M.Sc. Physics

SEM	Course Code	Course	Course Title	Ins.Hrs / Week	Credit	Marks		Total
						CIA	ESE	
I	20PPH1CC1	Core– I	Classical Dynamics and Relativity	6	5	25	75	100
	20PPH1CC2	Core – II	Mathematical Methods for Physicist	6	5	25	75	100
	20PPH1CC3	Core– III	Electronic Devices and Circuits	6	4	25	75	100
	20PPH1CC4P1	Core– IV	Advanced General Physics - I :Practicals	3	2	10	40	50
	20PPH1CC4P2		Advanced General Physics - II :Practicals	3	2	10	40	50
	20PPH1DE1	DSE – I #		6	4	25	75	100
			TOTAL	**30**	**22**			**500**
II	20PPH2CC5	Core– V	Advanced Mathematical Physics	6	5	25	75	100
	20PPH2CC6	Core– VI	Atomic and Molecular Spectroscopy	6	5	25	75	100
	20PPH2CC7	Core– VII	Electromagnetic Theory	6	4	25	75	100
	20PPH2CC8P1	Core– VIII	SolidStatePhysics :Practicals	3	2	10	40	50
	20PPH2CC8P2		Analog Electronics :Practicals	3	2	10	40	50
	20PPH2DE2	DSE – II #		6	4	25	75	100
			TOTAL	**30**	**22**			**500**
III	20PPH3CC9	Core– IX	Nuclear and Particle Physics	6	5	25	75	100
	20PPH3CC10	Core– X	Quantum Mechanics	6	5	25	75	100
	20PPH3CC11	Core– XI	Statistical Mechanics	6	4	25	75	100
	20PPH3CC12P1	Core– XII	Digital Electronics :Practicals	3	2	10	40	50
	20PPH3CC12P2		Numerical Programming in Physics: Practicals	3	2	10	40	50
	20PPH3DE3	DSE – III #		6	4	25	75	100
	20PPH3EC1	Extra Credit Course – I	Online Course (MOOC)	-	1*	-	-	-
			TOTAL	**30**	**22**			**500**
IV	20PPH4CC13	Core– XIII	Solid State Physics	6	5	25	75	100
	20PPH4CC14	Core– XIV	Electronic Communication	6	5	25	75	100
	20PPH4CC15P1	Core– XV	Microprocessor and Microcontroller :Practicals	3	3	10	40	50
	20PPH4CC15P2		Numerical Simulations in Physics :Practicals	3	2	10	40	50
	20PPH4DE4	DSE -IV #		6	4	25	75	100
	20PPH4PW	Project		6	5	-	100	100
	20PCNOC		Online Course (Compulsory)	-	1	-	-	-
	20PPH4EC2	Extra Credit Course – II	Physics for career examinations	-	5*	-	100	100*
			TOTAL	**30**	**24**			**500**
			GRAND TOTAL		**90**			**2000**

*Not considered for grand total and CGPA

Core Based Electives

SEMESTER	COURSE CODE	COURSE TITLE
I	20PPH1CE1A	Medical Physics and Ultrasonics
	20PPH1CE1B	Advanced Topics in Physics
II	20PPH2CE2A	Computational Physics
	20PPH2CE2B	Nanoscience and Technology
III	20PPH3CE3A	Microprocessor and Microcontroller
	20PPH3CE3B	Physics of Liquid Crystals
IV	20PPH4CE4A	Crystal Growth and Thin Films
	20PPH4CE4B	Fibre Optics and its Applications

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
I	20PPH1CC1	CORE – I	CLASSICAL DYNAMICS AND RELATIVITY	6	5	100	25	75

Course Outcomes:

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

CO 1. relate the underlying merits and demerits in the concept of Newton, Lagrangian,Hamilton and Hamilton-Jacobi theory.

CO 2.understand the need for action and angle variables and the applications of canonical transformation

CO 3.examine the normal modes of small oscillations and the dynamics of a rigid body

CO 4.debate the need for special theory of relativity and the Minkowski 4D-space

CO 5.construct mathematical modelsfor dynamical problems in the wide research area

Unit – I: Lagrangian Dynamics (18 Hours)

Constraints – generalized co-ordinates – principle of virtual work – D'Alembert'sprinciple – Lagrange's equation from the D' Alembert's principle – Newton's equation of motion from the Lagrange's equation- ##Superiority of Lagrangian mechanics over Newtonian approach##.

Derivation of Lagrange's equation from the Hamilton's principle – Applications: simple pendulum – Atwood's machine –motion under central force – series LC circuit

Unit – II: Hamiltonian Dynamics (18 Hours)

Generalized momentum and cyclic co-ordinates – Hamilton's equations – deduction of Hamilton's principle from the D'Alembert's principle – deduction of Hamilton's equation from the modified Hamilton's principle – Examples: Harmonic oscillator – ##Compound pendulum## — motion of a particle in a central force field - principle of least action-Jacobi's form and other forms of the principle of least action

Unit – III: Poisson's Brackets and Hamilton – Jacobi Theory (18 Hours)

Poisson's Bracket and its applications – canonical transformations – invariance of Poisson Bracket with respect to canonical transformations – Hamilton-Jacobi theory– solution of Harmonic oscillator problem using Hamilton-Jacobi theory– Action and Angle variables – Kepler's problem -– Hamilton's characteristic function for a conservative system.

Unit – IV: Small Oscillations and Rigid-body Dynamics (18 Hours)

General theory of small oscillations – Equation of motion for small oscillations – solution of eigen value equations – normal co-ordinates and normal frequencies of vibration – vibrations of a linear triatomic molecule.

Euler's angle – equation of motion of rigid body – Euler's equations – motion of a symmetric top under the action of gravity.

Unit – V: Relativistic Mechanics (18 Hours)

Relativistic energy – relation between momentum and energy and conservation laws – transformation of momentum and energy – Force in relativistic mechanics – The Lagrangian and Hamiltonian of a particle in relativistic mechanics-Minkowski space and Lorentz transformations – ##World point and world line – Four vectors-Examples##.

self study portion

Text Books:

1. J.C. Updhaya, Classical Mechanics, Himalaya Publishing House, 2005
   Unit – I: Section 2.3 – 2.7, 2.8 (Examples:2, 3,7& 8), 2.11, 2.12
   Unit – II: Section 3.2, 3.5,3.7, 5.3, 5.5, 5.11
   Unit – III: Section 6.3,7.2, 7.6, 8.2,8.3,8.4,8.5
   Unit – IV: Section 9.2, 9.4 , 9.6, 10.3,10.7, 10.14
   Unit – V: Section 13.3, 13.5, 13.6, 13.7, 13.8, 13.11, 14.2, 14.3, 14.4, 14.5, 14.6

Books for Reference:

1. H.Goldstain,Classical Mechanics, NarosaPublishing House, 2008
2. N.C.Rana and P.S.Joag,Classical Mechanics, Tata McGraw. Hill, 1991

Web Reference:

Unit – I: https://classcentral.com/course/swayam-theoritical-mechanics-14332
www.physics.iisc.ernet.in

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	**Code 20PPH1CC1**		**Title of the Course CLASSICAL DYNAMICS AND RELATIVITY**						**Hours 6**	**Credits 5**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓	✓	✓	
CO2	✓			✓		✓	✓	✓	✓	
CO3	✓	✓		✓		✓	✓	✓	✓	
CO4	✓			✓	✓	✓			✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches (√) = 36 (ie.) 72 %, Relationship : High										

Prepared by — Dr. A. S. HajaHameed

Checked by: — Dr. R. Radhakrishnan

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
I	20PPH1CC2	CORE – II	MATHEMATICAL METHODS FOR PHYSICISTS	6	5	100	25	75

Course Outcomes:

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

CO 1. orthogonal curvilinear coordinates, gradient, divergence,curl and Laplacian operators in these and their applications.

CO 2. basic concepts of linear vector spaces, orthogonalization process, matrices and matrix manipulations.

CO 3. tensors and their applications in the study of physical phenomena.

CO 4. concepts of complex analysis, Cauchy-Riemann condition, calculus of residues and evaluation of definite integrals.

CO 5. Statistical tools and statistical distributions.

Unit – I: Vector Analysis (18 Hours)

Gradient, divergence, curl, and Laplacian – Orthogonal curvilinear coordinate systems – spherical coordinate system and ##cylindrical coordinate system ## – Expression for gradient, divergence, curl and Laplacian – applications: Hydrodynamics – equation of continuity – Euler's equation of motion – The equation of heat flow in solids.

Unit – II: Linear Vector Space and Matrices (18 Hours)

Linear Vector Space**:** definition – linear independence, basis and expansion theorem – inner product and unitary spaces - orthonormal set - Schwartz Inequality-Gram-Schmidt's orthogonalization process

Special types of matrices – transpose of a matrix – the conjugate transpose – Hermitian and skew-Hermitian matrices – orthogonal matrices – trace of a matrix – eigen values, eigen vectors – power of a matrix – matrices in physics.

Unit – III: Tensors (18 Hours)

n-dimensional space – superscripts and subscripts – coordinate transformations – indicial and summation conventions – dummy and real indices – Kronecker delta symbol – scales, contravariant vectors and covariant vectors – tensors of higher ranks – algebraic operations of tensors – symmetric and anti symmetrictensors – applications – tensors in elasticity.

Unit – IV Complex Variables (18 Hours)

The derivative of a complex function *f*(*z*) and its analyticity – Cauchy – Riemann conditions – harmonic functions- Cauchy's Integral theorem - Cauchy's Integral formula – Laurent's series – zeros of a complex function-evaluation of residues-Cauchy Residue theorem –evaluation of definite integrals of the form $\int_0^{2\pi} f(sin\theta, cos\theta)d\theta$ and $\int_{-\infty}^{+\infty} f(x)dx$

Unit – V: Probability and Statistics (18 Hours)

Mathematical definition – binomial theorem of probability – measures of central tendency, averages – Karl Pearson's coefficient of correlation – standard deviation as the sum of distribution – Binomial distribution – Poisson's distribution – Normal distribution.

Text Books:

1. Sathya Prakash, Sultan Chand & Sons, Mathematical Physics, New Delhi,2011
   Unit – I: Section1.15, 1.19
   Unit – II: Section 1.18, 2.5, 2.6, 2.7, 2.9, 2.10, 2.17, 2.18, 2.19, 2.31, 2.36, 2.37, 2.39
2. A.W. Joshi, Matrices and Tensors in Physics, New Age International, New Delhi,1995
   Unit – III: Section 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.38
3. Charlie Harper, Introduction to Mathematical Physics, PHI,New Delhi,2006
   Unit – IV: Section 6.10, 6.11, 6.14, 6.16, 6.20, 6.23, 6.24, 6.25
4. A.K.Ghatak, I.C. Goyal and S.J. Chua,Mathematical Physics,Macmillman India Ltd, New Delhi,1995 Unit – V: 12.2, 12.7, 12.10, 12.12, 12.13, 12.20, 12.21, 12.22

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	**Code 20PPH1CC2**		**Title of the Course MATHEMATICAL METHODS FOR PHYSICISTS**						**Hours 6**	**Credits 5**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓		
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓		✓	✓	✓	✓	✓		
CO4	✓	✓		✓	✓	✓	✓	✓		
CO5	✓	✓		✓	✓	✓	✓	✓	✓	✓
Number of matches 40(ie.) 80 %, Relationship : High										

Prepared by: Checked by:

Dr. R. Raj Muhamed Mr. A. Mohamed Saleem

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
I	20PPH1CC3	CORE – III	ELECTRONIC DEVICES AND CIRCUITS	6	4	100	25	75

Course Outcomes:

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

CO 1. Acquire the basic principle and underlying concepts of electronic devices.

CO 2. gain a clear understanding of operations of electronic circuits.

CO 3. the ability to design and analyze electronic circuits.

CO 4.learn the applications of operational amplifier and IC 555and can demonstrate them timer.

CO 5.motivate towards research in this field towards the applications according to the social needs.

Unit – I: IC Fabrication and GaAs devices (18 Hours)

Introduction-advantages and limitations of ICs-classification of ICs-manufacturing process of monolithic ICs-monolithic diodes-resistors and capacitors-Gallium Arsenide devices-GaAs metal semiconductor-MESFET-of GaAs -depletion mode MESFET.

Unit –II: Solid State Devices (18 Hours)

Construction, operation and V-I characteristics of special devices: tunnel diode – Gunn diode – MOSFET – Enhancement MOSFET- SCR – SCR half wave rectifier – SCR Full wave rectifier – TRIAC – DIAC – UJT – UJT relaxation oscillator

Unit – III: Operational Amplifiers (18 Hours)

Instrumentation amplifier – Op-Amp circuits using diodes: half wave rectifier, full wave rectifier, peak detector, clipper and clamper circuits – sample and hold circuit – logarithmic and antilogarithmic amplifier.

Multipliers – dividers – differentiators – integrators –electronic analog computation: simulation of 2^{nd} order differential equation – simulation of transfer function

Unit – IV: Comparators, Waveform Generators and Filters (18 Hours)

Comparators – Zero crossing detector – window detector – Schmitt trigger – astablemulti-vibrator – mono-stablemulti-vibrator – Triangular wave generator.

RC phase shift oscillator – Wien's bridge oscillator – function generator – RC active filters: first order low pass, high pass and band pass filters.

Unit – V: 555 Timer and Phase –Locked Loops (PLL) (18 Hours)

Introduction – description and functional diagram of 555 timer – monostable operation – frequency divider – astable operation – Frequency Shift Keying(FSK) generator.

PLL Basic principle – analog phase detector – digital phase detector – voltage controlled oscillator (VCO) – PLL applications – frequency multiplication/division – frequency translation

Text Books:

1. S Salivahanan, N Suersh Kumar & A Vallavaraj, Electronic Devices and Circuits, Tata McGraw-Hill Publishing Company Limited, New Delhi, Second Edition, 2009.
   Unit–I: Section 19.1,19.2,19.3,19.4,19.5
   Unit–II:Section 5.8, 8.3, 8.5, 8.7, 8.8, 17.2

2. D.Roy Choudhury and ShailB. Jain, Linear Integrated Circuits, New Age International Publishers, Third Edition
   Unit–III: Section 4.3, 4.6,4.6.1-4.6.5, 4.7 – 4.12
   Unit–IV: Section5.1,5.2,5.2.1,5.3,5.4-5.7, 7.2, 7.2.1,7.2.4,7.2.5
   Unit–V: Section8.1-8.3, 8.3.1,8.4,8.4.1,9.2,9.3.1,9.3.2,9.4,9.7,9.7.1,9.7.2

Book for Reference:

1. V.K. Mehta, Rohit Mehta, Principles of Electronics, Reprint 2016. S. Chand Publications.

2. Ramkant A. Gayakwad, Op- Amps and Linear Integrated Circuits, 4th Edition, Prentice Hall of India. 2015.

Web reference

1. https://nptel.ac.in/courses/117/107/117107095/
2. https://nptel.ac.in/content/storage2/courses/117104071/ui/Course_home-26.htm-

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester	**Code 20PPH1CC3**		**Title of the Course ELECTRONIC DEVICES AND CIRCUITS**						**Hours 6**	**Credits 4**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓		✓		✓	✓		✓	✓
CO3	✓			✓		✓	✓	✓		✓
CO4	✓	✓	✓			✓	✓	✓		✓
CO5	✓	✓	✓	✓	✓	✓		✓	✓	
Number of matches (√) = 37 (ie.) 74 %, Relationship : High										

Prepared by: Checked by:

Mr. S. Mohamed Ibrahim Sulaiman Sait Mr. A. Mohamed Saleem

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
I	20PPH1CC4P1	CORE – IV	Advanced General Physics - I : Practical	3	2	50	10	40

Course Outcomes:

At the end of this course, students will be able to
CO1: the principles of elasticity and magnetism.
CO2: the concepts of Fourier Transforms and Fourier Decomposition of waves.
CO3: handling of equipments finding their accuracy and precision.
CO4: construction of circuits to perform as desired.
CO5: observational skills and analysis using them.

List of Experiments:

1. Determination of q, n, σ by elliptical fringes method.
2. Magnetic Susceptibility of a Liquid - Guoy's Method.
3. e/m Magnetron.
4. Determination of the Dielectric Constant of a given specimen.
5. Fourier Analysis of Periodic Waveforms.
6. Determination of magnetic susceptibility by Quincke's method.
7. B-H Curve – Determination of the energy loss of a magnetic specimen.
8. Dielectric Constant using Radio Frequency Hartley Oscillator.

Books for Reference:

1.M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , Reprint 2010.

2.C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First Edition, 2007.

Web Reference:

www.physicstutoruials.org
www.sciencelearn.org.nz

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	**Code 20PPH1CC4P1**		**Title of the Course Advanced General Physics - I : Practicals**					**Hours 3**	**Credits 2**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓		✓	✓	✓	✓	✓
CO2	✓			✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓			✓	✓			✓
CO4	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓	✓		✓	✓	✓		✓	✓	
Number of matches (√) = 36 (ie.) 72 %, Relationship : High										

Prepared by :

Dr. R. Rajmuhamed

Checked by :

Mr. F. S. Muzammil

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
I	20PPH1CC4P2	CORE – IV	Advanced General Physics - II : Practical	3	2	50	10	40

Course Outcomes:

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

CO1: the principles of Optics, Thermal Physics, Polarization and spectrometry.

CO2: in handling of equipments finding their accuracy and precision.

CO3: initial adjustments of the equipments.

CO4: observational skills and analysis.

CO5: the application of the experimental skills developed to solve newer problems.

List of Experiments:

1. Hartmann's formula: Determination of wave lengths of spectral lines.
2. Ultrasonic Diffraction – Bulk modulus.
3. Charge of an electron by spectrometer.
4. "g" factor determination – ESR spectrometer.
5. Hollow Prism: Polarizability of liquids.
6. Determination of Stefan's constant.
7. Thermal conductivity and Lorentz number determination – Forbe's method.
8. Verification of Richardson – Dushmann equation: Thermionic work function.

Books for Reference:

1.M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , Reprint 2010.

2.C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First Edition, 2007.

Web References:

www.physicstutoruials.org
www.sciencelearn.org.nz

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	**Code 20PPH1CC4P2**		**Title of the Course Advanced General Physics - II : Practicals**				**Hours 3**		**Credits 2**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓		✓	✓	✓	✓	✓
CO2	✓	✓		✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓			✓	✓			✓
CO4	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓	✓		✓	✓			✓	✓	
Number of matches (√) = 36 (ie.) 72 %, Relationship : High										

Prepared by : **Checked by :**

Dr. R. Raj Muhamed Capt. F. S. Muzammil

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
I	20PPH1DE1A	Discipline Specific Elective – I	Medical Physics and Ultrasonics	6	4	100	25	75

Course Outcomes:

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

CO1. learn to measure the electrical signals from human body and analyze the recorded bio-Potential signals.

CO 2. the ability to develope a physiological assist device for monitoring and treatment proposes for society.

CO 3. The ability to design and demonstrate a newer technology for laser based diagnostic methods and treatment.

CO 4. understand the concepts of ultrasonic interferometery and to measure the acoustical parameters of liquids.

CO 5. learn the applications of the ultrasonic instruments in industry.

Unit – I: Bio-potential Electrodes and Recorders (18 Hours)

Components of biomedical instrument system – electrodes – bio-potential recorder – characteristics of the recording system – electrical signals from the heart: electrocardiography (ECG) – electrical signals from brain: electroencephalogram (EEG) – electrical signal from muscles: electromyogram (EMG) – magnetic resonance imaging (MRI).

Unit – II: Physiological Assist Device and Operation Theatre Equipment (18 Hours)

Pacemaker – energy requirements to excite heart muscles – external and internal pacemaker – defibrillator – AC and DC defibrillators – renal function – dialysis –heamo-dialysis and peritoneal dialysis – peritoneal dialysis unit – ventilators- Microprocessor based ventilators – anesthesia machines– ## **e**lectro diagnostic/therapeutic stimulators ##.

Unit – III: Laser Based Diagnostic Methods and Nuclear Therapy (18 Hours)

Laser based blood cell counter – laser doppler blood flow meter – principle and theory of fluorescence, reflectance and light scattering spectroscopy – laser based technique for cancer diagnosis: fluorescence and Raman Spectroscopy – photodynamic therapy of tumors – ## nuclear therapy: teletherapy (Co^{60}) – brachytherapy##.

Unit – IV:Ultrasonic Study of Liquid Mixtures and Solutions (18 Hours)

Ultrasonic study of molecular interactions– preparation of multi component liquid mixtures**:** mole fraction – weight fraction – volume fraction-measurement techniques: ultrasonic interferometer – continuous wave method – pulse echo overlap method – density – viscosity

Ultrasonic velocity in mixtures and solutions: free length theory – collision factor theory – Nomoto'srelation – acoustical parameters: adiabatic compressibility – acoustic impedance – intermolecular free length – molar volume – free volume – internal pressure.

Unit – V: Industrial Applications of Ultrasound (18 Hours)

Classifications of ultrasonic applications: low frequency – high intensity applications:ultrasonic welding – ultrasonic cleaning – food industry – high frequency and low intensity application: level meters – thickness measurements– ultrasonic microscopy – acoustic holography (transmission acoustic holography)

Text Books:

1. Dr.M.Arumugam, Biomedical Instrumentation, Second Edition, Anuradha Publications, Chennai, Reprint 2010.
   Unit I: Section 2.1 – 2.4, 4.1–4.2, 4.3, 4.3.1– 4.3.5, 4.4, 4.4.1–4..4.5, 4.5, 4.5.1–4.5, 10.10, 10.10.1, 10.10.3 –10.10.5, 10.10.8
   Unit II: Section 5.2, 5.2.1, 5.2.2,5.5, 5.5.1, 5.8.1–5.8.4, 6.8, 6.9,5,6.3
   Unit III: Section 7.2, 6.10.3
2. Baldevraj, V.Rajendran and P.Palanichamy, Science and Technology of Ultrasonics, Narosa Publications, New Delhi.
   Unit IV: Section 6.3, 6.4, 6.4.1 – 6.4.3, 6.5, 6.5.1–6.5.3, 6.7, 6.7.1–6.7.3, 6.8, 6.8.1–6.8.6)
   Unit V: Section 5.2, 5.3, 5.3.1-5.3.2, 5.3.4, 5.4, 5.4.1-5.4.4)

Books for Reference:

1. John R. Cameron and James G.Skofronick, Medical Physics, John Wiley Interscience Publication, Canada.
2. S. Svanberg, Atomic & Molecular Spectroscopy (Basic aspects & Practical applications) – 4th Edition, 2007

Web Reference:

1. https://en.wikipedia.org/wiki/Laser-induced_fluorescence
2. https://www.google.com/search?biw=1366&bih=608&ei=C_djXaayF-Lez7sP-pKMwAU&q=lecture+notes+on+fluorescence%2C+reflectance%2C+light+scattering+and+photodynamic+therapy&oq=lecture+notes+on+fluorescence%2C+reflectance%2C+light+scattering+and+photodynamic+therapy&gs_l=psy-ab.12...0.0..133192...0.0..0.0.0.....0.....gws-wiz.FBc31MSRXnk&ved=0ahUKEwjm4-XC6aDkAhVi73MBHXoJA1gQ4dUDCAo
3. https://cancer.dartmouth.edu/radiation-oncology/teletherapy
4. https://www.mayoclinic.org/tests-procedures/brachytherapy/about/pac-20385159

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	**Code 20PPH1DE1A**		**Title of the Course Medical Physics and Ultrasonics**					**Hours 6**	**Credits 4**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓		✓		✓	✓	✓	✓	✓
CO4	✓	✓		✓		✓	✓	✓		
CO5	✓	✓				✓	✓	✓	✓	✓
Number of matches (√) = 41 (ie.) 82 %, Relationship : High										

Prepared by:
Dr. J. Ebenezar

Checked by:
Captain F. S. Muzammil

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – II

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
II	**20PPH2CC5**	**CORE – V**	**ADVANCED MATHEMATICAL PHYSICS**	**6**	**5**	**100**	**25**	**75**

Course Outcomes:

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

CO 1: acquire knowledge of methods for solving partial differential equations and familiarized themselves with separation of variables method.

CO 2: learn the special functions like the Hermite polynomials, the Legendre polynomials, Bessel differential equations and their applications in various physical problems.

CO 3: learn the Dirac delta function and its properties, which have applications in various branches of Physics

CO 4: understand the Fourier analysis of periodic functions and their applications in physical problems such as vibrating strings.

CO 5: gain the ability to apply group theory to Physics problems, which is a prerequisite For a deeper understanding of Crystallography, Particle Physics, Quantum mechanics and Energy bands in solids.

Unit – I: Partial Differential Equations (PDE) **(18 Hours)**

Definitions – Method of separation of variables – Solution of one-dimensional wave equation – One dimensional heat conduction equation – Modes of an optical fiber – Transformation and classification of PDEs – Characteristic coordinates – Canonical forms of hyperbolic, parabolic and elliptic equations

Unit – II: Special Functions (18 Hours)

Legendre differential equation:generating function, Rodrigue's formula and orthogonal properties - Hermite differential equation – generating function – Rodrigue's formula – orthogonal properties – Bessel's differential equation – recurrence formula for $J_n(x)$

Unit – III: The Beta, Gamma, Dirac-Delta and Green's Functions (18 Hours)

Definition of Beta and Gamma functions –symmetry property of Beta function – transformation of Beta function – transformation of Gamma function–relation between Beta and Gamma functions

Dirac-Delta function – properties of delta function – three dimensional delta function – Green's function for one-dimensional case – application to boundary value problem –symmetry property of Green's function – Green's function for Poisson's equation and solution of Poisson's equation – Green's function for quantum mechanical scattering problem

Unit – IV: Fourier and Laplace Integral Transforms (18 Hours)

Fourier sine and cosine transforms of derivatives – Fourier transform functions of two and three variables – finite Fourier transforms – solution of boundary value problems (BVP).

Laplace Integral Transform: Solution of differential equations – ordinary differential equation (ODE) with constant coefficients – ODE with variable coefficients - solution of integral equations – solution of boundary value problems

Unit – V: Group Theory (18 Hours)

Concept of a group – Abelian group – the cyclic group – the group multiplication table – Rearrangement theorem – Isomorphism and Homomorphism – the group of symmetry of an equilateral triangle – group of symmetry of a square – representation of groups – reducible and irreducible representations – Schur's Lemma I and II – The orthogonality theorem.

##Self study portion

Text Books:

1. A.K. Ghatak, Mathematical Physics, IC Goyal& S.J. Chua, Mac Millan India Ltd., 1995.
   Unit – I : 15.2, 15.3, 15.6, 15.5, 15.6, 15.7
2. SatyaPrakash, Mathematical Physics, Sultan Chand and Sons, New Delhi, 2001.
   Unit – II: 4.1, 4.2, 4.4, 4.6, 4.7, 7.11, 7.12, 7.13, 7.14, 7.21, 7.25, 7.33,7.36, 7.37, 7.40
   Unit – III: 11.1, 11.2, 11.7, 11.8 – 11.10, 11.12, 11.13
3. SatyaPrakash, Mathematical Physics, Sultan Chand and Sons, New Delhi (2005).
   Unit – IV: 9.9 , 10.9, 10.11, 10.12,10.14,10.15,10.18
4. PichaiRamadevi and VarunDubey, Group Theory for Physicists: With Applications, Cambridge University Press, New York, 2019.
   Unit–V: 1.1-1.7, 2.2- 2.3, 3.3, 5.7.1

Books for Reference:

1. Charlie Harper, Introduction to Mathematical Physics, PHI,New Delhi,2006.
2. P.K. Chattopadhyay, Mathematical Physics, New Age International,New Delhi,1990.

Web Reference

1. https://freevideolectures.com/course/3536/selected-topics-in-mathematical-physics
2. https://www.perimeterinstitute.ca/video-library/collection/11/12-psi-mathematical-physics
3. http://mediacore.ictp.it/media/mathematical-methods-lecture-1-of-34

Online Course Reference

Unit V :https://swayam.gov.in/nd1_noc20_ph03/preview

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	**Code 20PPH2CC5**		**Title of the Course ADVANCED MATHEMATICAL PHYSICS**					**Hours 6**	**Credits 5**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓		✓	✓
CO2	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO3	✓	✓		✓			✓	✓		
CO4	✓	✓	✓			✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches (√) = 40 (ie.) 80 %, Relationship : High										

Prepared by: Checked by:

Dr. S. Shek Dhavud Dr. C. Hariharan

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
II	**20PPH2CC6**	**CORE – VI**	**ATOMIC AND MOLECULAR SPECTROSCOPY**	**6**	**5**	**100**	**25**	**75**

Course Outcomes :

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

CO 1. acquire the basic, principle and underlying quantum concepts of spectroscopy.
CO 2. familiarize to differentiate various types of spectra.
CO 3. learn the spectroscopic instrumentation
CO 4. understand the spectroscopic applications in allied fields.
CO 5. motivate towards research in spectroscopy

Unit – I : Rotation of Molecules (18 Hours)

Classification of molecules –rotational spectra of rigid diatomic molecules – isotope effect in rotational spectra – non-rigid rotator – linear polyatomic molecules – microwave spectrometer – ##microwave oven##

Unit II: Infra-Red Spectroscopy (18 Hours)

Molecular and fundamental vibrations - vibrational energy of a diatomic molecule – selection rules – vibrating diatomic molecule – diatomic vibrating rotator – rotation-vibration spectra of polyatomic molecules – ##finger print technique## – IR spectrometer - instrumentation – FTIR spectroscopy.

Unit – III : Raman Spectroscopy (18 Hours)

Rotational Raman spectra - vibrational Raman spectra – Raman spectrometer – Hyper-Raman effect – stimulated Raman scattering – coherent anti-stokes Raman scattering (CARS)

Unit – IV : Electronic Spectroscopy (18 Hours)

Vibrational coarse structure – vibrational analysis of band systems – Deslandres table - Franck-Condon principle – intensity of vibrational- electronic spectra – rotational fine structure of electronic-vibration spectra – dissociation energy and products – principle of electron spin resonance – Electron Spin Resonance spectrometer – electron density – density functional theory (DFT) – Kohn-Sham equations

Unit – V : Resonance Spectroscopy (18 Hours)

Magnetic properties of nuclei – resonance condition – nuclear magnetic resonance imaging (NMRI) – nuclear magnetic resonance instrumentation – chemical shift – quadrupolar nucleus – principle of nuclear quadrupole resonance – transitions for non-axially symmetric systems – nuclear quadrupole resonance instrumentation

 # # Self study portion

Text Books:

1. G. Aruldhas, Molecular Structure and Spectroscopy, Second Edition, PHI Publishers.
   Unit -I:Section 6.1, 6.3, 6.4, 6.6, 6.8, 6.9, 6.10, 6.14
   Unit – II: Section7.1, 7.3, 7.4, 7.5, 7.11, 7.16, 7.18
   Unit-III: Section8.3, 8.4, 8.6, 15.5-15.8
   Unit –IV: Section9.2, 9.3, 9.6, 9.7, 9.9, 11.2, 11.3, 11.6
   Unit – V: Section10.1,10.2,10.3,10.8,10.19,12.1,12.2,12.4,12.5

Books for Reference:

1. Colin N. Banwell and Elaine M. McCash, Fundamentals of Molecular Spectroscopy, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2010.

2. Gurdeep R. Chatwal, Sham K. Anand, Spectroscopy- Atomic and Molecular, Himalaya PublishingHouse, Delhi, 2004.

Web References:

1. https://www.southampton.ac.uk/assets/centresresearch/documents/compchem/DFT_L6.pdf
2. e-PgPathshala,NME-ICT,paper10-M-15

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	**Code** **20PPH2CC6**	**Title of the Course** **ATOMIC AND MOLECULAR SPECTROSCOPY**						**Hours** **6**	**Credits** **5**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓		✓	✓	✓	✓	✓
CO2	✓	✓		✓		✓	✓	✓		
CO3		✓			✓	✓	✓	✓		✓
CO4			✓	✓	✓	✓	✓	✓	✓	
CO5				✓	✓	✓	✓	✓		
Number of matches (√) = 32 (ie.) 64 %, Relationship : Moderate										

Prepared by: Checked by:

Dr. M. Jamal Mohamed Jaffar Dr. S. Prabhakaran

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
II	20PPH2CC7	CORE – VII	ELECTROMAGNETIC THEORY	6	4	100	25	75

Course Outcomes:

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

CO 1: acquire the basics, principles of electrostatics, magnetostatics and field theory.

CO 2: learn the skills of problem solving in areas of electrostatics, magnetostatics and electro magnetism.

CO 3: understand the interactions of EM waves with different medium and acquired the knowledge of various modes of propagation of EM waves in wave guides using Maxwell's equations.

CO 4: analyze the basic laws of reflection and refraction and understand the kinematic and dynamic properties. Understood the generations and radiations of EM waves and their applications.

CO 5: learn the principles and applications of relativistic electrodynamics.

Unit–I: Electrostatics and Boundary value problems (18 Hours)

Gauss law - applications – field due to an infinite, straight, uniformly charged wire - Multipole expansion of charge distribution – method of separation of variables: cartesian coordinates – potential at a point between the plates of a parallel plate capacitor – spherical coordinates– potential at a point between the plates of a spherical capacitor – cylindrical coordinates - potential at a point due to a cylindrical capacitor

Unit–II:Magnetostatics (18 Hours)

Lorentz force law - Biot-Savart's law and its application -long straight wire – Ampere's circuital law and its application - toroidal solenoid – magnetic scalar and vector potential – magnetic boundary conditions for B and H between two media – magnetic intensity – magnetic susceptibility and permeability.

Unit–III:Field Equations and Potentials (18 Hours)

Maxwell's equations and their physical significance – continuity equation – displacement current – conservation law of energy: Poynting's theorem –Poynting's vector –electromagnetic potentials – gauge transformations: Lorentz gauge –Coulomb gauge – retarded potentials.

Unit–IV: Electromagnetic waves and their propagation (18 Hours)

Electromagnetic waves in free space – propagation of electromagnetic waves in dielectrics and in conductors - laws of reflection and refraction of electromagnetic waves: Kinematic and dynamic properties – Fresnel's law – Wave guide – rectangular wave guide – TM and TE modes – Multicavity klystron.

Unit–V: Relativistic Electrodynamics (18 Hours)

Einstein's postulates of special theory of relativity – #concept of four vectors – covariance of electrodynamic equations – Maxwell's equations in four vector – Transformations of electromagnetic fields – Four vector form of Lorentz equation – Lagrangian and Hamiltonian force equations for a relativistic charged particle.

--- ## Self study portions

Text Books:

1. K.K. Chopra and G.C. Agarwal, Electromagnetic Theory, Fifth Edition,K. Nath& Co., Meerut.
   Unit -I: Section1.3, Ex: 3(a), 1.4, 2.2(A), 2.2(B), 2.3 (A), 2.3(B),2.4(A), 2.4(B)
   Unit -II: Section3.2,3.3, 3.2(B), 3.2(C), 3.3, 3.3(C), 3.5, 3.6, 3.10 (a), 3.10(b)
   Unit -III: Section 3(A), 4.1, 4.2, 4.4,4.5, 4.7, 4.9, 4.10, 4.11, 8.1
   Unit -IV: Section 5.1, 5.2, 5.4, 6.2, 6.2 (A), 6.2 (B), 6.3, 6.8,

2. N. Ghosh, Electromagnetic theory and wave propagation, Section Edition, Narosa publishers, New Delhi.
   Unit V: Section 17.1, 17.2, 17.3, 17.4, 17.5, 17.6, 17.7.

Book for Reference:

1. David J. Griffiths, Introduction to Electrodynamics (3rd edition), Prentice-Hall of India.
2. J.D. Jackson, Classical Electrodynamics, (3rd edition), John-Wiley, New York.

Web References:

1. http://www.kau.edu.sa/GetFile.aspx?id=158642&fn=EMNotes.pdf
2. https://web.njit.edu/~vitaly/121/notes121.pdf
3. http://www.clerkmaxwellfoundation.org/html/electromagnetic_theory.html
4. https://www.electrical4u.com/electromagnetic-theory/
5. https://lecturenotes.in/subject/77/electromagnetic-theory-emt
6. https://ocw.mit.edu/courses/physics/8-311-electromagnetic-theory-spring-2004/
7. https://www.classcentral.com/course/swayam-electromagnetic-theory-5223
8. https://nptel.ac.in/courses/115/101/115101005/electromagnetictheory.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	**Code 20PPH2CC7**		**Title of the Course ELECTROMAGNETIC THEORY**						**Hours 6**	**Credits 5**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓			✓	✓	✓	✓
CO2	✓	✓		✓	✓		✓	✓	✓	
CO3	✓	✓	✓			✓	✓			✓
CO4	✓	✓	✓	✓		✓	✓		✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of matches (√) = 36 (ie.) 72 %, Relationship : High										

Prepared by: Checked by:

Dr. S. Abbas Manthiri Dr. C. Hariharan

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
II	**20PPH2CC8P1**	**CORE – VIII**	**SOLID STATE PHYSICS - PRACTICAL**	**3**	**2**	**50**	**10**	**40**

Course Outcomes:

At the end of this course, students will be able to
CO1: the principles of Solid State Physics.
CO2: initial adjustments of CRO, sensitive balance etc.
CO3: experimental skills.
CO4: methods of analysis.
CO5: apply the skills developed to future problems.

List of Experiments:

1. Determination of q, n, σ by Hyperbolic fringes method.
2. Characteristics of LDR.
3. Determination of Planck's constant.
4. Hystersis Loop Tracer.
5. Band gap energy – Four Probe method.
6. Determination of carrier concentration and Hall coefficients in semiconductors.
7. e/m Helical method.
8. Determination of magnetic susceptibility of anhydrous sample – Guoy's method.

Text Books:

1.M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , Reprint 2010.

2.C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First Edition, 2007.

Web References:

www.physicstutoruials.org
www.sciencelearn.org.nz

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes :

Semester II	**Code 20PPH2CC8P1**	**Title of the Course SOLID STATE PHYSICS PRACTICALS**						**Hours 3**	**Credits 2**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓		✓	✓	✓	✓	✓
CO2	✓	✓		✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓			✓	✓			✓
CO4	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓	✓		✓	✓	✓		✓	✓	
Number of matches (√) = 37 (ie.) 74 %, Relationship : High										

Prepared by :
Capt. F. S. Muzammil

Checked by :
Dr. R. Rajmuhamed

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
II	**20PPH2CC8P2**	**CORE – VIII**	**ANALOG ELECTRONICS - PRACTICAL**	**3**	**2**	**50**	**10**	**40**

Course Outcomes:

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

CO1: the principles of Analog Electronics.

CO2: identification of components and their tolerances.

CO3: principles of design and construction of electronic circuits.

CO4: measuring output using CRO, ammeters, voltmeters etc.

CO5: troubleshoot deficiencies and rectify problems that may occur.

List of Experiments:

1. Op – Amp characteristics.
2. Astable Multivibrator using 555 timer.
3. Analog Comparator.
4. Wien's Bridge Oscillator.
5. Characteristics and UJT Relaxation Oscillator.
6. D/A converter – Binary Weighted and R - 2R Ladder Method.
7. Monostable Multivibrator using 555 timer.
8. Low Pass, High Pass and Band Pass Filters.

Books for Reference:

1.M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , Reprint 2010.

2.C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First Edition, 2007.

Web References:

www.physicstutoruials.org

www.sciencelearn.org.nz

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	**Code** **20PPH2CC8P2**	**Title of the Course** **ANALOG ELECTRONICS PRACTICALS**							**Hours** **3**	**Credits** **2**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓		✓	✓	✓	✓	✓
CO2	✓	✓		✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓			✓	✓			✓
CO4	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓	✓		✓	✓	✓			✓	
Number of matches (√) = 36 (ie.) 72 %, Relationship : High										

Prepared by :

Capt. F. S. Muzammil

Checked by :

Dr. R. Rajmuhamed

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
II	**20PPH2DE2A**	**Discipline Specific Elective - II**	**COMPUTATIONAL PHYSICS**	**6**	**4**	**100**	**25**	**75**

Course Outcomes:

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

CO 1. acquire the basic knowledge and familiarise computational methods of physics problem solving techniques

CO 2.the capacity of solving problems of type polynomial, simultaneous, linear one dimensional equations and numerical Integration

CO 3. the ablity to construct the mathematical models of the physical problems

CO 4. learn to numerically simulate problems in physics using the mathematical models so constructed

CO 5. be motivated towards research by the understanding gained by mathematical modeling and numerical simulations

Unit- I : Overview of C Language (18 Hours)

Operators :arithmetic, relational, logical, assignment, increment and decrement, conditional and bitwise operators - formatted I/P and O/P functions - `scanf ()`&`printf()` functions, format specifiers. **Decision making statements:**`if`, `if-else`, `switch`,`go-to`, `break` and `continue` statements, **Loop constructs:** syntax and flow charts for `for loop`, `while loop`, `do-while loop`. **## One–dimensional and two dimensional arrays: declaration and initializing of arrays##**

UNIT –II SolvingPolynomialandSimultaneous Linear Equations (18 Hours)

Polynomial Equations: Newton-Raphson's Algorithm for solving polynomial equations-convergence of Newton-Raphsonmethod-Limitations of Newton-Raphson'smethod-C-Program for implementing Newton-Raphsonmethod.

Direct Solution of Simultaneous Linear Equations: Basic Gauss Elimination method-Gauss Elimination with Pivoting-C-program to implement Gauss elimination Method – problems.

UNIT –IIIOrdinary Differential Equations andNumerical Integration : (18 Hours)

Order and Degree of ODE's- Euler's Method –Runge-Kutte Fourth Order Method-**##Systems of Differential Equations##** -C Program to implement RK4 Method for a first order differential equation.

Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule –C program to evaluate integrals usingTrapezoidal and Simpson's 1/3 rules- problems.

UNIT - IV Curve Fitting: (18 Hours)

Interpolation and Regression: Interpolation of tabulated data and well defined functions- Lagrange's interpolation formula for polynomial functions-C program for implementing Lagrange's interpolation formula- Curve Fitting of linear equations: Linear Least Squares Regression method- **##Fitting of Transcedental Equations,##** C-Program for implementing Linear Least Square Fit – Problems.

Unit-V: Matrix Operations, Evaluation of Special Functions (18 Hours)

Matrix Operations: Determinant of a matrix, characteristic polynomial of a matrix-determination of the largest eigen value and the corresponding eigen vector of a matrix using power method. C-programs to implement these.

Special Functions: Analytic expressions for Legendre, Laguerre and Hermite polynomial functions-C-programs to implement these.

Text Books:

1. E. Balagurusamy, Programming in ANSI C, Tata Mc-Graw Hill, New Delhi, Sixth Edition, 2012.
Unit- I:Section 3.2 to 3.9, 5.2 to 6.4,7.1 to 7.6

2. E. Balagurusamy, Numerical Methods, Tata Mc-Graw Hill, New Delhi, Second Edition, 1999.
Unit- II: Section 6.8, 7.4
Unit-III: Section 11.13, 12.3, 12.4, 13.3, 13.6
Unit- IV: Section 9.1,9.4,10.1,10.3
3. Suresh Chandra, Computer Applications in C, Narosa, PublishingHouse,NewDelhi,
Second Edition, 2006
Unit -V: Section6.1,6.2,6.4,10.2,10.5,10.7,11.1 to 11.6

Books for Reference

1. K.R. Venugopal and S.R. Prasad, Mastering C, Tata Mc-Graw Hill, New Delhi, ThirdEdition,2007
2. Steven C. Chapra, NumericalMethods for Engineers,Tata Mc-Graw Hill, New Delhi, Seventh Edition,2016.

Web References:

1. https://khanacadamy.zendesk.com

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	**Code 20PPH2DE2A**		**Title of the Course COMPUTATIONAL PHYSICS**					**Hours 6**	**Credits 4**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓			✓	✓	✓	✓	✓		
CO3	✓	✓		✓		✓	✓	✓	✓	
CO4	✓			✓		✓	✓	✓		
CO5			✓	✓		✓	✓	✓	✓	✓
Number of matches (√) = 35 (ie.) 70 %, Relationship : High										

Prepared by: Checked by:

Capt. F. S. Muzammil Dr. R. Raj Muhamed

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
III	**20PPH3CC9**	**CORE – IX**	**NUCLEAR AND PARTICLE PHYSICS**	**6**	**5**	**100**	**25**	**75**

Course Outcomes:

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

1. Acquire essential knowledge on nuclear models and related theories.
2. Can understand the conservation laws for any nuclear reaction
3. Apply the nuclear theory to explain the radio active decays.
4. Learn the nuclear fission and fusion along with the related theories.
5. Analyze the classification and the details of elementary particles .

Unit – I : General properties of Atomic Nucleus (18 Hours)

Binding energy – Stability Curve - semi empirical mass formula – optical model – shell model: evidence for the existence of magic numbers – extreme single particle model – spin orbit potential.

Nuclear Forces: **#**Exchange forces **#**– Yukawa potential – ground state and excited state of deuteron – low energy n-p scattering - scattering length – phase shift – effective range theory.

Unit – II: Radioactive Decays (18 Hours)

#Alpha decay**#** – Gamow's theory of Alpha decay – Geiger-Nuttal law – neutrino hypothesis – Fermi's theory of beta decay – selection rules – Wu's experiment – non conversion of parity in beta decay – parity in β – decay – gamma decay – selection rules – internal conversion – nuclear isomerism.

Unit – III: Nuclear Fission and Fusion (18 Hours)

#Types of Fission**#** – distribution of Fission products – Nuclear chain reactions – Q-equation - Four factor formula – Bohr-Wheeler's theory of nuclear fission – liquid drop model.

Nuclear Fusion – Thermo nuclear reactions as source of stellar energy – controlled thermo nuclear reactions – Plasma confinement.

Unit – IV: Nuclear reaction (18 Hours)

Nuclear Transmutation by alpha , protons and neutron - neutron spectroscopy – Nuclear reaction cross sections – **#**theory of compound nucleus**#** – reciprocity theorem – Direct reactions – Stripping reactions – Partial wave analysis of nuclear reaction cross sections – Breit-Wigner dispersion formula for $l = 0$ neutrons.

Unit – V: Elementary particles (18 Hours)

#Classification of elementary particle**#** - fundamental interactions – conservation laws and their validity – the C-P-T theorem – Properties of elementary particles: the Massless Bosons – the Leptons – the mesons – symmetry schemes of elementary particles – SU(3) multiplets of Hardons – Gellmann – Okubo mass formula for SU(3) multiplets – Gellmann-Nishijima formula – Quarks, Flavours and colours.

 # Self Study Portions #

Text Books:

1. Nuclear Physics – D.C. Tayal, Himalaya Publishing House – New Delhi
   Unit – I: Chapter-I: 1.6, 1.7, 8.3, 8.4, 8.9-A, 9.4, 9.4- 10.21
   Unit – II: Chapter-V: 5.4, 5.5, 5.7, 6.3, 6.5, 6.6, 6.9, 7.4, 7.6
   Unit- III: Chapter-XIII: 13.1A, 13.2

Unit – IV: Chapter-X: 10.4, 10.7, 10.9, 10.12, 10.14, 10.20, 10.24
Unit – V: Chpater-XVIII: 18.1-18.4

Books for Reference:

1. Nuclear Physics - R.R.Roy and B.P.Nigam, New Age Publishers.
2. Nuclear Physics – R.C. Sharma, KedarNath Ram Nath, New Delhi.
3. Nuclear and particle Physics – S.L.Kakani, ShubhraKakani, Viva books, First Pub, 2008. Elements of nuclear Physics – M.L. Pandya, R.P.S. Yadav , KedarNath Ram Nath, New Delhi.
4. Nuclear Physics & Particle Physics – SatyaPrakash, Sultan Chand & Sons, New Delhi

Web References:

1. https://swayam.gov.in/nd1_noc20_ph19/preview

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	**Code 20PPH3CC9**		**Title of the Course NUCLEAR AND PARTICLE PHYSICS**					**Hours 6**	**Credits 5**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓			✓		✓	✓	
CO3	✓	✓	✓	✓		✓	✓	✓		
CO4		✓	✓		✓			✓	✓	✓
CO5	✓	✓		✓	✓	✓	✓		✓	✓
Number of matches (√) = 36 (ie.) 72 %, Relationship : High										

Prepared by : Checked by :

Dr. N. Peer Mohamed Sathik Dr. C. Hariharan

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
III	**20PPH3CC10**	**CORE – X**	**QUANTUM MECHANICS**	**6**	**5**	**100**	**25**	**75**

Course Outcome:

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

1. Conceptualize the abstract nature of the wave function and its interpretation in a statistical sense, the admissibility conditions that the wave function should obey and realize the importance of conservation laws and equation of continuity in quantum dynamics
2. Reason out the equivalence between the classical concepts and quantum ideas under suitable restraining conditions
3. Apply the theory of Wave Mechanics to understand simple exactly solvable problems like Linear Harmonic Oscillator, Hydrogen Atom etc., and find how the Matrix Mechanics developed by Heisenberg complements the Wave Mechanics theory developed by Schroedinger
4. Introduce the various approximation methods developed to study higher order systems, interactions of matter with waves and radiations, as well as to understand the concepts of angular momenta and spin and how these lead to the concept of Pauli's exclusion principle
5. Understand the behaviour of physical systems in the relativistic limits using the methods developed by Klein-Gordan and Dirac which lead to the concept of negative energy states.

Unit – I: Concepts and Formalism of Quantum Mechanics (18 Hours)

Time dependent Schrödinger equation- Physical Interpretation of Wave function ψ: Normalization and Probability Interpretation -Conservation of Probability: Equation of Continuity

Expectation Values: Ehrenfest's Theorem -**#**Admissibility conditions on wave functions**#**- Stationary states: Time-independent Schrödinger wave equation.

Unit – II: Exactly Soluble Eigen Value Problems and Matrix Formulation (18 Hours)

Commutation relations -Eigen values and Eigen functions of angular momentum operators - One Dimensional Linear Harmonic Oscillator-Reduction of a Two Body Hamiltonian-Hydrogen Atom

Hilbert Space-Linear Operatos-Eigen Functions and Eigen Values - **#**Hermitian Operators**#** – Simultaneous Measurability of Observables-General Uncertainty Relation-Dirac's Notation - Equations of Motions - Schroedinger, Heisenberg and Interaction Representations

Unit – III: Approximation Methods (18 Hours)

Stationary State Perturbation theory: non-degenerate case- Application Stark Effect in the ground state (n=1) of Hydrogen atom - degenerate cases- Applications: Stark Effect in the first excited state (n=2) of Hydrogen atom

Time Dependent Perturbation Theory: First Order Perturbation–**#**Harmonic Perturbations**#**- Transition to Continuum States : Fermi's Golden Rule

Unit – IV: Angular Momentum and Spin States (18 Hours)

General angular momentum - **#**Eigen values of J^2 and J_Z**#** – Matrix Representation of J_+ , J_-, J_x and J_y– Angular Momentum Matrices - Angular Momentum Matrices Problems

Spin angular momentum- spin ½ states -Pauli's spin matrices and their properties-Particle Exchange Operator - Symmetric and Antisymmetric Wave Functions-Construction of wave - Symmetric and Antisymmetric Wave Functions – Pauli's Exclusion Principle –Wave Function for a Particle including spin

Unit – V: Relativistic Wave Equations (18 Hours)

Klein-Gordon Equation for free particle- Interpretation of Klein-Gordon's Equation-Dirac's Relativistic Equation for a free particle-Dirac's Matrices-Covariant form of Dirac's Equation-

Probability Density.

Plane Wave Solutions of the Dirac's Equation- Negative Energy States -Dirac's Equation for a Particle in a Central Potential– **#**Spin of a Dirac Particle**#**

 # Self Study Portions #

Text Books:

Units	References	Chapters/Topics
Unit – I	A Text Book of Quantum Mechanics- P.M. Mathews and K. Venkatesan, Tata McGraw Hill, New Delhi, Second Edition-2017	Chapter: 2 Topics: 2.1,2.2,2.3,2.4,2.6,2.7,2.8,2.9
Unit - II	A Text Book of Quantum Mechanics- P.M. Mathews and K. Venkatesan, Tata McGraw Hill, New Delhi, Second Edition-2017	Chapter: 4 & 6 Topics: 4.3,6.17,4.15,4.16 & 4.17
	Quantum Mechanics – G. Aruldhas, Prentice Hall of India, New Delhi, Second Edition,2009	Chapter: 3& 8 Topics: 3.1, 3.2, 3.3, 3.4, 3.6, 3.7, 3.8, 3.9, 8.1,8.2 & 8.3
Unit - III	A Text Book of Quantum Mechanics- P.M. Mathews and K. Venkatesan, Tata McGraw Hill, New Delhi, Second Edition-2017.	Chapter: 5 Topics: 5.1,5.2,5.3 &5.4
	Quantum Mechanics – G. Aruldhas, PHI, New Delhi, Second Edition,2009	Chapter: 12 Topics: 12.1,12.2,12.3 & 12.4
Unit - IV	Quantum Mechanics – G. Aruldhas, PHI, New Delhi, Second Edition,2009	Chapter: 8 & 13 Topics: 8.4,8.5,8.6,8.7,8.8,8.9, 13.1,13.2 & 13.3
Unit - V	Quantum Mechanics – G. Aruldhas, PHI, New Delhi, Second Edition,2009	Chapter: 15 Topics: 15.1,15.2,15.4,15.5,15.6,15.7,15.8,15.9 & 15.10

Books for Reference:

1. Quantum Mechanics – Leonard Issac Schiff &Jayendra N Bandyopadhyay, McGraw Hill Education (India) Private Limited, New Delhi, Fourth Edition, 2014.
2. Quantum Mechanics, John L Powell and Bernd Crasemann, Dover Publications Inc. (2015)

Web Reference: (Units: I, II and III.)

NPTEL Course in Physics- Quantum Mechanics and Applications- Prof. AjoyGhatak, IIT New Delhi **https://nptel.ac.in/courses/115/102/115102023/**

by Klein-Gordan and Dirac which lead to the concept of negative energy states.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes :

Semester III	**Code 20PPH3CC10**	**Title of the Course QUANTUM MECHANICS**							**Hours 6**	**Credits 5**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO4	✓	✓		✓		✓	✓	✓	✓	
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of matches (√) = 41 (ie.) 82 %, Relationship : High										

Prepared by :
Dr. A. Ishaq Ahamed

Checked by :
Dr. S. Abbas Manthiri

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credit	Max. Mark	Internal Marks	External Marks
III	20PPH3CC11	CORE – XI	STATISTICAL MECHANICS	6	4	100	25	75

Course Outcomes:

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

CO 1. Acquire the Basic Principles Of Statistical Mechanics In Physics
CO 2. Ability to understand the fifth state of matter under condensation.
CO 3. Capacity to Visualize the behavior pattern of identical groups.
CO 4. Explore new avenues in phase transition.
CO 5. Get motivated to carryout research in frontier areas Astrophysics, condensed matter physics.

Unit – I: Classical Statistics (18Hours)

Phase space – **#**Density of distribution in phase space**#** - Ensembles – Canonical – micro canonical and grand canonical (concepts only) - Liouville's theorem – statistical equilibrium – partition function w.r.t grand canonical ensemble – properties – relation between partition function and thermodynamic quantities – thermo dynamic probability – Relation between statistical and thermodynamical quantities.

Unit – II: Kinetic theory (18Hours)

#Binary collisions**#** – Boltzmann transport equation – Boltzmann's H-theorem and its analysis – transport phenomenon – mean free path – zero order approximation – viscosity of a gas – Navier-Stoke'sequation .

Unit – III: Entropy and Thermodynamics (18Hours)

Entropy – Principle of increase of entropy – entropy and disorderness – **#**entropy and probability**#** – Gibb's paradox – resolution of paradox – Sackur-tetrode equation – thermodynamic potentials and reciprocity relations – equilibrium conditions (thermal Mechanical and Concentration).

Unit – IV: Quantum statistics (18 Hours)

#Ideal Bose systems**#** – Photon gas – Thermal properties of Bose-Einstein gas – B-E condensation – B-E degeneracy – Mean energy of Fermions – Electron gas in metals – Thermionic emission work function – white dwarfs.

Unit – V: Advanced Statistical Mechanics (18 Hours)

Super fluids - Liquid Helium - λ-transition - Tisza's two fluid model - Landau's theory of phase transitions - Pauli's theory of paramagnetism - General formulation of Ising model – **#**One dimensional Ising model **#**- Order parameter in critical phenomenon.

 # Self Study Portions #

Text Books:

1. Statistical Mechanics, Gupta and Kumar, PragathPrakasan Publication, 22nd Edition.
   Unit – I: Page No: 67 – 142
   Unit – IV: Page No: 243 – 276
2. Statistical Mechanics, B.K. Agarwal and Melvin Eisner, Newage Publication, Second Edition.
   Unit – III: Page No: 37 – 53.
3. Statistical Mechanics, KERSON HUANG, Wiley India Publication, Second Edition.
   Unit – II: Page No: 56 – 117
   Unit – V: Page No: 307 – 396

Online course:

https://swayam.gov.in/nd1_noc20_cy28/preview

Web References:

http://stxavierstn.edu.in/ict_ppts/phy/anavenus/9.pdf
https://ps.uci.edu/~cyu/p238C/LectureNotes/IsingModel/IsingModel.pdf

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	**Code 20PPH3CC11**		**Title of the Course STATISTICAL MECHANICS**					**Hours 6**	**Credits 5**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓		✓	✓	✓	✓	✓
CO2	✓	✓		✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓			✓	✓			✓
CO4	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓	✓		✓	✓	✓		✓	✓	
Number of matches (√) = 40 (ie.) 80 %, Relationship : High										

Prepared by :

1. F.S.MUZAMMIL

Checked by :

1. J.UMAR MALIK

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
III	20PPH3DE3A	Discipline Specific Elective - III	MICROPROCESSOR AND MICROCONTROLLER	6	4	100	25	75

Course Outcomes:

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

1. Learn the hardware and software functions of Intel 8085 microprocessor and 8051 microcontroller.
2. Develop the assembly language programming skills.
3. Learn the functions of memory and I/O peripherals for interfacing of Intel 8085 Microprocessor and Intel 8051 microcontroller.
4. Understand the microprocessor/microcontroller architectures and programming concepts.
5. Acquire the talent to implement the applications of microprocessor/microcontroller for data processing, electronic instrumentation and control systems according to the social needs.

UNIT–I: Intel 8085 Microprocessor Hardware (18 Hours)

Intel 8085 architecture – Pin configuration – Timing diagram for opcode fetch cycle and memory read and write - Address space partitioning – memory mapped I/O and I/O mapped I/O schemes – memory and I/O interfacing – **#**interrupts of Intel 8085**#**.

Unit – II: Intel 8085 Assembly language (18 Hours)

Addressing modes – instructions set – data transfer, arithmetic, branch, stack, I/O and machine control group

Programming: addition, subtraction, multiplication and division of 8-bit numbers – **#**Ascending and descending order**#** – sum of the series of 8-bit numbers.

Unit-III: Peripheral Devices (18 Hours)

Programmable Peripheral Interface (PPI) Intel 8255 – Programmable DMA Controller Intel 8257 – Programmable Interrupt Controller (PIC) Intel 8259.

Interfacing: **#**ADC 0800**#** – DAC 0800 – Stepper Motor Control

Unit – IV: Intel 8051 Microcontroller (18 Hours)

Differences between microprocessor and microcontroller – architecture of 8051 – memory organization – pin details of 8051 – special function registers – Timers/Counters – Timer and control registers – Timer modes of operation – counters – serial data I/O – SCON – PCON – Serial data transmission modes – Interrupts in 8051- **#**Interrupt control**#**

Unit – V: 8051 Assembly Language (18 Hours)

Instruction set: addressing modes – data transfer, arithmetic, logical, Boolean variable manipulation and program branching groups

Programming: **#**BCD addition**#** – Average of the given numbers – I/O Port – Timer Mode 1 – Counter

 # Self Study Portions #

Text Books:

Unit– I and II: B.Ram, *Fundamentals of Microprocessors and Microcontrollers*, DhanpathRai Publications(P) Ltd.
Unit – I: Chapter: 3.1-3.1.5, 3.3.1,3.3.2, 3.3.4, 7.2,7.2.1, 7.2.2, 7.3.1,7.3.2, 7.5, 7.5.1,7.5.2,7.5.3
Unit – II: Chapter: 4.3, 4.6, 5.5, 6.3, 6.4, 6.21, 6.26, 6.29, 6.30.
Unit – III: Chapter : 7.7.1, 7.7.2, 7.7.3, 7.7.4, 7.8, 7.8.1, 7.9, 8.6, 8.12, 9.7
Unit – IV, V: P.S. Manoharan, *Microprocessor&Microcontroller*, Charulatha Publication, 2011.
Unit - IV: Chapter: 4.1 – 4.9
Unit – V: Chapter : 5.2,5.3, 5.3.1,5.3.2, 5.3.3, 5.3.4, 5.3.4, 5.4, 5.5, 5.6.1, 5.7

Books for Reference:

1. Ramesh S.Gaonkar, *Microprocessor architecture, Programming and applications with the 8085*, Penram International Publishing (India) , Fourth edition.

2. A.P.Godse D.A. Godse, *Microprocessor and Microcontroller*, Technical Publication Pune, First edition-2009.

3. V.Vijayendran, *Fundamentals of Microprocessors-8085 Architecture*, Programming & Interfacing, S.Vishvanathan (Printers & Publishers), PVT. LTD.

Web Reference:

https://ict.iitk.ac.in/courses/microprocessors-and-microcontrollers/

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	**Code** **20PPH3DE3A**		**Title of the Course** **MICROPROCESSOR AND MICROCONTROLLER**						**Hours** **6**	**Credits** **4**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓		✓	✓		✓	✓
CO3	✓		✓	✓		✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓		✓	
CO5	✓	✓		✓					✓	
Number of matches (√) = 37 (ie.) 74 %, Relationship : High										

Prepared by :

Mr. A. Mohamed Saleem

Checked by :

Mr. A. Abbas Manthiri

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
III	**20PPH3CC12P1**	**CORE – XII**	**DIGITAL ELECTRONICS– PRACTICAL**	**3**	**2**	**50**	**10**	**40**

Course Outcomes:

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

1. Logic gates, their construction and their truth tables
2. De Morgan's Theorems, their verification and simplification of Boolean expressions
3. Construction of digital circuits, flip-flops, registors and counters
4. Construction of adders, subtractors, comparators, multiplexers and demultiplexers and IC Regulated Power Supplies required for these
5. Digital principles to apply them to newer problems that they may encounter in future

List of Experiments:

1. IC Regulated Dual Power Supply
2. Verification of De Morgan's theorem and simplification of Boolean expressions using K-Map.
3. Adders and Subtractors using Logic Gates.
4. Counters & Displays. [0 – 9 counter using IC 7490, 7 segment display using decoder driver 7447]
5. Flip flops – RS, JK & D flip flops.
6. Shift registers (Shift left and shift Right)
7. Comparators (1-bit and 2-bit)
8. Multiplexer and Demultiplexer.

Books for Reference:

1.M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , Reprint 2010.

2.C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First Edition, 2007.

Web References:

www.physicstutoruials.org
www.sciencelearn.org.nz

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	**Code** **20PPH3CC12P1**	**Title of the Course** **DIGITAL ELECTRONICS– PRACTICALS**					**Hours** **3**				**Credits** **2**
Course Outcomes (COs)	**Programme Outcomes (POs)**						**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓			✓	✓	✓	✓	
CO2	✓	✓	✓	✓			✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓			✓	✓	✓	✓	
CO4	✓	✓	✓	✓			✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Number of matches (√) = 43 (ie.) 86 %, Relationship : High											

Prepared by :
Mr. A. Mohamed Saleem

Checked by
Dr. A. Ishaq Ahamed

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
III	**20PPH3CC12P2**	**CORE – XII**	**NUMERICAL PROGRAMMING IN PHYSICS – PRACTICAL**	**3**	**2**	**50**	**10**	**40**

Course Outcomes:

At the end of this course, students will be able to
Some basic numerical methods for solving quadratic and polynomial equations
The solution of matrices and regression analysis using least square fitting
The evaluation of statisitcal parameters and random number generation
The implementation of these methods using C language
Application these techniques and programming knowledge to solve certain problems in Physics

List of Experiments:

1. False position method: Roots of a Quadratic equation
2. Newton's Raphson's method: Roots of a polynomial equation.
3. Gauss elimination Method: Application to electrical network.
4. Linear Least Squares Fitting: Determination of the charge of an electron.
5. The characteristics equation of matrix using Fadeev- Leverrier method.
6. Determinant of a matrix- Decompose method
7. Evaluation of statistical parameters: Mean deviation, Standard deviation
8. Random number generation – Determination of the value of π.

Books for Reference:

1.M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , Reprint 2010.

2.C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First Edition, 2007.

Web References:

www.physicstutoruials.org
www.sciencelearn.org.nz

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	**Code 20PPH3CC12P2**	**Title of the Course NUMERICAL PROGRAMMING IN PHYSICS – PRACTICALS**					**Hours 3**	**Credits 2**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓			✓	✓	✓	✓	
CO2	✓	✓	✓			✓	✓	✓	✓	✓
CO3	✓	✓	✓		✓	✓	✓	✓	✓	
CO4	✓	✓	✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches (√) = 41 (ie.) 82 %, Relationship : High										

Prepared by :

Mr. A. Mohamed Saleem

Checked by :

Dr. A. Ishaq Ahamed

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
IV	20PPH4CC13	CORE – XIII	SOLID STATE PHYSICS	6	5	100	25	75

Course Outcome:

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

1. Acquire a knowledge of various crystal systems, reciprocal lattice, and crystal defects.
2. Learn the principle of semiconductors, lattice vibrations and demonstrate the theories of lattice specific heats.
3. Understand the thermal and electrical conductivity as well learnt Free Electron theory and Band theory of solids.
4. Understand the concept of Dielectrics and Magnetism in solids.
5. Acquire the knowledge of superconductivity and their applications

Unit-I: Crystal Physics (18 Hours)

Crystals-Crystal lattice and translation vectors -Types of lattices (2D & 3D)- Lattice direction and planes- Simple crystal structures-Close packed and loose packedstructures- Structure of Diamond, Zinc Blende and Sodium chloride- **#**X-ray diffraction**#** - Powder crystalmethod -Reciprocal lattice-Properties-Various Defects.

Unit-II: Semiconductors, Lattice Vibrations and Thermal Property (18 Hours)

Intrinsic and Extrinsic semiconductors- Fermi level and conductivity – Lattice vibrations – Onedimensional Monatomic lattice - **#**One dimensional diatomic lattice**#** – Phonons - Phonon momentum-Lattice heat capacity- Classical theory (Dulong and Petit Law) – Einstein's theory-Debye's model-Density modes.

Unit-III: Free Electron Theory and Band Theory of Solids (18 Hours)

#Drude - Lorentz's classical theory of free electron gas**#** – Expression for thermal and electricalconductivity - Wiedemann-Franz Law – Free electron Gas in a 3-D-Application of free electron gasmodel – Bloch theorem –Kronig-Penny model – velocity and effective mass of electron.

Unit-IV: Dielectrics and Magnetism in Solids (18 Hours)

#Polarization and Susceptibility**#** – Local field-Dielectric constant and Polarizability (Clausius-Mosotti Equation) - Sources of Polarizability - Ferroelectricity - Piezo electricity –Classical theory of diamagnetism - quantum theory of paramagnetism -Weiss theory of ferromagnetism-Hund rules-#Concept of Domains# –Antiferromagnetism–Ferrimagnetism.

Unit-V: Superconductivity (18 Hours)

Introduction –The Meissner effect – Soft and hard superconductors – #Thermodynamicalandoptical properties#– Type -I and Type-II superconductors- London equations – BCS theory- Quantumtunneling-Josephson tunneling- Theory of DC& DC Josephson effects-HighTcsuperconductors – **#**SQUIDS**#** – critical fields – critical currents –Magnetic levitations.

 # self study portion #

Text Books:

1. Solid State Physics – S. O. Pillai, New Age International (P) Ltd, Revised 6th Edition, 2008.
Page Nos:
87 – 109, 123 – 146, 164 – 169, 179 – 189, 334 – 361, 373 – 428, 441 – 507, 523 – 567,625 – 663.

Books for Reference:

1. Introduction to Solid State Physics - C.Kittel, Wiley Publication.
2. Solid State Physics - Gupta, Kumar, Sharma, S. Chand & Company Ltd.
3. Solid State Physics – R.K. Puri and V.K. Babbar, S. Chand & Company Ltd.
4. Solid State Physics - Gupta Saxena, PrakathiPrakasan Publications.

Online course Reference

https://nptel.ac.in/courses/115/105/115105099/

Web References:

https://www.crystalage.com/crystal_information/seven_crystal_systems/

http://www.tutorsglobe.com/homework-help/physics/lattice-vibration-75520.aspx

https://opentextbc.ca/universityphysicsv3openstax/chapter/band-theory-of-solids/

https://www.askiitians.com/iit-jee-electrostatics/dielectrics-and-polarisation/

https://opentextbc.ca/universityphysicsv3openstax/chapter/superconductivity/

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester IV	**Code 20PPH4CC13**		**Title of the Course SOLID STATE PHYSICS**						**Hours 6**	**Credits 5**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓				✓	✓	✓	✓	
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓		✓	✓	
CO4	✓		✓		✓	✓	✓	✓	✓	
CO5	✓		✓		✓	✓		✓	✓	✓
Number of matches (√) = 37 (ie.) 74 %, Relationship : High										

Prepared by :
Dr. A.S. Haja Hameed

Checked by :
Dr. C. Hariharan

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
IV	20PPH4CC14	CORE-XIV	ELECTRONIC COMMUNICATION	6	5	100	25	75

Course Outcomes:

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

1. Understand the fundamental concepts of digital modulation and transmission.
2. Identify the configuration of optical fiber cable and its uses in digital communication system.
3. Understand the basic principle of antenna and its use according to its radiation pattern.
4. Explain the satellite orbital pattern, satellite positions and possibility of line sight for communication between earth station and satellite.
5. Improve social communication in remote areas and research activities such as space science, remote sensing and weather prediction.

Unit – I: Digital Modulation (18 Hours)

Bit rate, M-ary encoding, Baud and Minimum band width - Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) – FSK transmitter and receiver – Binary Phase Shift Keying (BPSK) – BPSK receiver – **#**Quaternary Phase Shift Keying (QPSK) **#**– QPSK band width - QPSK transmitter and receiver

Unit – II: Digital transmission (18 Hours)

Pulse modulation – PCM – PCM sampling – Block diagram - sampling rate – Signal to quantization noise ratio – companding – analog and digital – Delta modulation transmitter and receiver – Adaptive delta modulation - Differential PCM - **#**Time Division Multiplexing (TDM) **#**

Unit – III: Optical Fiber Communications (18 Hours)

Block diagram of an optical fiber communication system – optical fiber types – construction – cable configuration – Snell's law - critical angle – acceptance angle, acceptance cone, and numerical aperture – **#**optical fiber configuration**#** – mode of propagation – index profile – single mode and multimode step index - graded index – optical fiber comparison – losses in optical fiber cables – power, absorption, Raleigh scattering, radiation and coupling - modal dispersion (qualitative description only).

Unit –IV: Antennas (18 Hours)

Basic antenna operation – antenna equivalent circuit – antenna coordinate system and radiation patterns –near and far fields – radiation resistance and antenna efficiency – antenna gain – effective isotropic radiated power(EIRP) –antenna polarization –beamwidth –bandwidth – antenna input impedance – **#**basic antenna**#** – elementary doublet – half wave dipole – antenna arrays – broadside array – end fire array –parabolic reflector antenna – reflectors –beam width – efficiency – power gain – center feed

Unit – V: Satellite Communications (18 Hours)

#Kepler's laws**#** – satellite orbits – satellite elevation categories – satellite orbital patterns – geosynchronous satellites – round trip time delay of geosynchronous satellites – Clarke orbit – advantages and disadvantages of geosynchronous satellites – angle of elevation – azimuth angle – satellite system link models – uplink and downlink model – transponder

 # Self Study Portions #

Text Books:

Wayne Tomasi, *Electronic Communications Systems Fundamentals Through Advanced*, Pearson Education, Fifth Edition.

Unit – I : 9.2 - 9..5.2
Unit – II : 10.2 – 10.4.1, 10.5, 10.9 – 10.9.2, 10.12 – 10.14 & 11.2
Unit – III : 13.5 – 13.10
Unit – IV :15.2, 15.4, 15.5, 15.7, 15.8, 15.9, 15.10, 15.11, 15.12, 15.15.1, 15.15.2, 15.7.1, 15.7.2.1
Unit – V :25.3 – 25.6.2, & 25.9 – 25.9.3

Books for Reference :

1. Louis E.Frenzel, *Communication ElectronicsPrinciples and applications*, Tata McGraw-Hill PublishingCompany Limited, Third edition,2002.
2. Dennis Roddy – JhonCoolen, *Electronic Communications*, EsternEconomy Edition, Fourth Edition.

Web reference

1. https://nptel.ac.in/courses/117/101/117101051/
2. https://swayam.gov.in/nd1_noc20_ee20/preview

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester IV	**Code 20PPH4CC14**		**Title of the Course ELECTRONIC COMMUNICATION**						**Hours 6**	**Credits 5**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO3	✓		✓	✓		✓		✓	✓	✓
CO4		✓	✓	✓	✓	✓	✓		✓	
CO5	✓			✓	✓		✓		✓	
Number of matches (√) = 38 (ie.) 76 %, Relationship : High										

Prepared by : Checked by :

Mr. A. Mohamed Saleem Mr. A. Abbas Manthiri

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
IV	20PPH4DE4A	Discipline Specific Elective - IV	CRYSTAL GROWTH AND THIN FILMS	6	4	100	25	75

Course Outcome:

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

1. Understand various nucleation theories in crystal growth.
2. Apply the knowledge of solution growth and experiment methods to grow crystals.
3. Conceptualize the methods of crystal growth from melt and vapor.
4. Understand various thin film techniques and apply to various fields.
5. Be capable analyzing the thin films by microscopic and spectroscopic methods.

Unit – I: Nucleation and Nucleation theory (18 Hours)

Solution, Solubility and Supersolubility – Expression of Supersaturation – Meir's solubility diagram – Measurement of metastable zone width of solution, induction period, Gibb's free energy, interfacial tension and critical radius for crystallization- Classical theory of nucleation: Energy formation of a nucleus – Spherical nucleus –**#**Cylindrical nucleus**#**.

Unit – II: Low Temperature Solution growth (18 Hours)

Crystallization by slow cooling methodandslow evaporationmethod – Temperature gradient method – SankaranarayananRamasamy (SR) method - Gel growth – Principle of gelgrowth – various types of gel – Structure of gel – Growth of Crystals in gels – #Importance of gel technique#.

Unit – III: Other Crystal growth techniques (18 Hours)

High Temperature solution growth(Flux growth) –Choice of flux - Melt growth methods: Czochralskiand Bridgeman methods - Physical Vapor Deposition (PVD) - **#**Chemical Vapour Deposition (CVD) **#**.

Unit – IV: Preparation of Thin film (18 Hours)

Physical Method : DC sputtering – Laser beam evaporation – Electron Beam Evaporation – Chemical methods:– Pyrolysis — Disproportionation method – #Chemical deposition# – Electrodeposition – Massmethod (Micro balance technique) – Optical method(Photometric) – #Applications of thin films#.

Unit – V: Thin filmcharacterization (18 Hours)

X-ray microanalysis –Hall Effect measurement-#Electron Microscopy# –Scanning Electron Microscopy (SEM)–Atomic Force Microscopy (AFM)- Auger Electron Spectroscopy (AES). X-Ray Photo Electron Spectroscopy (XPES) – **#**Scanning Tunneling Microscopy (STM) **#** - Secondary Ion Mass Spectrometry (SIMS).

 # self study portion #

Books for Study:

1. Crystal Growth, Dr. P. SanthanaRaghavan and Dr. P. Ramasamy, KRU Publications.

Units Page Numbers

I 19 – 30
II 151 – 164
III 198 – 247

2. Thin Film Fundamentals, A. Goswami, Reprint, 2008, New Age International Publishers.

Units Page Numbers

IV 29 – 40

V 111 – 137

Online course:

https://www.classcentral.com/course/swayam-chemical-crystallography-13940

https://swayam.gov.in/nd2_arp19_ap98/preview

Web References:

https://www.aimspress.com/article/10.3934/matersci.2019.2.174/pdf

http://www.physics.uwo.ca/~lgonchar/courses/p9812/Lecture14_Growth.pdf

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester IV	**Code 20PPH4DE4A**		**Title of the Course CRYSTAL GROWTH AND THIN FILMS**						**Hours 6**	**Credits 4**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓	✓		✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓		✓	✓	✓	✓		✓	✓	
CO4	✓		✓		✓	✓	✓	✓	✓	✓
CO5	✓		✓		✓	✓		✓	✓	✓
Number of matches (√) = 40 (ie.) 80 %, Relationship : High										

Prepared by :

Dr. A.S. HajaHameed

Checked by :

Dr.J. Ebenezar

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
IV	20PPH4EC2	EXTRA CREDIT COURSE - II	PHYSICS FOR CAREER EXAMINATIONS	---	5 (Not for CGPA)	100	--	100

Course Outcomes :

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

1. Solve MCQ types of questions related to CSIR syllabus
2. Motivate to think the need of problem solving skills in Physics concepts
3. Learn, prepare for JRF examinations
4. Enhance the knowledge in Physics
5. Gather materials for competitive examinations and excel in them.

Unit – I: Classical Mechanics

Dynamical systems, Phase space dynamics, stability analysis, central force motions. Two body collisions – Problems in Poisson brackets and canonical transformations- Applications of Lagrangian and Hamiltonian formalisms and equations of motions- Hamiltonian-Jacobi theory and its applications scattering in laboratory and centre of mass frames-symmetry invariance and Noether's theorem – Lorentz transformations, relativistic kinematics and mass-energy equivalence

Unit – II: Thermodynamic and statistical Physics

Consequences of thermodynamic laws – Thermodynamic potentials, Maxwell relations, chemical potential, phase equilibriums - Uses of micro-canonical, canonical and grand canonical ensembles and patrician functions- Applications of the relations connecting free energy and thermodynamic quantities – Problems in classical and quantum statistics

Unit – III: Quantum Mechanics

Eigen value problems-Wave function in co-ordinate and momentum representations – Uses of commutators and Heisenberg uncertainty principle –Dirac notation for state vectors – Motion in a central potential : orbital angular momentum, angular momentum algebra, spin, addition of angular momenta; Applications of time – independent perturbation theory , variational method, time – dependent perturbation theory, WKB theory and Fermi's Golden rule - spin-orbit coupling, and its consequences – Applicatins of Klein –Gordon and Dirac equations

Unit – IV: Atomic and Molecular Physics

Quantum states of an electron in an atom – Electron spin – Spectrum of Helium and Alkali atom - Relativistic corrections for energy levels of Hydrogen atom, hyperfine structure and isotropic shift, width of spectrum lines, LS and JJ couplings – Zeeman, Paschen– Bach and Stark effects – Problems in electronic, rotational, vibrational, and Raman spectra of diatomic molecules, ESR and NMR – uses of Frank-Condon coefficient - Laser theory and problems

Unit – V: Electronics and experimental methods

Linear and Nonlinear curve fitting, chi-square test –transducers (temperature, pressure/vacuum, magnetic fields, vibration, optical and particle detectors) – Measurement and control - Signal conditioning and recovery –Impedance matching, amplification (Op-amp based, instrumentation amp, feedback), filtering and noise reduction, shielding and grounding , Fourier transform, lock-in detector, box-car, integrator, modulation techniques- High frequency devices (including generators and detectors)

Text Books:

1. **Dr. Surekha Tomar CSIR JRF exam for Physical sciences , Upkar Prakashan, Agra 2019**
   - Unit – I: p. 128-197
   - Unit – II: p. 389-472
   - Unit – III: p. 295-388
   - Unit – IV: p.644-698
   - Unit – V: p.473-591

Books for Reference:

www.physics.iisc.ernet.in

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester IV	**Code 20PPH4EC2**		**Title of the Course PHYSICS FOR CAREER EXAMINATIONS**				**Hours -**			**Credits 5 (Not for CGPA)**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓	✓	✓	
CO2	✓			✓		✓	✓	✓	✓	
CO3	✓	✓		✓		✓	✓	✓	✓	
CO4	✓			✓	✓	✓			✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches (√) = 36 (ie.) 72 %, Relationship : High										

Prepared by :

Dr. R. Radhakrishnan

Checked by :

Dr. S. Prabakaran

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
IV	20PPH4CC15P1	CORE – XV	MICROPROCESSOR AND MICROCONTROLLER - PRACTICAL	3	2	50	10	40

Course Outcomes:

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

1. Number systems and conversion from one system to another
2. Interfacing principles and waveform generation
3. Basic arithmetic operations and explore possible applications beneficial to the society
4. Stepper motor control and traffic light control and other some similar projects
5. To carry out simple electronic, microprocessor and microcontroller projects not only as a hobby. But also to help the society with their applications

List of Experiments:

Microprocessor Experiments using Intel 8085

1. Conversion from Decimal to Hexadecimal and vice versa.
2. Interfacing of ADC
3. Wave form generation using DAC 0800
4. Interfacing of Hex key board

Microcontroller Experiments using Intel 8051

5. Basic Arithmetic Operations
6. Interfacing of seven segment display
7. Stepper Motor control
8. Traffic light control

Books for Reference:

1.M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , Reprint 2010.

2.C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First Edition, 2007.

Web References:

www.physicstutoruials.org
www.sciencelearn.org.nz

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester IV	**Code 20PPH4CC15P1**		**Title of the Course MICROPROCESSOR AND MICROCONTROLLER :PRACTICALS**					**Hours 3**	**Credits 2**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓			✓	✓	✓	✓	
CO2	✓	✓	✓			✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches (√) = 42 (ie.) 84 %, Relationship : High										

Prepared by :

Dr. A. Ishaq Ahamed

Checked by :

Mr. A. Mohamed Saleem

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
IV	20PPH4CC15P2	CORE – XV	NUMERICAL SIMULATIONS IN PHYSICS - PRACTICAL	3	2	50	10	40

Course Outcomes:

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

1. For the evaluation of the Special Functions like Hermite Polynomials to simulate the behaviour of LHO
2. Of Random Number Generation to simulate Brownian Motion, Radioactivity Decay and Interpolation using Lagrange's Method to simulate nuclear scattering and finding out the nuclear cross-section
3. Of Euler Method and RK4 Method to solve diffirential equations to stimulate projectile motion and oscillations of a LCR circuit
4. Numerical integration using Simpson's 1/3 Rule to study the motion of a particle in a central field potential
5. To simulate more such problems so as to improve the understanding of concepts and applications of Physics

List of Experiments:

1. Plotting of Linear Harmonic Oscillator wave functions.
2. Numerical simulation of Beats phenomenon.
3. Lagrange's Interpolation: Determination of nuclear scattering energies.
4. Simulation of Brownian motion in a fluid
5. Simulation of Radioactive decay.
6. Simulation of Projectile Motion using Euler's method.
7. Simpson's 1/3 Rule: Motion of a body in a central potential.
8. RK-IV method: Electromagnetic Oscillations in an LCR circuit.

Books for Reference:

1.M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , Reprint 2010.

2.C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First Edition, 2007.

Web References:

www.physicstutoruials.org
www.sciencelearn.org.nz

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester IV	**Code 20PPH4CC15P2**		**Title of the Course NUMERICAL SIMULATIONS IN PHYSICS - PRACTICALS**					**Hours 3**	**Credits 2**
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**			
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓			✓	✓	✓	✓	
CO2	✓	✓	✓			✓	✓	✓		
CO3	✓	✓	✓	✓		✓	✓	✓	✓	
CO4	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches (√) = 39 (ie.) 78 %, Relationship : High										

Prepared by :

Mr. A. Mohamed Saleem

Checked by :

Dr. A. Ishaq Ahamed

Note:

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High