation values and Ehrenfest's theorem – Heisenberg Uncertainty conditions and Heisenberg relation application.

UNIT II: Exactly Solvable Systems: (18 pds.)

Linear harmonic Oscillator - Particle in a box- Rigid rotator – Hydrogen atom- Square well Potential- Eigen function by solving 3 dimension Schrödinger equation.

UNIT III: Approximation methods: (15 pds.)

Time independent perturbation theory: Non-degenerate energy levels — Ground state of Helium – degenerate levels (I^{st} and 2^{nd} Order) – WKB approximation – spin-orbit interaction- Hydrogen molecule.

Time dependent perturbation theory: Harmonic Perturbation–Transition probability – Fermi's Golden Rule.

UNIT IV: Scattering Theory and Angular Momentum: (15 pds.)

Scattering theory: Scattering cross section – Green's function approach -- Born Approximation– Partial wave analysis.

Angular momentum: Matrix representation of J – Pauli's spin matrices–spin½ and 1– addition of angular momenta – Clebsch Gorden (CG) coefficients (basic ideas only)

UNIT V: Relativistic Quantum Mechanics: (15 pds.)

Klein-Gordon equation for a free particle and in an electromagnetic field – Dirac equation for a free particle - Hilbert space – Schrödinger, Heisenberg and interaction pictures - Charge and current densities - Dirac matrices – Plane wave solution - Spin angular momentum – Spin-orbit coupling.

Books for study:

1. G. Aruldhas, Quantum Mechanics, (Prentice Hall of India, New Delhi, 2008).
2. Sathya Prakash, Advanced Quantum Mechanics (Kedar Nath Ram Nath, New Delhi,2014).
3. P. M. Mathews and K. Venkatesan, A Text Book of Quantum Mechanics (Tata McGraw Hill, New Delhi, 2010).
4. K. D. Krori, Principles of Non-Relativistic and Relativistic Quantum Mechanics (Prentice Hall of India, New Delhi, 2012).
5. Ajit Kumar, Fundamental of Quantum Mechanics (Cambridge University Press, Cambridge, 2018).
6. S. Rajasekar and R. Velusamy, Quantum Mechanics I: The Fundamentals (CRC Press, Boca Raton, 2022)

Books for study and Reference:

1. L.I. Schiff, Quantum Mechanics (Tata McGraw Hill, New Delhi, 2017).
2. V. Devanathan, Quantum Mechanics, Naroso Publishing House (2005)
4. V. K. Thankappan, Quantum Mechanics (Wiley-Eastern, New Delhi, 1985)
5. N. Zettili, Quantum Mechanics: Concepts and Application (Wiley, New Jersey,2022).

WEBLINK:
https://nptel.ac.in/courses/122106034

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the foundations of Quantum Mechanics.	**K5**
CO2	Develop skills to solve Schrödinger's equation with various potentials.	**K4**
CO3	Familiarize with the Dirac notations and operator algebra.	**K5**
CO4	Acquire knowledge about the theory of identical particle and spins.	**K4**
CO5	Learn quantum mechanical angular momentum theory.	**K4**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course					Hours	Credits
II	24PPH2C4	CC-IV QUANTUM MECHANICS					5	5
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	2	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	3	2	2	3	3	2	3	2	3	2.5
CO-4	3	3	2	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE COURSE -V
ATOMIC AND MOLECULAR PHYSICS

Semester	Course code	Title of the course	Hours	Credits
II	**24PPH2C5**	**CC-V ATOMIC AND MOLECULAR PHYSICS**	**5**	**5**

Objective:

- To understand the outgrowth of the structure, extra nuclear part of the atom and origin of the spectra.

UNIT I: Atomic Spectra and Hyperfine Structure (18Pds)

Hydrogen fine structure - Fine structure Alkali metals – intensity rules for fine structure doublets - Spinning electron and the vector atom model - coupling schemes – selection rules – Exchange symmetry of wave functions – Pauli's exclusion principle – Alkali type spectra.

UNIT II: Atoms in External Fields and Electromagnetic spectrum (18Pds)

Atoms in External Fields: Zeeman and Paschen - Back effect of one and two electron systems – Stark effect – Absorption or Emission of radiation - Natural line broadening - Doppler broadening – X-ray Spectra – Emission and absorption spectra of X-rays.

UNIT III: Quantum theory of valance (18Pds)

Molecular orbital method –MO treatment of hydrogen molecule- valance bond method-heitler London theory- hybrization(sp,sp2)

UNIT IV: Molecular symmetry (18Pds)

Symmetry operation - rotation about symmetry axis – symmetry elements –reducible & irreducible representation – the great orthogonality theorem- character table for c2v point group

UNIT V: Electronic spectra of di atomic molecules (18Pds)

Vibrational coarse structure – Vibrational analysis of band systems- Franckcondon principle – Rotational fine structure of electronic vibration spectra – Photo electron spectroscopy.

Books for Study:

1. C. N. Banwell, Fundamentals of Molecular Spectroscopy (McGraw Hill, NewYork, 1981).
2. B. P. Straughan and S. Walker, *Spectroscopy Vol.I.*(Chapman and Hall, New York, 1976).
3. R. P. Feynman et al. *The Feynman Lectures on Physics Vol. III.* (Narosa, NewDelhi, 1989).

Books for Reference:

1. A. K. Chandra, *Introductory Quantum Chemistry* (Tata McGraw Hill, New Delhi, 1989).
2. Pople, Schneiduer and Berstein, *High Resolution NMR* (McGraw Hill, New York).
3. ManasChanda, *Atomic Stucture and Chemical Bond* (Tata McGraw Hill, New Delhi, 1991)

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the hyperfine structure, coupling schemes and selection rules.	**K3**
CO2	Acquire the knowledge for Emission of radiation.	**K4**
CO3	Know the treatment of hydrogen molecule.	**K2**
CO4	Acquire the knowledge of symmetry elements and orthogonality theorem.	**K4**
CO5	Understand the rotational fine structure of electronic vibration.	**K3**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course								Hours	Credits
II	24PPH2C5	CC-V ATOMIC AND MOLECULAR PHYSICS								5	5
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	2	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	3	2	2	3	3	2	3	2	3	2.5
CO-4	3	3	2	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE COURSE -VI
THERMODYNAMICS AND STATISTICAL PHYSICS

Semester	Course code	Title of the course	Hours	Credits
II	24PPH2C6	CC-VI THERMODYNAMICS AND STATISTICAL PHYSICS	4	4

Objective:

• Thermodynamics deals with temperature variations in the systems, where as statistical mechanics theories to solve the system.

UNIT I: Thermodynamics (15 Pds)

Zeroth law of thermodynamics – Vanderwaal's equation of state Work- energy and first law of thermodynamics - entropy and second law of thermodynamics (no calculation) – Clausius Claypeyron's equation – Gibbs phase rule –Application- Principle of increase of entropy - Helmholtz free energy.

UNIT II: General Principles of statistics and Partition Function (15 Pds)

Phase space - Ensembles - Liouville's theorem - Definition of Micro Canonical, Canonical and Grand Canonical ensembles - Microstates and Macro states - Partition function and thermodynamics quantities- Canonical partition function - Maxwell Boltzmann distribution law (law only) - Gibb's Paradox.

UNIT III: Quantum Statistics: (15 Pds)

Basic concept of quantum mechanics - Quantum Statistics of identical particle - -Bose-Einstein statistics - Fermi-Dirac statistics –Maxwall – Boltzmann statistics - Bose-Einstein degeneracy and condensation – Black body radiation and Planck's radiation – Specific heat anomaly - Thermionic emission.

UNIT IV: Kinetic Theory of gas and Transport Theory (15 Pds)

Fundamental Assumption of Kinetic theory – Maxwell-Boltzmann law of distribution of velocity- Transport phenomena – Mean free path (no expression) – Brownian motion – Weidman Franz law - Application gases – Transport theory – Distribution Function – Boltzmann Transport equation.

UNIT V: Phase transitions and specific heats (15 Pds)

Phase transitions - first and second kind - critical exponent - Ising model - Bragg Williams Approximation - Dulong and Petit's law - Einstein's theory of the specific heat – Debye's theory of specific heat of a solid.

Books for study:1. B. K. Agarwal and M. Eisner, Statistical Mechanics (New Age International, New Delhi, 2020).

2. R. K. Pathria and P. D. Beale, Statistical Mechanics (Academic Press, Cambridge, 2021).

3. S. L. Kakani and C. Hemrajani, Statistical Mechanics (Viva Books Private Limited, New Delhi, 2017).

4. S. C. Garg, R. M. Bansal and C. K. Ghosh, Thermal Physics: Kinetic Theory, Thermodynamics and Statistical Mechanics (McGraw Hill, New Delhi, 2013)

Books for reference:

1. D. A. McQuarrie, Statistical Mechanics (Viva Books India, New Delhi, 2018).
2. F. Reif, Fundamentals of Statistical and Thermal Physics (Sarat Books, Kolkata, 2010).
3. A. Engel and C. V. D. Broeck, Statistical Mechanics of Learning (Cambridge University Press, Cambridge, 2001).
4. W. Greiner, L. Neise and H. Stocker, Thermodynamics and Statistical Mechanics (Springer, New York, 2001)

WEBLINK:

1. http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf
2. https://nptel.ac.in/courses/104103112

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Calculate the thermodynamical quantities, theoretically, using different methods.	**K4**
CO2	Construct partition function for a system in thermal equilibrium and calculate the corresponding thermodynamical quantities.	**K5**
CO3	Demonstrate the ensemble approach to different physical problems like Black body radiation	**K4**
CO4	Apply ensemble approach to solve classical and quantum thermodynamic systems.	**K5**
CO5	Explain Bose-Einstein condensation and its applications.	**K4**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course					Hours	Credits			
II	24PPH2C6	CC-VI THERMODYNAMICS AND STATISTICAL PHYSICS					4	4			
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	2	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	3	2	2	3	3	2	3	2	3	2.5
CO-4	3	3	2	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE COURSE -VII
ADVANCED OPTICS

Semester	Course code	Title of the course	Hours	Credits
II	**24PPH2C7**	**CC-VI ADVANCED OPTICS**	**4**	**4**

Objectives:

Upon learning this subject, the students will have been exposed to the fundamental principles behind the operation of various light sources as well as detectors.

UNIT I : Incoherent Source : (15 Pds)

Semiconductor – basics - direct and indirect bandgap semiconductors – light emitting diode (LED) - Internal and external quantum efficiency – LED characteristics – types of LEDs (Self-study).

UNIT II : Coherent Source : (15 Pds)

Lasers – basics –laser diode (LD) – internal and external quantum efficiency – laser modes (Self-study) – problems.

UNIT III : Detectors: (15 Pds)

Photodiode – quantum efficiency – responsivity – long-wavelength cut-off – p-i-n photodiode –avalanche photodiode (APD) – heterojunction photodiodes – separate absorption and multiplication (SAM) APD – superlattice APD (Self-study) – phototransistors (Self-study) – problems.

UNIT IV : Modulators : (15 Pds)

Introduction – optical polarization – birefringence – retardation plates (Self-study) – electro-optic modulator (EOM) - Pockels effect - Kerr effect – longitudinal and transverse EOMs - acousto-optic modulator (AOM) – Raman -Nath modulator – Bragg modulator – magneto optic modulator (MOM) (Self-study).

UNIT V : Fiber Optic Communication Systems: (15 Pds)

Optical fibers – basics – digital systems and analog systems – system architecture: point to point links – distribution networks – local area networks.

Book for Study

1. GovindP. Agrawal (Wiley), Fiber-Optic Communication Systems, (3rd Edition).
2. Palanisamy P.K., Semiconductor Physics and Opto electronics, Ed II Scitech

Publications. (2003).
3. R. P. Khare, Fiber Optics and Optoelectronics (Oxford University Press, Oxford, 2004).
3. Palanisamy P.K. Material Science Ed II Scitech (2003).

Books for Reference

1. Optics, 4th Edition, by Eugene Hecht (Addison-Wesley).
2. Djafar K.Mynbaev and Lowell L. Scheiner (Prentice-Hall), Fiber-Optic Communications Technology.
3. A. K. Maini, Lasers and Optoelectronics: Fundamentals, Devices and Applications (Wiley, New York,2013).

WEBLINK:

1. https://nptel.ac.in/courses/115102026

Course Out comes:

CO Number	CO Statement	Knowledge Level
CO1	Explain the working mechanism of various types of LEDs.	**K2**
CO2	Comprehend the basics of coherent light source (LD).	**K3**
CO3	Recall the working principles of various types of photo detectors.	**K4**
CO4	Design the various types of modulators.	**K4**
CO5	Apply the knowledge of various types of sources and detectors for designing a typical optical fiber communication system.	**K4**

MAPPING WITH PROGRAMME OUTCOMES

Semester	Course code	Title of the Course								Hours	Credits
II	24PPH2C7	CC-VII ADVANCED OPTICS								4	4
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	2	2.5
CO-2	2	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	3	2	2	3	3	2	3	2	3	2.5
CO-4	2	3	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	3	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE PRACTICAL - II

PHYSICS PRACTICAL-II (MICROPROCESSOR AND "C" PROGRAMMING)

Semester	Course code	Title of the course	Hours	Credits
II	24PPH2C2P	CP-II PHYSICS PRACTICAL-II (MICROPROCESSOR AND "C" PROGRAMMING)	6	3

Objective:

• To develop programming skills of microprocessor and C programming in Solving some mathematical problems and their applications.

LIST OF EXPERIMENTS :(ANY 10)

A. Microprocessor:

1. Finding the largest and smallest numbers in a data array.
2. Arranging a set of numbers in ascending and descending orders.
3. Study of multi byte decimal addition.
4. Study of multi byte decimal subtraction.
5. Study of seven segment display.
6. Traffic control system.
7. Digital clock.
8. Generation of square and sine waves using DAC 0800.
9. Control of stepper motor using microprocessor.

B. 'C' Programming

1. Roots of algebraic equations -- Newton-Raphson method.
2. Least-squares curve fitting – Straight-line fit.
3. Numerical integration – Composite Simpson's rules.
4. Numerical differentiation – Euler method.
5. Solution of simultaneous linear algebraic equations – Gauss elimination method.
6. Solution of simultaneous linear algebraic equations – Gauss-Seidal method.
7. Solution of ordinary differential equations – Runge-Kutta 2nd order method.

BOOKS FOR REFERENCE:

1. Department of Physics, *Practical Physics*, (M.Sc Physics Main), St.Joseph's College, Tiruchirapalli 1998.

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Describe the architecture and organization of microprocessor along with instruction set format.	**K5**
CO2	Describe modes and functional block diagram of 8086 along with pins and their functions.	**K4**
CO3	List and describe memory and addressing modes.	**K4**
CO4	List, describe and use different types of instructions, directives and interrupts.	**K5**
CO5	Develop assembly language programs using various programming tools.	**K4**

MAPPING WITH PROGRAM OUTCOMES

Semester	**Course code**		**Title of the Course**							**Hours**	**Credits**
II	**24PPH2C2P**		**CP-II PHYSICS PRACTICAL-II (MICROPROCESSOR AND "C" PROGRAMMING**							**6**	**3**
Couse outcomes	**Programme outcomes(POs)**					**Programme Specific Outcomes(PSOs)**					**Mean scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	2	2	3	3	2	3	2	3	2.5
CO-4	3	2	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	3	2	3	3	2	3	2.5
Mean overall score											**2.5(High)**

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INDUSTRIAL BASED COURSE
LASER PHYSICS

Semester	Course code	Title of the course	Hours	Credits
II	**24PPH2I**	**IBC - LASER PHYSICS**	**3**	**3**

Objective:

- To introduce the physical and engineering principles of laser operation and their applications.

UNIT I: Fundamentals of LASER **(6Pds)**

Interaction of radiation with matter - Spontaneous emission – Stimulated emission – Meta stable state – Population inversion – Pumping – Laser Characteristics

UNIT II: Production of LASER **(6Pds)**

Helium – Neon Laser – Ruby Laser – CO2 Laser – Semiconductor Laser – Neodymium [Nd] laser

UNIT III: Industrial Applications of LASER **(6Pds)**

Laser cutting – Welding – Drilling – Hologram – Recording and reconstruction of hologram – Holographic interferometry and application.

UNIT IV: Lasers in Medicine **(6Pds)**

Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment -clinical applications of laser – Laser safety fundamentals.

UNIT V: Lasers in Communication **(6Pds)**

Optic fiber communication – Total internal reflection – Block diagram of fiber optic communication system – Advantages of fiber optic communication.

BOOKS FOR STUDY:

1. N. Avadhanulu, An introduction to LASERS, S. Chand & Company,2001.

BOOKS FOR REFERENCES:

1. William T. Silfvast, Laser fundamentals, University Press, Published in South Asia by Foundation books, New Delhi, 1998.

2. K. Thyagarajan and A.K. Ghatak, LASER Theory and Application, Mc Millan, India Ltd, 1984.

Course outcome:

CO Number	CO Statement	Knowledge Level
CO1	Studied the LASERS are used in optical disk drives, laser printers, barcodes scanners, DNA sequencing instruments, fiber - optics.	**K2**
CO2	Studied the semiconducting chip manufacturing and free - space optical communication.	**K3**
CO3	LASER surgery and skin treatments, cutting and welding materials, military and law enforcement device.	**K3**
CO4	Studied the production of LASER in various method.	**K4**
CO5	Understood the diode lasers are the key components of any broadband communication system.	**K4**

MAPPING WITH PROGRAMME OUTCOMES

Semester	Course code	Title of the Course					Hours	Credits			
II	**24PPH2I**	**IBC LASER PHYSICS**					**3**	**3**			
Couse outcomes	**Programme outcomes(POs)**					**Programme Specific Outcomes(PSOs)**					**Mean scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	1	3	2	3	2	3	3	2.5
CO-2	3	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	1	2	3	3	2	3	2	3	2.5
CO-4	3	2	3	2	3	1	2	3	2	2	2.5
CO-5	3	3	2	3	3	2	3	3	1	3	2.5
Mean overall score											**2.5(High)**

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NON MAJOR ELECTIVE-I
PHYSICS IN EVERYDAY LIFE

Semester	Course code	Title of the course	Hours	Credits
II	24PPH2N1A	NME-I :PHYSICS IN EVERYDAY LIFE	3	2

Objective:

To understand the concepts connection in day today life as physics aspects.

UNIT I: Physics in Earth's Atmosphere (6Pds)

Sun, Earth's atmosphere as an ideal gas; Pressure, temperature and density, Pascal's Law and Archimedes' Principle, Coriolis acceleration and weather systems, Rayleigh scattering, Red sunset, Reflection, refraction and dispersion of light, Total internal reflection, Rainbow.

UNIT II: Physics in Human Body: (6Pds)

The eyes as an optical instrument, Vision defects, Rayleigh criterion and resolving power, Sound waves and hearing, Sound intensity, Decibel scale, and temperature control.

UNIT III: Physics in Sports: (6Pds)

The sweet spot, Dynamics of rotating objects, Running, Jumping and pole vaulting, Motion of a spinning ball, Continuity and Bernoulli equations, Banana shot: Magnus force, Turbulence anddrag.

UNIT IV: Physics in Technology: (6Pds)

Microwave ovens, Lorentz force, Global Positioning System, CCDs, Lasers, Displays, Optical recording, CD, DVD Player, Tape records, Electric motors, Hybrid car, Telescope, Microscope, Projector etc.

UNIT V: Physics in Digital Access Devices: (6Pds)

Digital computer - Internet access - Online ticket reservation - Functions and networks - Barcode Scanner and decoder - Electronic Fund Transfer -Automated Teller Machines (ATMs) - Set-Top boxes - Digital cable TV – Video on demand.

UNIT VI: Green Energy

Electricity as energy-Electromagnetic Induction-thermal power generation-Heat engine-nuclearpower-solar power-wind power-biofuels

TEXT BOOK:

1. University Physics by F. W. Sears, M. Zemansky, R. A. Freedman, and H. D. Young, Pearson Education

2. Fundamentals of Physics by D. Halliday, R. Resnick, J. Walker, John Wiley & Sons

Course outcome:

CO Number	CO Statement	Knowledge Level
CO1	Understood the Earth's atmosphere in physics aspects.	**K2**
CO2	Studied the properties of optics and sound as Physics in Human Body.	**K2**
CO3	Understood the basic physics in sports concept.	**K3**
CO4	Understood our everyday usage home appliance with concepts of physics.	**K3**
CO5	Studied the basic knowledge of Digital Access Devices.	**K4**

MAPPING WITH PROGRAMME OUTCOMES

Semester	Course code	Title of the Course					Hours	Credits			
II	**24PPH2N1A**	**NME-I PHYSICS IN EVERYDAY LIFE**					**3**	**3**			
Couse outcomes	**Programme outcomes(POs)**					**Programme Specific Outcomes(PSOs)**					**Mean scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	1	3	2	3	2	3	3	2.5
CO-2	2	2	3	3	1	3	2	3	3	2	2.5
CO-3	3	2	1	2	3	3	2	3	2	3	2.5
CO-4	2	2	3	2	3	1	2	3	2	2	2.5
CO-5	3	3	2	3	1	2	3	3	1	3	2.5
Mean overall score											**2.5(High)**

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NON-MAJOR ELECTIVE-I
ENVIRONMENTAL POLLUTION: PHYSICAL ASPECTS

Semester	Course code	Title of the course	Hours	Credits
II	24PPH2N1B	NME-I ENVIRONMENTAL POLLUTION: PHYSICAL ASPECTS	3	2

Objective:

This paper deals with different aspects of environmental contamination, which have adverse effects on human health.

UNIT 1: ENVIRONMENTAL POLLUTANTS (6Pds)

Definition of pollution; pollutants; classification of pollutants; solubility of pollutants (hydrophilic and lipophilic pollutants), organometallic compounds, acid mine drainage, causes of soil pollution and degradation; effect of soil pollution on environment, control strategies.

UNIT II: AIR POLLUTION (6Pds)

Ambient air quality: monitoring and standards (National Ambient Air Quality Standards of India); air quality index; sources and types of pollutants (primary and secondary); smog (case study); effects of different pollutants on human health (NOx, SOx, PM, CO, CO2, hydrocarbons and VOCs) and control measures; indoor air pollution: sources and effects on human health.

UNIT III: NOISE POLLUTION

Noise pollution: sources and permissible ambient noise levels; effect on communication, impacts on life forms and humans, control measures, Radioactive material and sources of radioactive pollution.

UNIT IV: FRESH WATER POLLUTION AND MARINE POLLUTION (6Pds)

Sources of surface and ground water pollution; water quality parameters and standards; organic waste and water pollution; eutrophication; COD, BOD, DO; Marine resources and their importance; sources of marine pollution; oil spill and its effects; coral reefs and their demise; coastal area management; existing challenges and management techniques.

UNIT V: POLLUTION CONTROL (6Pds)

Activated Sludge Process (ASP) – Trickling Filters – oxidation ponds, fluidized bed reactors, membrane bioreactor neutralization, ETP sludge management; digesters, up flow anaerobic sludge blanket reactor, fixed film reactors, sequencing batch reactors, hybrid reactors, bio scrubbers, bio trickling filters;

Text Books:

1. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2006. Environmental and Pollution Science. Elsevier Academic Press.

2. Purohit, S.S. & Ranjan, R. 2007. Ecology, Environment & Pollution. Agrobios Publications.

Reference Books:

1. Gurjar, B.R., Molina, L.T. & Ojha C.S.P. 2010. Air Pollution: Health and Environmental Impacts. CRC Press, Taylor & Francis.

2. Hester, R.E. & Harrison, R.M. 1998. Air Pollution and Health. The Royal Society of Chemistry, UK.

3. Park, K. 2015. Park's Textbook of Preventive and Social Medicine (23rd edition Banarsidas Bhanot Publishers.

4. Vesilind, P.J., Peirce, J.J., & Weiner R.F. 1990. Environmental Pollution andControl. Butterworth-Heinemann, USA.

Course outcome:

CO Number	CO Statement	Knowledge Level
CO1	Understood the conventional energy sources can cause several different types of pollution.	**K2**
CO2	Studied the most common ones are air pollution and noise pollution	**K3**
CO3	As results of Sources of surface and ground water pollution	**K3**
CO4	Studied the marine pollution, Marine resources and their importance	**K4**
CO5	Understood schemes of pollution control	**K4**

MAPPING WITH PROGRAMME OUTCOMES

Semester	Course code	Title of the Course	Hours	Credits
II	**24PPH2N1B**	**NME-I I ENVIRONMENTAL POLLUTION: PHYSICAL ASPECTS**	**3**	**3**

Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	1	3	2	3	2	3	3	2.5
CO-2	2	1	3	3	1	3	2	3	3	1	2.5
CO-3	3	2	1	2	3	3	2	1	2	3	2.5
CO-4	2	2	3	2	3	1	2	3	2	2	2.5
CO-5	3	3	2	3	1	2	3	3	1	3	2.5
Mean overall score											**2.5(High)**

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CORE COURSE- VIII
ELECTROMAGNETIC THEORY

Semester	Course code	Title of the course	Hours	Credits
III	24PPH3C8	CC-VIII ELECTROMAGNETIC THEORY	6	6

Objective:

- To learn the theory for the fields produced by stationary and moving charge and charged systems and propagation of electromagnetic fields.

UNITI: Electrostatics **(18Pds)**

Gauss's law- Gauss's law in differential form - Possion's equation and Laplace's equation, Application - Work and energy in electrostatics – Energy of a point charge distribution – Dielectrics – Induced dipoles – Gauss's Law in the presence of dielectrics.

UNIT II: Magneto statics (18Pds)

Current density – Ampere's law of force - Biot-Savart law - Ampere's circuital law – Force on current carrying conductors and charges - magnetic scalar and vector potential – multipole expansion of a current distribution – Magnetic dipole in a uniform field – magnetic induction – Boundary conditions – magnetic - Magnetization and Magnetization current – Magnetic intensity - magnetic susceptibility and permeability.

UNIT III: Dispersion (18Pds)

Normal and Anomalous dispersion – Dispersion in Gases – Experimental demonstration of Anomalous dispersion in gases- Solids and Liquids – Clasusius Mossotti relation – Lorentz formula – Scattering and scattering parameters.

UNIT IV: Maxwell's Equation and Electromagnetic Waves (18Pds)

Maxwell's equations – Poynting theorem - Wave equation in terms of scalar and vector potential – Transverse nature of electromagnetic wave- Conservation of energy and momentum - Continuity equation - Propagation of plane electromagnetic waves in (a) free space, (b) Isotropic and Anisotropic non- conducting medium and (c) conducting medium - Skin depth - Polarization of electromagnetic waves.

UNIT V: Relativistic electrodynamics (18Pds)

Microwave Generation and Waveguides Klystron, Magnetron -Travelling wave tube - Rectangular and cylindrical waveguides- TM mode – TE mode – TEM mode - Resonant cavities

Books for Study:

1. K.K. Chopra& G.C. Agarwal, Introduction to Electromagnetic theory, Kedar Nath Ram Nath and Co, Meerut, 2010).

2. SatyaPrakash,Electromagnetic theory & Electrodynamics, (KedarNath Ram Nath, 2016).

3. D. J. Griffith, Introduction to Electrodynamics (Pearson, New York, 2013)

4. Narayana Rao, Basic Electromagnetics with Application (Prentice Hall of India, New Delhi, 1997).

Books for Study and Reference:

1.S.P Puri, Classical electrodynamics, Tata McGraw- Hill Publishing CompanyLimited, NewDelhi, Second Edition,1997.
2. John David Jackson, Classical electrodynamics, John Wiley & Sons, Inc. Third Edition, 1999.
3. D. K. Cheng, Field and Wave Electromagnetics (Pearson, New Delhi, 2015).
4. W. Miah, Fundamentals of Electromagnetics (McGraw Hill, New York, 1980).
5. A. K. Saxena, Electromagnetic Theory and Applications (Narosa, New Delhi, 2013).

WEBLINK:

https://nptel.ac.in/courses/108104087

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Describe the fundamentals of electro and magnetostatics.	**K3**
CO2	Understand Maxwell's equations, and scalar and vector potentials.	**K3**
CO3	Acknowledge the applications of electromagnetic waves to reflection and refraction.	**K4**
CO4	Describe the application of dispersion and scattering of electromagnetic waves.	**K4**
CO5	Understand about wave guide.	**K3**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course								Hours	Credits
III	**24PPH3C8**	**CC-VIII ELECTROMAGNETIC THEORY**								**6**	**6**
Couse outcomes	**Programme outcomes(POs)**					**Programme Specific Outcomes(PSOs)**					**Mean scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	2	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	2	2	3	3	2	2	2	3	2.5
CO-4	2	2	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	2	2	3	3	2	3	2.5
Mean overall score											**2.5(High)**

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CORE COURSE-IX
SOLID STATE PHYSICS

Semester	Course code	Title of the course	Hours	Credits
III	**24PPH3C9**	**CC-IX SOLID STATE PHYSICS**	**5**	**5**

Objective:

- To study the understanding of the basic theoretical models of crystals and the properties of matter from a microscopic point of view
-

UNIT I: Crystal structure and lattice dynamics **(18Pds)**

Crystalline & Amphrous solids - Different features of crystals- Lattice and three dimensional lattice point- Crystal System, Bravias lattices - Indexing of directions and planes, notations, Inter-planar spacings and angles, co- ordination number, packing factors (SC, BCC, FCC) – Miller Indices - Reciprocal lattice & their properties - atomic scattering factor-extinction rules for BCC, FCC, NaCl and diamond structure

.

UNIT II: **Lattice vibration and semiconductor:** **(18Pds)**

Lattice vibrations for a linear mono atomic lattice - linear diatomic lattice. Brillouin zones – phonon momentum –inelastic scattering of neutrons by phonon- Qualitative Description of the Phonon Spectrum in Solids. Dulog and Petit's Law, Einstein and Debye theories of specific heat aof solids, T^3 law.

UNIT III: Dielectric properties: **(18Pds)**

Dielectric polarization - dielectric constant &Polarisability -Classius - Mossotti equation- dielectric constant of semiconductor – electronic Polarizability- ionic Polarizability - Normal and Anomalous Dispersion – Electrostriction &piezo electric effect.

UNIT IV: Magnetism: **(18Pds)**

Dia, Para, Ferri and ferromagnetic materials, Magnetic dipole moment- magnetic susceptibility-Langevin's theory of dia and para magnetism –. Anti-Ferro magnetism - molecular field theory of anti Ferro magnetism.

UNIT V: **Elementary band theory:** **(18Pds)**

Band gaps, conductors, Semiconductors and insulators, P and N type Semiconductors, conductivity of semiconductors, mobililty, Hall effect, Hall coefficient.

Superconductivity: Meissner effect- Type - I ,Type - II super conductors - London's theory - isotope effect - thermo dynamic effects - Dc and Ac Josephson effect – High temperature superconductivity.

BOOKS FOR STUDY:

1. N. Singh, Solid State Physics (Wiley India, New Delhi, 2021).
2. S. L. Kakani and A. Kakani, Materials Science (New Age International, New Delhi2016).
3. J. P. Srivastava, Elements of Solid State Physics (Prentice Hall of India, New Delhi2014).
4. Solid state Physics: Structure and properties of materials, Mohammad Abdul Wahab, 2nd edition, Alphascience International (2005).
5. Introduction to Solid state Physics, Charles Kittel, 7th edition, John Wiley & sons (2007)

6. Solid state Physics, Neil. W. Ashcroft, N. David Mermin, Harcourt Asia PTE Ltd, first reprint (2001).

BOOKS FOR REFERENCE:

1. C. Kittel, Introduction to Solid State Physics (Wiley, New Delhi, 2019).
2. M. A. Wahab, Numerical Problems in Solid State Physics (Narosa, New Delhi, 2019).
3. K. S. Thorne and R. D. Blandford, Modern Classical Physics (Princeton University Press, Princeton, 2018).

WEBLINK:

1. http://physics.bu.edu/~okctsui/PY543/3_notes_Crystals_2013.pdf
2. http://www.phys.nthu.edu.tw/~spin/course/106F-2/Chapter%203.pdf
3. https://nptel.ac.in/courses/115105099

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Ability to analysis the different types of crystals systems.	**K4**
CO2	Ability to analysis the vibration of atomic lattice	**K4**
CO3	Understand the basic properties of dielectrics	**K3**
CO4	Acquiring the knowledge of different types of magnetic properties	**K5**
CO5	Understand the basic knowledge of crystals and superconductors.	**K3**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course								Hours	Credits
III	**24PPH3C9**	**CC-IX SOLID STATE PHYSICS**								**5**	**5**
Couse outcomes	**Programme outcomes(POs)**					**Programme Specific Outcomes(PSOs)**					**Mean scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	2	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	2	2	3	3	2	2	2	3	2.5
CO-4	2	2	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	2	2	3	3	2	3	2.5
									Mean overall score		**2.5(High)**

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CORE COURSE – X
CRYSTAL GROWTH AND THIN FILM PHYSICS

Semester	Course code	Title of the course	Hours	Credits
III	24PPH3C10	CC-X CRYSTAL GROWTH AND THIN FILM PHYSICS	5	5

Objective:

- To understand the theoretical concepts involved in crystal growth and thin film and to learn the basic characterizing techniques of materials.

Unit 1: Nucleation and Growth (11Pds)

Importance of crystal growth – Classification of crystal growth methods –Nucleation – Different kinds of nucleation (homogeneous, Heterogeneous) – Classical theory of nucleation: Gibbs Thomson equations for vapour and solution - Kinetic theory of nucleation – Becker and Doring concept on nucleation rate – Energy of formation of a spherical nucleus .

Unit 2: Growth Techniques (18Pds)

Solution Growth Technique: Low temperature solution growth: Solution - Solubility and super solubility – Expression of super saturation – Miers T-C diagram - Constant temperature bath and crystallizer – Seed preparation and mounting - Slow cooling and solvent evaporation 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 gel method.

Unit 3: Melt Growth Techniques (16Pds)

Melt technique: Bridgman technique - Basic process – Various crucibles design - Thermal consideration –Vertical Bridgman technique –Crystal Pulling technique - Czochralski technique – Experimental arrangement – Growth process –Zone melting technique –Skull melting process –Verneuil Process

Unit 4: Thin Film Deposition Techniques (15Pds)

Thin Films – Introduction to Vacuum Technology - Deposition Techniques - Basics of vacuum – Physical Vapour Deposition (PVD) – Thermal evaporation –Electron beam evaporation – Pulsed Laser Ablation –Sputtering techniques - DC and RF sputtering – Ion plating Chemical methods –Chemical bath deposition – Spray pyrolysis – Spin coating – Dip coating – SILAR – Electro spinning –Hydrothermal – Sol - gel synthesis – Metal organic (Chemical vapour deposition). Applications of thin films: Thin films in photovoltaic technologies dye sensitised solar cells – Thin films in electronic devices – Chemical and mechanical applications

Unit 5: Characterization Technique (15Pds)

X – Ray Diffraction (XRD) – Powder and single crystal - Fourier transform Infrared analysis (FT-IR) – Elemental analysis – Elemental dispersive X-ray analysis (EDAX) - ScanningElectron Microscopy (SEM) – UV-Vis-NIR Spectrometer – Etching (Chemical) – Vickers Micro hardness –Dielectric studies – Second harmonic generation test.

Books for Study:

1. K. Ravichandran, K. Swaminathan, B. Sakthivel and A. T. Ravichandran, Introduction to Thin Films and Crystal Growth (Jazym Publications, Tiruchirappalli, 2019).

2. J.C. Brice, Crystal Growth Processes, John Wiley and Sons, New York (1986)

3. P. SanthanaRagavan and P. Ramasamy, Crystal Growth Processes and Methods, KRU Publications, Kumbakonam (2001)

4. D.Velmurugan elements of crystallography M.jpublications ,Chennai.

Books for Study and Reference :

1. A. Goswami, Thin Film Fundamentals, New Age International (P) Limited, New Delhi (1996)

2. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, CBS, Publishers and Distributors, New Delhi.

WEBLINK:

1. http://www.issp.ac.ru/ebooks/books/open/Modern_Aspects_of_Bulk_Crystal_and_Thin_Film_Preparation.pdf
2. https://onlinecourses.nptel.ac.in/noc20_mm19/preview

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the nucleation of crystal and thin film	**K3**
CO2	Acquire the knowledge of various types of growth technique.	**K4**
CO3	Know the different type melt growth technique.	**K4**
CO4	Acquire the knowledge of thin film deposition and Spray Pyrolysis.	**K6**
CO5	Understand the characterization technique for crystal and thin films.	**K4**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course					Hours	Credits			
III	24PPH3C10	CC-10:CRYSTAL GROWTH AND THIN FILM PHYSICS					5	5			
Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	2	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	2	2	3	3	2	2	2	3	2.5
CO-4	2	2	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	2	2	3	3	2	3	2.5
Mean overall score											2.5(High)

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CORE PRACTICAL - III
PHYSICS PRACTICAL-III (ADVANCED ELECTRONICS)

Semester	Course code	Title of the course	Hours	Credits
III	24PPH3C3P	CP-III PHYSICS PRACTICAL-III (ADVANCED ELECTRONICS)	6	3

OBJECTIVE:

- Verification of characteristics and applications of electronic components and devices.

LIST OF EXPERMENTS:

1. Construct the LDR circuit and verify the characteristics.
2. Construct the Digital to analog converter and verify the R-2R and weighted method
3. Construct the NAND/NOR gates using IC's and verify that can perform as a universality.
4. Study the Digital comparator using XOR and NAND gates
5. Construct the Four bit binary up and down counter using IC 7473
6. Construct the BCD to 7 segment display and verify the performance.
7. Study of RAM
8. Study of counter using IC 7490(0-9 and 00-99)
9. Construct the Voltage controlled oscillator using IC 555
10. Construct the Half adder and full adder circuit using NAND and NOR gate

BOOKS FOR REFERENCE:

1. Department of Physics, *Practical Physics*, (M.Sc Physics Main), St.Joseph's College, Tiruchirapalli 1998.

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Applying the number system and uses.	**K3**
CO2	Verified the truth table for universal gates.	**K4**
CO3	Applying the PN junction diode and verify its characteristics.	**K4**
CO4	Analyze the memory address.	**K4**
CO5	Analyze the digital electronics weight method.	**K4**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course								Hours	Credits
III	**24PPH3C3P**	**CP-III PHYSICS PRACTICAL-III (ADVANCED ELECTRONICS)**								**6**	**3**
Couse outcomes	**Programme outcomes(POs)**					**Programme Specific Outcomes(PSOs)**					**Mean scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	2	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	2	2	3	3	2	2	2	3	2.5
CO-4	2	2	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	2	2	3	3	2	3	2.5
Mean overall score											**2.5(High)**

Prepared by **Verified by**

CORE ELECTIVE COURSE-II

MICROPROCESSOR AND COMMUNICATION ELECTRONICS

Semester	Course code	Title of the course	Hours	Credits
III	24PPH3E2A	CEC-II : MICROPROCESSOR AND COMMUNICATION ELECTRONICS	5	3

Objective:

- To study the microprocessor, interfacing, digital transmission and satellite communication of the system.

UNIT I: Microprocessor Architecture and Instruction set: (15 pds.)

8085, 8086/8088 microprocessor architectures – Various registers – Central processing unit of micro computers – Timing and control unit – Instruction and data flow – System timings –Examples – Instruction set -- Data transfer group – Logical group – Branch group – Stack and I/O control instructions – Addressing modes.

UNIT II : Software Programs (8085 only): (15 pds.)

Addition – Subtraction – Multiplication – Division – BCD arithmetic – Searching an array of a given number – Choosing the biggest and smallest numbers from a list – Ascending and descending orders – Square root of a number – Time delay – Square wave generator.

UNIT III: Interfacing and I/O devices: (15 pds.)

Interfacing memory and devices -- I/O and Memory mapped I/O -- Type of interfacing devices --Data transfer schemes -- Programmed and DMA data transfer schemes – Programmable Peripheral Interface (8255A) -- 8253 Timer Interface -- DMA controller – Programmable Interrupt controller (8259) -- Programmable communication Interface (8251).

UNIT IV: Digital Transmission Systems & Modulation Techniques: (15 pds.)

Point-to-point links -- Line coding coherent optical fiber communications -- Definition and Classification coherent systems – Requirements on semiconductor lasers. Modulation – Demodulation – Principles of amplitude, frequency and phase modulations –Simple circuits for amplitude, frequency and phase modulation and demodulation – Pulse modulation.

UNIT V: Satellite Communications: (15 pds.)

Ground Station – Antenna, angle of elevation and transmission path – Height of geo station orbits -- Problems – Satellite works – Frequency allocation and polarization – Various blocks of equipment abroad the satellite – Transmit and receiver contour – Block diagram of network control station (NCS) interconnecting telephone traffic between remote stations

Book for study:

1. R. Goankar, Micropressor Architecture, Programming and Applications (Wiley Eastern, New Delhi, 1985).

2. B. Ram, Fundamentals of Microprocessors and Microcomputers (Dhanapet Rai & Sons, NewDelhi, 1995).

3. M. Schwarts, W. R. Bennet and S. Stein, Communication Systems and Techniques (McGrawHill, New Delhi).

Book for references:

1. G. Kennedy, Electronic Communication Systems (Tata McGraw Hill, New Delhi, 1995).

2. J. Millman and L. C. Halkias, Electronic Devices and Circuits (McGraw Hill, Singapore,1972).

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Acquire knowledge in data transmits, receives and interprets the data to operate device.	**K5**
CO2	Learn about functions of 8085 microprocessor.	**K4**
CO3	Understand about data into the system.	**K4**
CO4	Learn about time between two values.	**K5**
CO5	Learn about radio waves to send signals to the antennas on the earth.	**K4**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course	Hours	Credits
III	**24PPH3E2A**	**CEC-II : MICROPROCESSOR AND COMMUNICATION ELECTRONICS**	**5**	**3**

Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	2	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	2	2	3	3	2	2	2	3	2.5
CO-4	2	2	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	2	2	3	3	2	3	2.5
Mean overall score											**2.5(High)**

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CORE ELECTIVE COURSE-II

FIBER OPTIC COMMUNICATION

Semester	Course code	Title of the course	Hours	Credits
III	24PPH3E2B	CEC-II : FIBER OPTIC COMMUNICATION	5	3

Semester: III **Max.Marks: 75**
Course Code: 24PPH3E2B **Credit: 3**
Total Periods: 45 Periods **Exam Hours: 3 hrs**

Objective:

- To acquire knowledge about the principles of fiber optic communication and to learn the design of optical communications, power, noise and rise time.

UNIT I: Principle Of Fiber Optic Communication: (6 pds.)

Introduction -Advantages of optical fiber communication-Elementary fiber optic communication-Fiber bundles and cables-Fiber strength-fiber optical properties-Fiber characteristic term and fiber cutoff wave length-optical and electrical band width-special fiber optic cables.

UNIT-II: Optical Fiber Measurements: (6 pds.)

Introduction -Fiber attenuation measurements-Total fiber attenuation-Fiber absorption loss measurement-Fiber scattering loss measurement-Time domain measurement-Fiber numerical aperture measurements-outer diameter-core diameter-mode field diameter for single-mode fiber.

UNIT-III: Optical Detectors: (6 pds.)

Quantum efficiency – Responsively - PN photodiode - PIN photodiode - Avalanche photo diodes – phototransistors - photo conductive detectors.

UNIT-IV: Fiber Optical Communication System: (6 pds.)

Introduction-transmitter design-receiver design-link design-line codes for optical fiber links-wavelength division multiplexing (WDM)-Data buses –Local area network (LAN) system-Microwave technology applications of light wave system

UNIT-V: Economics, and potential applications of optical fiber communication system

(6 pds.)

Economics with fiber optic communication systems- prospects for fiber optic communication fiber optic applications-application of integrated optics –applications in photoreceptor optics.

BOOK FOR STUDY:

1. Optical fiber communication by John M Senior second edition.

2. Fiber optic communication byS.Chand D.C Agarwal

BOOKS FOR REFERENCE:

1. Fiber-Optic Communications Technology, by Djafar K.Mynbaev and Lowell L. Scheiner (Prentice-Hall).
2. Fiber Optic Communications, 4th Edition, by Joseph C. Palais(Prentice Hall).

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Acquire knowledge in reflection of light ray.	**K3**
CO2	Learn about transmission of light between two ends of fiber.	**K4**
CO3	Understand about conversion of light photons into current.	**K5**
CO4	Understand about information transmits from one place to another through an optical fiber.	**K4**
CO5	Learn about internet communication and cable television signals.	**K5**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course	Hours	Credits
III	**24PPH3E2B**	**CEC-II : FIBER OPTIC COMMUNICATION**	**5**	**3**

Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	2	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	2	2	3	3	2	2	2	3	2.5
CO-4	2	2	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	2	2	3	3	2	3	2.5
Mean overall score											**2.5(High)**

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NON MAJOR ELECTIVE-II
RENEWABLE ENERGY TECHNOLOGIES

Semester	Course code	Title of the course	Hours	Credits
III	24PPH3N2A	NME-II RENEWABLE ENERGY TECHNOLOGIES	3	2

Unit – I: Basic drying technology (15Pds)

Drying – Definition - three states of water – heat requirements for vaporization – latent heat – specific heat – humidity – relative humidity – heat transfer in drying – mass transfer in drying - drying process - capillary and diffusion theory -dryer performance indices - heat utilization factor - coefficient of performance - efficiency.

Unit – II: Solar air heaters (15Pds)

Introduction – types of air heaters – performance of solar air heaters – applications of solar air heaters – testing of solar air heaters – Types of moisture: Bound moisture, Free moisture, equilibrium moisture content - water vapour and air – water content of crop - drying rate.

Unit – III: Drying of agricultural products (15Pds)

Solar drier – types of solar drier – advantages of solar drier over sun drying – Design procedure for solar based forced convention type driers – moisture content and its measurement – Types of moisture: Bound moisture, Free moisture, equilibrium moisture content - moisture removal- drying curve – constant rate period, falling rate period, Deep bed drying – water vapour and air – water content of crop - drying rate.

Unit – IV: Emerging trends in drying technology (15Pds)

Classification and selection of dryers - applications - properties of dried sample - physical, chemical and biological characteristics of dehydrated food - re-hydration ratio - size and density - shelf life - water activity - microbial stability of selected foods - novel drying techniques - hybrid dryers - energy and environment conservation.

UNIT – V: Measurement of solar insolation, humidity and moisture (15Pds)

Pyranometer -– Dry and wet bulb psychometrics – Hot wire electrode type hygrometer (anemometer) – Dew cell – Electrolysis type hygrometer – Commercial type dew point meter – different types of sensors (temperature, pressure, light intensity – vision, humidity).

Unit – VI: Temperature measurement and thermocouple (15Pds)

Definitions and standards - Resistance thermometer – Signal conditioning of industrial RTDs (Pt100) and their characteristics - 3 lead and 4 lead RTDs – Thermistors - Thermocouples - Laws of thermocouple – Fabrication of industrial thermocouples.

References:

1. Heat and Mass Transfer - Senthil, A R Publications, 2010.
2. Unit operations of Agricultural Processing - Sahay KM & Singh SS, Vikas Publishing house, 2004.
3. Solar crop drying - Sodha & Bansal, CRC Press, 1997.

COURSE OUTCOME

CO NUMBER	COSTATEMENT	KNOWLEDG ELEVEL
CO1	Understood the basic drying technology.	**K3**
CO2	To know about types, performance and testing of solar air heater.	**K3**
CO3	Understood the advantages of solar driers.	**K4**
CO4	To know the applications of driers.	**K4**
CO5	To know about the Temperature measurement and thermocouple.	**K3**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course	Hours	Credits
III	**24PPH3N2A**	**NME-II RENEWABLE ENERGY TECHNOLOGIES**	**3**	**2**

Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	1	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	1	2	1	3	1	2	2	3	2.5
CO-4	2	2	3	2	3	2	1	3	2	2	2.5
CO-5	3	3	2	3	1	2	3	3	2	3	2.5
									Mean overall score		**2.5(High)**

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NON MAJOR ELECTIVE-II
SOLAR ENERGY AND ITS UTILIZATION

Semester	Course code	Title of the course	Hours	Credits
III	24PPH3N2B	NME-II SOLAR ENERGY AND ITS UTILIZATION	3	2

Unit – I: Solar Energy Fundamentals (15Pds)

Introduction – conduction – convection – radiation – structure of sun – solar constant – electromagnetic energy spectrum – terms and definitions – solar radiation at earth's surface – solar radiation geometry – solar radiation measuring instruments – solar data - solar angles - day length - angle of incidence on tilted surface.

Unit – II: Solar Energy conversion system (15Pds)

Solar energy applications – essential subsystems in solar energy conversion system – solar energy chain – sun path diagram - shadow determination - extraterrestrial characteristics - analysis of Indian solar radiation data.

Unit – III: Solar collectors (15Pds)

Solar collectors: Concentrating collectors - Flat plate collector and evacuated tube collector – characteristic features of collector - selective surfaces - ideal coating characteristics – collector efficiency – types of energy storage system.

Unit – IV: Solar Heating and cooling systems (15Pds)

Liquid based solar heating system - natural, forced and gravity flow, mathematical, modelling - solar desiccant cooling - solar thermal storage - sensible storage - latent heat storage - thermo-chemical storage - solar still - solar cooker - solar pond - solar passive heating and cooling systems - Green house technology - Fundamentals - design - modelling and applications.

Unit – V: Solar PV technology (15Pds)

Solar cell physics - P-N junction: homo and hetero junctions, Metal-semiconductor interface - dark and illumination characteristics - figure of merits of solar cell - efficiency limits - variation of efficiency with band gap and temperature - efficiency measurements - high efficiency cells - Tandem structure.

Unit – VI: Solar PV applications (15Pds)

SPV applications - centralized and decentralized SPV systems - standalone - hybrid - grid connected system - system installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems - Government schemes and policies.

References:

1. Solar Energy Utilization – G.D. Rai - Khanna Publications
2. Solar Energy – SP Sukathme, Tata Mc Graw Hill, 2008
3. Solar Energy: Fundamentals & Applications - Garg HP & Prakash J - Tata Mc Graw Hill, New Delhi
4. Solar Thermal Engineering System - Tiwari GN, Narosa Publishing House
5. Solar Cells and their applications - Lary D Partin - John Wiley and Sons, New York 1995

Course outcome:

CO Number	CO Statement	Knowledge Level
CO1	Understood the Solar Energy Fundamentals.	**K2**
CO2	To know about Solar Heating and cooling systems.	**K3**
CO3	Understood the solar collector concept.	**K3**
CO4	Studied the types of energy storage system.	**K4**
CO5	Understood the applications.	**K4**

MAPPING WITH PROGRAMME OUTCOMES

Semester	Course code	Title of the Course					Hours	Credits			
III	**24PPH3N2B**	**NME-II: SOLAR ENERGY AND ITS UTILIZATION**					**3**	**2**			
Couse outcomes	**Programme outcomes(POs)**					**Programme Specific Outcomes(PSOs)**					**Mean scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	1	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	1	2	1	3	1	2	2	3	2.5
CO-4	1	2	3	2	3	2	1	3	2	2	2.5
CO-5	3	3	2	3	1	2	3	3	2	3	2.5
Mean overall score											**2.5(High)**

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CORE COURSE -XI
NUCLEAR AND PARTICLE PHYSICS

Semester	Course code	Title of the course	Hours	Credits
IV	24PPH4C11	CC-XI NUCLEAR AND PARTICLE PHYSICS	6	6

Objective:

- To study the understanding properties of nuclei and various types of Nuclear Reactions

UNIT I: General properties of Nuclei: (18Pds)

Nuclear mass and binding energy - size, spin, parity statistics, magnetic dipole moment and electric quadruple moments - Weizacker's semi-empirical mass – formula - Nuclear stability. Spin of the Nuclei. Theories of nuclear composition. (Proton- electron, Proton-Neutron).

UNIT II: Nuclear Models: (18Pds)

Nuclear Forces - General Characteristics of nuclear forces - ground state of Deuteron (simple theory) - The Meson theory of nuclear force -neutron - proton scattering at low energies (Scattering length, Phase shift)- spin dependence of n-p force. Nuclear models - Fermi gas model - The Liquid drop model -Shell model and Collective model (a) vibrational states, (b)rotational states. Magic Numbers.

UNIT III: Nuclear Reactions: (18Pds)

Nuclear Reactions -Types of nuclear reactions -conservation laws for nuclear reactions - The compound nucleus theory - nuclear reaction cross section -Partial wave analysis of Nuclear reaction- Resonance scattering - Breit-Wigner one level formula for scattering. –Optical model- Neutron Physics: Discovery of Neutrons - fundamental properties of Neutron.

UNIT IV: Nuclear Fission and Nuclear Fusions: (18Pds)

Nuclear Fission - Discovery of nuclear fission - energy release in fission - nature of the fission fragments - energy release in fission process - Bohr-Wheeler theory of nuclear fission, Neutron multiplication and fission chain reaction. Reactors -power reactors-Biological and other effect of nuclear radiations. Nuclear Fusion -Nuclear fusion and thermo nuclear reactions. Sources of energy of stars.

UNIT V: Elementary Particles: (18Pds)

Elementary Particles - Classification of elementary particles - fundamental interactions (Gravitational, electromagnetic, strong, week) -parameters of elementary particles - conservation laws and their validity - CPT theorem - properties of elementary particles - Anti nucleons, Anti proton, Gell Ma Okubuu formula for SU(3) multiples- Quarks Flavours and colours.

Books for Study:

1. Atomic and Nuclear Physics (Vol. II) - S.N. Ghoshal -S.Chand& Co, New Delhi -19970.

2. Elements of Nuclear Physics - M.L.Pandya& P.R.S. Yadav -KedarNath Ram Nath,Meerut - 1993.
3. Nuclear Physics-D.C.Tayal, Himalaya Publishing House, Bombay-(1995)
4. Nuclear Physics - R.R.Roy and B.P. Nigam - Wiley Eastern Ltd, New Delhi -1993.

Books for Reference:

1. Theoretical Nuclear Physics - John. M, Blatt and Victor F. Weisskopf- John Wiley & Sons. New York, London -1952.
2. Mesons and Fields (Vol. I) - S. S. Schwaber, H.A.Betha and F.de/ Hoffmann - Row and Peterson, New York -1956.
3. Basic Nuclear Physics— S.Srivastave - PragathiPraksan -Meerut.

WEBLINK:

1. https://nptel.ac.in/courses/115103101

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basic structure, properties of nucleus.	**K3**
CO2	Acquire the knowledge of various nuclear modules.	**K4**
CO3	Know the different type of nuclear reactions.	**K4**
CO4	Apply the knowledge of nuclear reactions for producing fission and Fusion energy.	**K3**
CO5	Understand symmetry properties & Quark model of elementary particles.	**K3**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course	Hours	Credits
IV	**24PPH4C11**	**CC-XI :NUCLEAR AND PARTICLE PHYSICS**	**6**	**6**

Couse outcomes	Programme outcomes(POs)					Programme Specific Outcomes(PSOs)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	2	2	3	3	2	3	2	3	3	2	2.5
CO-3	3	2	2	2	2	3	2	2	2	3	2.5
CO-4	2	2	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	2	2	3	3	2	3	2.5
									Mean overall score		**2.5(High)**

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CORE ELECTIVE COURSE – III
NANOSCIENCE AND NANOMATERIALS

Semester	Course code	Title of the course	Hours	Credits
IV	24PPH4E3A	CEC-III :NANOSCIENCE AND NANOMATERIALS	6	3

OBJECTIVE:

To learn the structure, properties, characterization and application of nanomaterials.

Unit I: Introduction to Nano and Types of Nanomaterials: (15 prds)

Need and origin of nano – nano and energetic – top-down and bottom-up approaches—introductory ideas of 1D, 2D and 3D nanostructured materials –quantum dots – quantum wire – quantum well – excition confinement in quantum dots.

Unit II: Carbon Nanostructures: (15 prds)

Carbon molecules and carbon bond –C60: Discovery and structure of C60 and its crystals – superconductivity in C60 -- carbon nanotubes: Fabrication – structure – electrical properties – vibrational properties – mechanical properties – applications (fuel cells, chemical sensors, catalysts).

Unit III: Fabrication of Nanomaterials: (15 prds)

Synthesis of oxide nanoparticles by sol-gel method – Electrochemicals deposition method Electrospinning method –lithography – atomic layer deposition –Langmuir – Blodgett films – zeolite cages – core shell structures – organic and inorganic hybrids.

Unit IV: Characterization of nanomaterials: (15 prds)

Principles, experimental set-up, procedure and utility of scanning electron microscopy (SEM), transmission electron microscopy (TEM), Scanning tunneling microscopy (STM) and scanning probe microscopy (SPM).

Unit V: Applications of nanomaterials: (15 prds.)

Molecular electronics and nanoelectronics – Nanorobots – biological Applications of nanoparticles – catalysis by gold nanoparticles – band-gap engineered quantum devices – Nanomechanics – CNT emiters –Photoelectrochemical cells – Photonic crystals – Plasmon waveguides.

Books for study:

1.T.Pradeep et al., A textbook of Nanoscience and nanotechnology (Tata McGraw Hill, New Delhi,2012).

2.R.W.Kelsall,I.W.Hamley and M. Geoghegan, Nanoscale science and nanotechnology (John-Wiley & Sons,Chichester,2005).

3.G.Cao,Nanostructures and Nanomaterials (Imperial College Press,London,2004).

4.C.P.Poole and F.J. Owens, Introduction to Nanotechnology (Wiley, New Delhi,2003).

Books for references:

1.H.S.Nalwa,Nanostructured materials and Nanotechnology (Academic Press,Sandiego,2002).

2.M.Wilson,K.Kannangara,G.Smith,M.Simmons,B.Raguse,Nanotechnology:Basic science and emerging technologies (Overseas Press, New Delhi,2005).

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basics of nanomaterials.	**K3**
CO2	Acquire the knowledge of carbon nano structure.	**K4**
CO3	Know the fabrication of different martials.	**K4**
CO4	Apply the knowledge of characterization of nanomaterials.	**K3**
CO5	Understand the applications of nanomaterials.	**K3**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course								Hours	Credits
IV	**24PPH4E3A**	**CEC-III :NANOSCIENCE AND NANOMATERIALS**								**6**	**3**
Couse outcomes	**Programme outcomes(POs)**					**Programme Specific Outcomes(PSOs)**					**Mean scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	2	2	3	3	2	3	2	3	1	2	2.5
CO-3	3	2	2	2	2	3	1	2	2	3	2.5
CO-4	2	2	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	2	3	2	2	3	3	2	3	2.5
Mean overall score											**2.5(High)**

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ELECTIVE COURSE – III
MEDICAL PHYSICS

Semester	Course code	Title of the course	Hours	Credits
IV	24PPH4E3B	CEC-III: MEDICAL PHYSICS	6	3

OBJECTIVE:

This paper provides abroad knowledge on the interaction of Non Ionizing radiation and ultra sound in tissues and their use in medicine.

UNITI: REVIEW OF NON-IONISING RADIATION PHYSICS IN MEDICINE(15 prds.)

Different sources of Non-Ionising radiation- their physical; properties-first law of photochemistry-Law of reciprocity- - Electrical Impedance and Biological Impedance - Principle and theory of thermography - applications.

UNITII: TISSUE OPTICS: (15 prds.)

Various types of optical radiations - UV, visible and IR sources - Lasers: Theory and mechanism- Laser Surgical Systems-Measurement of fluence from optical sources - Optical properties of tissues – theory and experimental techniques-interaction of laser radiation with tissues – photo thermal -photo chemical – photo ablation-electro mechanical effect

UNITIII: MEDI PHOTONICS: (15 prds.)

Lasers in dermatology, oncology and cell biology - Application of ultrafast pulsed lasers in medicine and biology - Lasers in blood flow measurement -- Fiber optics in medicine-microscopy in medicine -brief ringence-Fluore science microscope-confocal microscope-Hazards of lasers and their safety measures.

UNITIV: MEDICAL ULTRASOUND: (15 prds.)

Production, properties and propagation of ultrasonic waves – Bio acoustics-Acoustical characteristics of human body- Ultrasonic Dosimetry - Destructive and non destructive tests-Cavitation-Piezo electric receivers, thermo electric probe–Lithotropy-High power ultra sound in therapy.

UNITV: RADIO FREQUENCY AND MICROWAVE: (15 prds.)

Production and properties-interaction mechanism of RF and miroc waves with biological systems: Thermal and non-thermal effects on whole body, lens and cardio vascular systems-tissue characterization and Hyper thermia and other applications-Biomagnetism-Effects-applications.

OUTCOME:

Students will be able to use Laser, Ultra sound and microwaves for different diagnosis and Therapeutic applications

TEXTBOOKS:

1.S.S.MartellucciandA. N.Chester,Laser Photobiology and Photomedicine,PlenumPress,NewYork,1985.
2. MarkolfH .Neimz, Laser-Tissue Interactions, Springer Verlag, Germany,1996.

REFERENCES:

1.J. P. Woodcock, Ultrasonic, Medical Physics Handbook series 1, Adam Hilger,Bristol,2002.
2.J.R.Greening,Medical Physics,North HollandPublishingCo.,NewYork,1999.
3. R. Pratesi and C. A. Sacchi, Lasers in Photomedicine and Photobiology, Springer Verlag, WestGermany,1980.
4. Harry Moseley, Hospital Physicists' Association, Non-ionis ingradiation: microwaves, ultraviolet, and laser radiation, A. Hilger, in collaboration with the Hospital Physicists' Association,1988.

COURSE OUTCOME

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basic of non-ionizing radiation.	**K3**
CO2	Acquire the knowledge of tissue optics.	**K4**
CO3	Know the fundamentals of medi photonics.	**K4**
CO4	Apply the knowledge of medical ultrasound.	**K3**
CO5	Understand symmetry properties radio frequency & microwave.	**K3**

MAPPING WITH PROGRAM OUTCOMES

Semester	Course code	Title of the Course								Hours	Credits
IV	**24PPH4E3B**	**CEC-III MEDICAL PHYSICS**								**6**	**3**
Couse outcomes	**Programme outcomes(POs)**					**Programme Specific Outcomes(PSOs)**					**Mean scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	3	3	2	3	2	3	2	3	3	2.5
CO-2	2	2	3	3	2	3	2	3	2	2	2.5
CO-3	3	1	2	2	2	3	2	2	2	3	2.5
CO-4	2	2	3	2	3	2	2	3	2	2	2.5
CO-5	3	3	1	3	2	2	3	3	2	3	2.5
Mean overall score											**2.5(High)**

Prepared by **Verified**