B.Sc., Physics

Programme Code - UPH

(Aided & SF)

Programme outcome - PO (Aligned with Graduate Attributes)- Bachelor of Science (B.Sc.,)

Scientific Knowledge and Critical Thinking

Apply the knowledge of Life Science, Physical and Chemical Science, Mathematics, statistics, Computer science and humanities for the attainment of solutions to the problems that come across in our day-to-day life/activities.

Problem Solving

Identify and analyze the problem and formulate solutions for problems using the principles of mathematics, natural sciences with appropriate consideration for the public health, safety and environmental considerations.,

Communication and Computer Literacy

Communicate the fundamental and advanced concepts of their discipline in written and oral form. Able to make appropriate and effective use of information and information technology relevant to their discipline

Life-Long Learning

Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Ethical, Social and Professional Understanding

Commitment to principles, codes of conduct and social responsibility in order to behave consistently with personal respect. Acquire the responsibility to contribute for the personal development and for the development of the community. Respect the ethical values, social responsibilities and diversity.

Innovative, Leadership and Entrepreneur Skill Development

Function as an individual, and as a member or leader in diverse teams and in multidisciplinary settings. Become an entrepreneur by acquiring technical, communicative, problem solving, intellectual skills.

THIAGARAJAR COLLEGE, MADURAI – 9.

(Re-Accredited with 'A' Grade by NAAC)

Department of Physics

"LIGHT"

(Learn with focus; **I**nnovate for a cause; be **G**rateful; be **H**umane; **T**ransform dreams into reality)

VISION
To provide an ambient environment for teaching and research in physics with focus on achieving academic excellence
MISSION
• *To contribute to develop and sustain teaching and evaluation methods in physics learning in tune with emerging trends in science* • *To constantly explore and enhance research potential among faculty and students to promote innovation* • *To bridge the gap between curriculum based learning and career readiness/employability of physics graduates* • *To create a conscientious awareness among students about issues pertaining to welfare of society and environment.*

Programme Educational Objectives (PEO)

The objectives of this programme is to equip/prepare the students to

PEO1	A successful career in academia, government, industry, corporates or as an entrepreneur, or as self-employed.
PEO2	Continue to learn and advance in academia to undertake higher education with focus on research and development
PEO3	Communicate effectively by way presenting a brief lecture on a specific topic in physics or writing scientific reports, projects, dissertation and engage in debates and discussion
PEO4	Acknowledge the importance of participation in co-curricular and extra-curricular activities to nurture and grow leadership skills,
PEO5	be socially sensitive to contemporary issues and play a constructive role in the welfare of the society

Programme specific outcomes- B.Sc., Physics

On the successful completion of B.Sc., Physics, the students will be able to

PSO1	Identify key concepts, principles and fundamental laws that are central to the study of various areas of physics, define and describe them with clarity
PSO2	Demonstrate the application of physics principles, concepts and laws with necessary experimental background and assess their consequences
PSO3	Explain the mathematical foundation of the underlying physics principles, concepts and laws
PSO4	Formulate, discuss and analyses problems in physics identifying key concepts and principles to solve them
PSO5	Plan and execute an experiment through careful observations, precise measurements, analyses, interpretation and effectively communicate the results by way of presenting a brief lecture on a science topic or writing scientific reports, projects, dissertation and engage in debates and discussions

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined B.Sc. Physics on or after June 2020)
PROGRAMME CODE : UPH

Semester – I

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted/ Semester	Max Marks CA	Max Marks SE	Total
Part I Tamil		IkkalaIlakkiyam	6	3	90	25	75	100
Part II English		Communicative English - I	6	3	90	25	75	100
Core 1	UPH20C11	Properties of Matter	4	3	60	25	75	100
Core 2	UPH20C12	Heat and Thermodynamics	4	3	60	25	75	100
Core Lab 1	UPH20CL21	Major Practical-I	2	-	30	-	-	-
Generic Elective	UMA20GE11P	Ancillary Mathematics-I	6	5	90	25	75	100
AECC I	U20ES11	Environmental Science	2	2	30	15	35	50
TOTAL			**30**	**19**	**450**	**140**	**410**	**550**

Semester – II

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted/ Semester	Max Marks CA	Max Marks SE	Total
Part I Tamil		Tamil / Other Language	6	3	90	25	75	100
Part II English		English	6	3	90	25	75	100
Core 3	UPH20C21	Mechanics	4	3	60	25	75	100
Core 4	UPH20C22	Optics	4	3	60	25	75	100
Core Lab 1	UPH20CL21	Major Practical-I	2	2	30	40	60	100
Generic Elective	UMA20GE11P	Ancillary Mathematics-II	6	5	90	25	75	100
AECC II	U20VE21	Value Education	2	1	30	15	35	50
TOTAL			**30**	**20**	**450**	**180**	**470**	**650**

Semester – III

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted	Max Marks CA	Max Marks SE	Total
Part I Tamil	U20P131	Tamil / Other Language	6	3	90	25	75	100
Part II English	U20EN31	English for Comm. III	6	3	90	25	75	100
Core 5	UPH20C31	Electricity &Magnetism	4	4	60	25	75	100
Core 6	UPH20C32	Modern Optics	4	4	60	25	75	100
Core Lab 2	UPH20CL41	Major Practical-II	2	-	30	-	-	-
Generic Elective	UCH20GE31 P	General Chemistry - I	4	4	60	25	75	100
Generic Elective Lab	UCH20GL41 P	Ancillary Chemistry Lab – Volumetric analysis	-	2	30	-	-	-
NME I	UPH20NE31	Solar energy	2	2	30	15	35	50
TOTAL			**30**	**22**	**450**	**140**	**420**	**550**

Semester – IV

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted	Max Marks CA	Max Marks SE	Total
Part I Tamil	U20P141	Tamil / Other Language	6	3	90	25	75	100
Part II English	U20N41	English for Comm. IV	6	3	90	25	75	100
Core 7	UPH20C41	Introduction to Remote Sensing and GIS	4	4	60	25	75	100
Core 8	UPH20C42	Fundamentals of Electronics	4	4	60	25	75	100
Core Lab 2	UPH20CL41	Major Practical-II	2	2	30	40	60	100
Generic Elective	UCH20GE41P	General Chemistry - II	4	4	60	25	75	100
Generic Elective lab	UCH20GL41P	Ancillary Chemistry Lab – Volumetric analysis	2	2	30	40	60	100
NME – II	UPH20NE41	Non-conventional Energy	2	2	30	15	35	50
TOTAL			**30**	**24**	**450**	**220**	**530**	**750**

Semester – V

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted	Max Marks CA	Max Marks SE	Total
Core	UPH20C51	Elementary Solid State Physics	6	6	90	25	75	100
Core	UPH20C52	Analog Electronics	6	6	90	25	75	100
Core	UPH20C53	Modern Physics	5	5	75	25	75	100
Core Elective I	UPH20CE51 A/B/C	Numerical Methods with Programming in C /Mathematical Physics/Introduction to Microprocessor	5	5	75	25	75	100
SEC I	UPH20SE51 A/B/C	Introduction to nanophysics-I/ Medical physics-I/Physics in everyday life	2	2	30	15	35	50
Core Lab 3	UPH20CL61	Major Practical-III	2	-	30	-	-	-
Core Lab 4	UPH20CL62	Major Practical-IV	2	-	30	-	-	-
Value Education		Value Education	2	1	30	15	35	50
TOTAL			**30**	**25**	**450**	**130**	**370**	**500**
	UPH20IN	**Internship**	-	2	-	15	35	50

Semester – VI

Course	Code No	Subject	Contact Hrs / Week	Credits	Total No of Hrs Allotted	Max Marks CA	Max Marks SE	Total
Core	UPH20C61	Atomic and Molecular spectra	6	6	90	25	75	100
Core	UPH20C62	Nuclear and particle physics	6	6	90	25	75	100
Core	UPH20C63	Digital Electronics	6	6	90	25	75	100
Elective	UPH20CE61 A/B/C	Introduction to Quantum mechanics/Optical fiber communication/ Electromagnetism	6	5	90	25	75	100
SEC2	UPH20SE61 A/B/C	Maintenance of Electrical Equipments/ Introduction to nanophysics-II/ Medical physics-II	2	2	30	15	35	50
Core Lab 3	UPH20CL61	Major Practical-III	2	2	30	40	60	100
Core Lab 4	UPH20CL62	Major Practical-IV	2	2	30	40	60	100
			30	**29**	450	195	455	650
Part V		**NCC/ NSS/ PET**		**1**		50	50	100
TOTAL CREDITS FOR SEMESTERS I to VI				**140**				

Internship shall be undertaken by students after the fourth semester summative examination during vacation such that it concludes before the commencement of fifth Semester. Such internship training shall be for a minimum duration of 10 working days in a reputed industry/firm/company/research lab/medical center, etc.

The Internship training is evaluated for a maximum of 50 marks which is distributed as follows: 35 marks for the report submitted (External evaluation) and 15 marks for performance in viva- voce examination conducted by the department (Internal evaluation).

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined B.Sc. Physics on or after June 2020)
PROGRAMME CODE: UPH

Course Code	Course Title	Category	L	T	P	Credit
UPH20C31	Electricity & Magnetism	Core 5	4	-	-	4

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Third	25	75	100

Preamble

The course enables students to comprehend the fundamental concepts of electrostatics and magnetostatics with suitable examples for the application of various laws and equations. Innovations in the field of electromagnetism that have had immense impact on the everyday life of humans is added at the end of each unit as application notes.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Apply Gauss`s law and relate it to various applications to deduce electric field and electric potential	70%	60%
CO2	Realize how electric field is influence by the presence of materials and boundary conditions for electric fields existing in two different media.	70%	60%
CO3	Comprehend practical electrostatic problems by applying Poisson's/Laplace's equations and the method of images along with appropriate boundary conditions.	70%	60%
CO4	Appreciate how the relationships between flow of steady current and accompanying magnetic fields are governed by the basic laws of magnetostatics.	70%	60%
CO5	Evaluate the properties of magnetic field in material media and correlate the underlying concepts to practical applications.	70%	60%

Mapping of Course Outcomes with Programme Outcomes

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	M	S	S	M	-
CO2	M	S	S	M	M	L
CO3	M	M	S	L	M	-
CO4	-	S	S	M	L	-
CO5	-	S	S	M	L	M

Mapping of Course Outcomes with Programme Specific Outcomes

#	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S
CO2	S	M	S	S	M
CO3	S	S	S	S	S
CO4	S	S	M	S	S
CO5	S	M	S	S	M

Blooms taxonomy: Assessment Pattern

Bloom's category	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Course Title :Electricity , Magnetism and Electromagnetism

Unit I Electrostatics : Coulomb's Law and Field Intensity - Electric Fields due to Continuous Charge Distributions - Electric Flux Density - Gauss's Law—Maxwell's Equation - Applications of Gauss's Law - Electric Potential - Relationship between **E** and *V* -Maxwell's Equation - An Electric Dipole and Flux Lines - Energy Density in Electrostatic Fields – Application note : Electrostatic Discharge

Unit II Electric fields in material space : Properties of Materials - Convection and Conduction Currents - Conductors - Polarization in Dielectrics - Dielectric Constant and Strength - Linear, Isotropic, and Homogeneous Dielectrics - Continuity Equation and Relaxation Time - Boundary Conditions – Application note : Materials with High Dielectric Constant - Graphene - Piezoelectrics

Unit III Electrostatic boundary-value problems: Poisson's and Laplace's Equations - Uniqueness Theorem - General Procedures for Solving Poisson's or Laplace's Equation Resistance and Capacitance - Method of Images – Application note : Capacitance of Microstrip Lines - RF MEMS - Supercapacitors

Unit IV Magnetostatic fields : Biot–Savart's Law - Ampere's Circuit Law - Maxwell's Equation - Applications of Ampere's Law - Magnetic Flux Density - Maxwell's Equation - Maxwell's Equations for Static Fields - Magnetic Scalar and Vector Potentials - Derivation of Biot–Savart's Law and Ampere's Law - Application Note: Lightning – Polywells.

Unit V Magnetic forces, materials and devices : Forces due to Magnetic Fields - Magnetic Torque and Moment - A Magnetic Dipole - Magnetization in Materials - Classification of Materials - Magnetic Boundary Conditions - Inductors and Inductances - Magnetic Energy - Magnetic Circuits - Force on Magnetic Materials - Application Note—Magnetic Levitation - SQUIDs

Text Books:

1. Sadiku, M.N.O., *Elements of Electromagnetics* (7thed), Oxford University Press, 2018.

References:

1. Kip, A.F, *Fundamentals of Electricity and Magnetism* (2nd ed)., McGraw-Hill, 1969.
2. Mahajan, S. & Rai Choudhry, S., *Electricity, Magnetism and Electromagnetic theory*, Tata McGraw Hill, 2017.
3. Purcell, E.M. & Morin, D.J., Electricity and Magnetism (3rd ed), Cambridge University Press, 2013.
4. Ulaby, F.T. &Ravaioli, U., Fundamentals of Applied Electromagnetics (7th ed), Pearson, 2015.

Web Resources:

1. https://iwant2study.org/ospsg/index.php/interactive-resources/physics/05-electricity-and-magnetism
2. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
3. http://nptel.ac.in
4. https://phet.colorado.edu/

Course Designers:

1. Dr.R.V.Krishnakumar
2. Dr.J.Suvetha Rani

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined B.Sc. Physics on or after June 2020)
PROGRAMME CODE: UPH

Course Code	Course Title	Category	L	T	P	Credit
UPH20C32	MODERN OPTICS	Core 6	4	-	-	4

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Third	25	75	100

Preamble

- Understand a broad overview of the various optical instruments.
- Know about laser and the basis of holography
- Appreciate the fibre optics and nonlinear optical phenomena**.**

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Explain the various types of optical instrument and its construction	75%	70%
CO2	Outline the characteristics and principle of lasers	75%	70%
CO3	Interpret the images produced by Holography and its applications	75%	70%
CO4	Classify the types of optical fibers	75%	70%
CO5	Elaborate the phenomena of wave propagation and non-linear polarization	75%	70%

Mapping of Course Outcomes with Programme Outcomes

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	L	M	S	M
CO2	M	S	L	M	M	L
CO3	S	S	L	S	M	M
CO4	-	S	M	L	M	L
CO5	S	S	M	L	L	L

Mapping of Course Outcomes with Programme Specific Outcomes

#	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	S	S	M
CO2	M	X	S	S	M
CO3	S	M	S	M	S
CO4	S	S	M	X	S
CO5	L	M	M	L	L

Blooms taxonomy

Bloom's category	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Course Title : Modern optics

Unit I OPTICAL INSTRUMENTS: The Eye – Camera – Size of an object – The Simple Magnifier – Field of view – Stops and Pupils – Objective and Eyepiece – Huygen's Eyepiece – Ramsden Eyepiece – Comparison of Ramsden Eyepiece with Huygen's Eyepiece – Compound Microscope – Telescopes – Reflecting Telescope – Constant Deviation Spectrometer – Abbe Refractrometer.

Unit II LASERS: Attenuation of light in an optical medium – thermal equilibrium – Interaction of light with matter – Einstein`s relations-Light Amplification- Population inversion – Active medium – Pumping – Metastable states –Principal pumping schemes – Optical resonant cavity-Axial modes-Types of lasers – Ruby, He-Ne, CO_2 Laser – Laser beam characteristics-Applications.

Unit III HOLOGRAPHY: Introduction - Principle of holography – Theory- Important properties of a hologram – Advances -Applications.

Unit IV FIBRE OPTICS: Introduction – Optical Fiber – Critical Angle of Propagation – Modes of Propagation – Acceptance Angle – Fractional Refractive index change – Numerical Aperture – Types of Optical Fibers – Normalized Frequency – Pulse Dispersion – Attenuation – Applications – Fiber Optic Communication Systems – Advantages.

Unit V NON-LINEAR OPTICS: Introduction – Wave Propagation and Momentum Conservation – Linear Medium – Nonlinear Polarization – Second Harmonic Generation – Phase Matching – Sum and Difference Frequency Generation – Parametric Oscillation – Self-Focussing of Light – Stimulated Raman Scattering.

Text Books:

1. Subrahmanyam, BrijLal N. &Avadhanulu, M.N. 2006, A Text Book Of Optics, S. Chand and Company Ltd, New Delhi (ISBN:81-219-2611-4).

References:

1. Jenkins F.A., White H.E, 1981.Fundamentals Of Optics, 4th Edition, Mcgraw- Hill Book Company, (ISBN:0-07-032330-5).

Web Resources:

1. https://www.leoni-fiber-optics.com
2. https://phys.libretexts.org

Course Designers:

1. Mr.M.Venkatachalam
2. Dr.S.Rajakarthihan

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined other than B.Sc. Physics on or after June 2020)
PROGRAMME CODE: UPH

Course Code	Course Title	Category	L	T	P	Credit
UPH20NE31	SOLAR ENERGY	Non-major Elective I	2	-	-	2

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Third	15	35	100

Preamble

- Explain the available Non-conventional Energy sources
- Describe the working principle of Solar devices

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Acquire the knowledge about the types of conventional energy sources	70%	60%
CO2	Apply the modern energy harvesting techniques in daily life.	70%	60%
CO3	Assess the potential from direct and indirect solar energy	70%	60%
CO4	The basic physics behind radiation and the solar energy collecting devices were learnt in detail	70%	60%
CO5	Understand the concepts of solar Photovoltaic cell.	70%	60%

Mapping of Course Outcomes with Programme Outcomes

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	-	M	M	S
CO2	M	M	-	M	S	S
CO3	L	-	L	M	S	-
CO4	M	S	L	M	L	L
CO5	M	S	S	-	-	M

Mapping of COs with POs

B.Sc., P.O.

#	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	X	M
CO2	S	L	M	L	S
CO3	L	M	M	S	M
CO4	M	L	S	M	L
CO5	S	L	M	S	L

B.A. P.O.

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	-	M	-	M	S
CO2	M	-	M	-	M	S
CO3	S	-	M	-	M	M
CO4	S	-	M	L	S	S
CO5	M	L	S	L	S	M

B.B.A. P.O.

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	S	-	M	S
CO2	M	M	L	-	M	S
CO3	-	L	M	-	M	S
CO4	-	M	L	-	S	M
CO5	L	M	-	-	L	L

B.Com. P.O.

	PO1	PO2	PO3	PO4	PO5
CO1	-	M	S	-	S
CO2	L	-	-	-	S
CO3	M	-	M	-	S
CO4	L	L	M	L	S
CO5	M	M	M	L	S

Blooms taxonomy: Assessment Pattern

Bloom's category	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Course Title: Solar energy

Unit I SOLAR ENERGY Conventional Energy sources – Renewable Energy sources- Solar Energy- Solar radiation and measurements- Solar constant- Solar radiation at the Earth's surface- Solar radiation measurements- Physical principle of the conversion of solar radiation into heat- Concentrating collectors - Storage of solar energy- Thermal storage.

Unit II APPLICATION OF SOLAR ENERGY Solar Water Heating- Solar cells- Basic Photovoltaic system for power generation- Solar distillation- solar pumping- solar cooking.

Text Books:

Rai G.D., 2011, Non-Conventional Energy Sources, Reprint, Khanna Publishers, New Delhi

References:

Sukhatme S.P. 1984. Solar Energy Principles thermal collection and storage, Tata McGraw Hill publications

Web Resources:

http://www.environmentalpollution.in

Course Designers:

Dr.S.Rajakarthihan

Dr. D.Saravanakkumar

Thiagarajar College (Autonomous) :: Madurai – 625 009

Department of Physics

(For those joined B.Sc. Physics on or after June 2020)

PROGRAMME CODE: UPH

Course Code	Course Title	Category	L	T	P	Credit
UPH20C41	Introduction to Remote Sensing and GIS	Core 7	4	-	–	4

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Fourth	25	75	100

Preamble

This course deals withthe basic principles of remote sensing and GIS, different types of GIS model, the creation, editing of input dataand integration of GIS with Remote sensing.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Know the basic concepts of Remote sensing	75%	60%
CO2	Learn the concept and methods of positioning in Global Positioning System	75%	60%
CO3	Interpret various capabilities and models of GIS	75%	60%
CO4	Analyze the creation of data and data input methods	75%	60%
CO5	Apply GIS tools in various areas of application	75%	60%

Mapping of Course Outcomes with Programme Outcomes

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	M	M	S
CO2	M	M	M	M	S	S
CO3	L	M	S	M	L	S
CO4	L	S	M	M	M	S
CO5	M	S	S	M	M	S

Mapping of Course Outcomes with Programme Specific Outcomes

#	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	M	M	M
CO2	M	L	M	L	L
CO3	S	L	L	M	L
CO4	M	L	L	L	S
CO5	S	M	L	L	L

Blooms taxonomy: Assessment Pattern

Bloom's category	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Course Title: Introduction to Remote Sensing and GIS

UNIT I- Remote sensing- Basic principles : Introduction - Electromagnetic Remote Sensing Process - Physics of Radiant Energy:- Nature of Electromagnetic Radiation - Electromagnetic Spectrum - Energy Source and its Characteristics - Atmospheric Interactions with Electromagnetic Radiation - Atmospheric Properties - Absorption of Ozone - Atmospheric Effects on Spectral Response Patterns - Energy Interactions with Earth's Surface Materials - Spectral Reflectance Curves

UNIT II Fundamentals of GIS : Introduction—Map as Model - Spatial Elements - Terminology - Classification of Maps - Map Scale - Spatial Referencing System - Map Projections - Grouping of Map Projections- Roots of GIS - Overview of Information System - The Four Ms - Contribution Disciplines - GIS Definitions and Terminology - Geographical Entities - Attributes - Topology - Cognitive Models - GIS Queries - GIS Architecture - Components of a GIS - GIS Work Flow - Theoretical Models of GIS - Functional Elements of GIS - Fundamental Operations of GIS - Theoretical Framework for GIS - GIS Categories - Levels/Scales of Measurement

UNIT III Spatial data Modelling : Graphic Representation of Spatial Data - Raster Data Representation - Vector Data Representation - Spatial Data Models - Raster GIS Models - Simple Raster Arrays - Hierarchical Raster Structures - Types of Raster GIS Models - Compact Raster Data Models - Vector GIS Models - Spaghetti Model - Topological Models - Shape File - Compact Vector Data Models - Comparison of Raster and Vector Models

UNIT IV Data input and Editing : Introduction - The Data Stream - Existing Datasets - Creation of Data - Data Input Methods - Keyboard Entry - Manual Digitising - Scanning and Automatic Digitising - GPS for GIS Data Capture - Capturing Coordinate Data - Advantages of GPS - GPS Data Creation - Data Editing - Detecting and Correcting Errors - Data Reduction and Generalisation - Edge Matching and Rubber Sheeting.

UNIT V Integration of remote sensing and GIS: Introduction - Remote Sensing and GIS Synergy - Raster Data for GIS - Vector Data for GIS - Need for Integration - Facilities for Integration - General View on Applications-Objectives - Methodology - Work Flow - Data Used - Details and Limitations of the Data Used-Basic Themes -Base Map -Transportation Map - Village Map - Physiography Map - Land Use / Land Cover Map - Agriculture - Wasteland-Socio Economic Conditions - Population - Details of Village Wise Farmers Categories: - Transportation - Livestock - Education Facilities

Activities:

- Google earth: Pinning a particular place, marking measurement and on-screen digitization
- Creation of Geo database
- Handling GPS using Smart phone
- Image Classification
- Map creation using GISUsing open source software QGIS

Text Books:

1. M.Anji Reddy, Text book of Remote sensing and geographical information systems, 2008, 3rd edition, BS Publications.
   Unit –I : Chapter 2: Sections:2.1 – 2.7
   Unit –II : Chapter 1 & 7: Sections: 1.1 – 1.6 & 7.1 – 7.12
   Unit –III : Chapter 8: Sections: 8.1 – 8.6
   Unit – IV : Chapter 10: Section : 10.1 – 10.5
   Unit V : Chapter 13 & 15: Section: 13.1 – 13.5 ; 15.1 – 15.3 ; 15.5 – 15.5.7 & 15.8

References:

1. Ahmed El-Rabbany , Introduction to GPS The Global Positioning System, Artech House Boston, London, 2002 ARTECH HOUSE, INC.
2. Thomas M. Lillesand, Emeritus, Ralph W. Kiefer, Emeritus, Jonathan W. Chipman, REMOTE SENSING AND IMAGE INTERPRETATION, Seventh Edition, Wiley.

Web Resources:

1. https://nptel.ac.in › courses › module1 › lecture1
2. *http://ibis.geog.ubc.ca › Handouts › lecture03*
3. *https://volaya.github.io* › gis-book › gisbook
4. *http://studymaterial.unipune.ac.in* › jspui › bitstream

Course Designers:

1. Dr.R.Dhanalakshmi
2. Dr.J.Suvetharani

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined B.Sc. Physics on or after June 2020)
PROGRAMME CODE: UPH

Course Code	Course Title	Category	L	T	P	Credit
UPH20C42	FUNDAMENTALS OF ELECTRONICS	Core 8	4	-	-	4

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Fourth	25	75	100

Preamble

- Appreciate the development of electronics in discrete components
- Provide the fundamental aspects regarding the design of analog electronic circuits for various applications.
- Evaluate the functioning of unipolar and bipolar junction transistors

Course Outcomes

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Realize the basic concepts of Thevenin& Norton's Theorem	70%	75%
CO2	Understand the characteristics PN junction diode and their applications	70%	75%
CO3	Demonstrating the applications of Diode	70%	75%
CO4	Realize the basics of concepts of transistor biasing	70%	75%
CO5	Comprehend the basic concepts of Field effect Transistor	70%	75%

Mapping of Course Outcomes with Programme Outcomes

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	M	-
CO2	M	S	M	S	M	L
CO3	S	S	-	S	M	M
CO4	S	S	-	S	M	L
CO5	S	S	-	S	M	M

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	L	S	M
CO2	M	L	L	L	L
CO3	M	S	M	M	L
CO4	M	L	L	M	L
CO5	M	L	M	L	L

Blooms taxonomy: Assessment Pattern

Bloom's category	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Course Title: Fundamentals of Electronics

Unit I BASIC CIRCUIT ANALYSIS: Voltage source- constant voltage source- constant current source- conversion of voltage source into current source- maximum power transfer theorem- Thevenin's theorem- procedure for finding Thevenin's equivalent circuit- Norton's theorem- Procedure for finding Norton equivalent circuit- Chassis and ground

Unit II SEMICONDUCTOR DIODE: PN junction- properties of PN junction- biasing a PN junction-current flow in a forward biased PN junction- Volt- Ampere characteristics of PN junction- Important terms- Limitations in the operating conditions of pn junction - Semiconductor diode- crystal diode as a rectifier-Resistance of crystal diode- half wave rectifier-full –wave rectifiers-efficiency of HWR and FWR- bridge rectifier-efficiency-ripple factor

Unit III FILTER CIRCUITS AND APPLICATIONS OF DIODES: Filter circuits- Capacitor filter- choke input filter- capacitor input filter- voltage multipliers- half-wave voltage doubler-Zener diode- equivalent circuit of zener diode- zener diode as voltage stabilizer- clipping circuits- positive clipper- biased clipper- combination clipper- Application of clippers- clamping circuits- Basic idea of a clamper- positive clamper- negative clamper

Unit IV TRANSISTOR AND TRANSISTOR BIASING: Transistor – Naming the transistor terminals – Transistor action – Transistor symbols - Transistor connections and their characteristics: Common base connection-Characteristics of common base connection - common emitter connection- Characteristics of common emitter connection - common collector connection- transistor load line analysis-operating point- cut-off and saturation points- Faithful amplification – Transistor biasing – stabilisation – stability factor - methods of transistor biasing: base resistor method- emitter bias circuit- biasing with collector feedback resistor- voltage divider bias method – Hybrid parameter – The h parameters of a Transistor.

Unit V FIELD EFFECT TRANSISTORS: Junction field effect transistor- principle and working of JFET- Schematic symbol of JFET - Difference between JFET and bipolar transistor-JFET as an amplifier- output characteristics of JFET- variation of trans conductance of JFET-JFET biasing: bias battery- self-bias, voltage divider bias – Types of MOSFETs- Circuit operation of D-MOSFET – E-MOSFET operation.

Text Books:

Mehta, V. K. Rohit Mehta, Principles of electronics, 11th ed., S. Chand & Co., New Delhi. ISBN: 81-219-2450-2

References:

1. Bell, D. A. Electronic devices and circuits, 4th ed., Prentice-Hall of India, New Delhi.
2. Malvino A., Bates, D. J. Electronic principles, 7th ed., Tata McGraw-hill publishing Co. Ltd., New Delhi.
3. R.S.SEDHA, A Textbook on Applied Electronics, S.Chand& Co.,ISBN: 9788121927833

Web Resources:

1. *https://www.electronics-tutorials.ws/dccircuits/dcp_9.html*
2. *https://www.dictionary.com/browse/semiconductor-diode*
3. http://uav.ece.nus.edu.sg/~bmchen/courses/EG1108_Rectifiers.pdf
4. *https://www.electronics-tutorials.ws/amplifier/transistor-biasing.html*
5. www.mhhe.com/engcs/electrical/neamen01/etext/ch05.pdf

Course Designers:

1. Dr.R.Dhanalakshmi
2. Dr.J.Suvetha Rani
3. Ms.K. Gangadevi

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined other than B.Sc. Physics on or after June 2020)
PROGRAMME CODE: UPH

Course Code	Course Title	Category	L	T	P	Credit
UPH20NE41	NON CONVENTIONAL ENERGY	Non- Major Elective II	2	-	-	2

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Fourth	15	35	50

Preamble

- Explain the available Bio and Wind Energy sources
- Understand the working various Bio and Wind Energy devices

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Learn basic concepts of biomass energy conversion and working principles of different bio-gas plants	70%	60%
CO2	Learn basic concepts of wind energy conversion and principles of different wind energy conversion systems.	70%	60%
CO3	Gain an understanding of the Biomass conversion Technologies	70%	60%
CO4	Explain the basic principles behind the energy generation in the wind.	70%	60%
CO5	Learn basic concepts of wind energy conversion and principles of different wind energy conversion systems.	70%	60%

Mapping of Course Outcomes with Programme Outcomes

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	S	M	L	M	S
CO2	M	S	-	M	L	-
CO3	-	-	M	S	S	S
CO4	M	M	S	S	-	-
CO5	L	M	S	M	L	-

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	M	S
CO2	M	S	S	L	S
CO3	S	L	M	S	M
CO4	M	S	S	L	S
CO5	S	L	M	S	M

B.A. P.O.

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	-	M	-	M	S
CO2	M	-	M	-	M	S
CO3	S	-	M	-	M	M
CO4	S	-	M	L	S	S
CO5	M	L	S	L	S	M

B.B.A. P.O.

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	S	-	M	S
CO2	M	M	L	-	M	S
CO3	-	L	M	-	M	S
CO4	-	M	L	-	S	M
CO5	L	M	-	-	L	L

B.Com. P.O.

	PO1	PO2	PO3	PO4	PO5
CO1	-	M	S	-	S
CO2	L	-	-	-	S
CO3	M	-	M	-	S
CO4	L	L	M	L	S
CO5	M	M	M	L	S

Blooms taxonomy: Assessment Pattern

Bloom's category	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Course Title : NON- CONVENTIONAL ENERGY

Unit I BIO-MASS ENERGY Biomass conversion Technologies – Biogas generation – Classification of bio-gas plant- Types- KVIC, Janta and Deena bandhu model biogas plant- Gasification of Biomass – Gasifier – Construction and operation of down draught and up draught gasifier – Application of Gasifiers

Unit II WIND ENERGY The nature of wind- Wind energy conversion- Basic Components of Wind Energy conversion Systems (WECS) - Classification of Wind Energy conversion Systems – Advantage and Disadvantage of WECS- Energy Storage- Application of Wind Energy.

Text Books:

1. Rai, G.D. 2011, Non-Conventional Energy Sources, Reprint, Khanna Publishers, New Delhi.

References:

1. Sukhatme S.P. Solar Energy Principles thermal collection and storage, 1984, Tata McGraw Hill publications

Course Designers:

1. Dr.S.Rajakarthihan

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined B.Sc. Physics on or after June 2020)
PROGRAMME CODE: UPH

Course Code	Course Title	Category	L	T	P	Credit
UPH20CL41	Major Practical-II	Core Lab	-	-	4	2

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Third & Fourth	40	60	100

Preamble

The course enables students to comprehend the fundamental concepts of Mechanics, optics and application of diodes with practical observations.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Understand the experimental ideas related with mechanics and optics.	80%	80%
CO2	Identify the link between theory and practical	80%	80%
CO3	Appreciate the applications of transistors and diodes	80%	80%
CO4	Analyze observations and make meaningful conclusions	80%	80%
CO5	Develop the obtained result with practical appliances	80%	80%

Mapping of Course Outcomes with Programme Outcomes

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	S	S	S	M
CO2	S	M	M	S	M	L
CO3	L	M	S	S	M	L
CO4	M	S	S	M	L	S
CO5	S	M	S	S	S	M

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	S	M
CO2	M	M	M	S	M
CO3	S	-	S	L	S
CO4	S	-	S	M	M
CO5	M	L	M	M	M

List of experiments

1. Spectrometer – Angle of the prism
2. Newton's rings
3. Grating normal incidence N &λ for Hg spectrum
4. Comparison of capacities – BG
5. LCR circuit – series resonance
6. LCR circuit – parallel resonance
7. i-d curve
8. Sonameter – frequency of AC mains
9. Comparison of mutual inductances
10. Absolute determination of mutual inductance
11. Verification of Thevenin's/Norton's theorem
12. Half wave rectifier
13. Bridge rectifier
14. Zener diode characteristics
15. Determination of Capacity (absolute)
16. Low pass, High pass, Band Pass RC filters
17. Comparison of resistance – BG
18. Transistor characteristics-CB mode
19. Transistor characteristics-CE mode
20. Logic gates – NAND, NOR, NOT using diodes and transistor

Allied Papers

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined B.Sc. Mathematics and Chemistry on or after June 2020)
PROGRAMME CODE : UPH

Course Code	Course Title	Category	L	T	P	Credit
UPH20GE11C/ UPH20GE31M	**PHYSICS – I**	**Generic elective**	**4**	**-**	**-**	**4**

Year	Semester	Int. Marks	Ext. Marks	Total
First / Second	First/Third	25	75	100

Preamble

- Understand the basic concepts in mechanics and properties of matter.
- Differentiate Elastic and inelastic collisions with examples.
- Know the different moduli of elasticity and the phenomenon of viscosity.
- Relate the phenomenon discussed under Geometrical and physical Optics in day to day life.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Distinguish different types of forces existing in nature; work, power and energy involved in translatory and rotational motion.	75%	70%
CO2	Classify Elastic and inelastic collisions with examples and calculate the energy loss during impact.	75%	70%
CO3	Understand the concept of Elasticty, viscosity, Bernouill`s theorem and its applications.	75%	70%
CO4	Know the different types of lenses, principal points, cardinal points and the equivalent focal length of the lens system.	75%	70%
CO5	Learn the principles of Interference, Diffraction and polarization and the experiments related to them.	75%	70%

Mapping of Course Outcomes with Programme Outcomes

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	L	S	L	M
CO2	M	M	M	S	S	M
CO3	L	S	S	M	S	M
CO4	L	-	L	M	M	-
CO5	L	S	S	S	M	L

Mapping of Course Outcomes with Programme Specific Outcomes

#	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	L	L
CO2	S	L	L	M	L
CO3	S	S	M	M	L
CO4	M	M	L	L	S
CO5	S	L	L	S	M

Blooms taxonomy : Assessment Pattern

Bloom's category	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Course Title: Physics - I

Unit I: MECHANICS

Force, Work, Power and Energy Conservative and nonconservative force with example- Friction – central forces - work done by a force – work done by a varying force – Expression for kinetic energy – Expression for potential energy - power. **Rotational motion** Torque work and power in rotational motion - (derivations of expressions) – Torque and angular acceleration – Angular momentum and angular impulse – K.E. of rotation – motion along the inclined plane – diatomic molecule – reduced mass.

Unit II: IMPULSE AND IMPACT

Impulse and momentum – Elastic and Inelastic impacts – Direct impact of two smooth spheres – Expressions of final velocities – Loss of energy due to impact

Unit III: PROPERTIES OF MATTER

Viscosity Stokes law – Determination of a viscosity of liquid (theory and experiment) – Derivation of Poiseuille‟s formula (Analytical method) – Bernoullistheorem- proof and application. **Elasticity** Elastic moduli – Bending of beams – Expression for B.M – E by uniform bending (theory and experiment) – E by non –uniform bending (Theory and experiment) –I section girders – Torsion – Expression for couple per unit twist – work done in twisting – Torsion pendulum (Theory and Experiment).

Unit IV: GEOMETRICAL OPTICS

Deviation produced by a thin lens – focal length of two thin lenses in contact – Equivalent focal length of two lenses separated by a distance – Principal points – Cardinal points – Dispersion of light – Dispersion through a prism – Dispersive power.

Unit V: PHYSICAL OPTICS

INTERFERENCE : Interference in thin films – Air wedge – Newton's rings – Diffraction grating – Determination of wavelength of light using transmission grating (normal incidence) – POLARISATION : Double refraction – Huygens theory – Nicol prism – QWP – HWP – Optical activity – Biot's law – Specific rotator power – Laurent's halfshade polarimeter.

TEXT BOOK:

1. Murugeshan, R. 1998. Optics and Spectroscpy, S.Chand& Co., New Delhi,

REFERENCE BOOKS:

1. Sears, Zemansky and Young, 2005. University Physics (6th ed.), Narosa Publishing House, New Delhi
2. Mathur, D.S. 2004. Elements of Properties of Matter, S. Chand & Co. New Delhi.
3. Venkatachalam, N. 1999. Optics and Spectroscopy, CMN Publications.

Web Resources:

1. https://en.wikipedia.org/wiki/Conservative_force
2. https://en.wikipedia.org/wiki/Viscosity
3. https://en.wikipedia.org/wiki/Newton%27s_rings
4. https://en.wikipedia.org/wiki/Impulse_(physics)

Course designers:

1. Mrs.R.Sribala
2. Dr.J.Suvetha Rani
3. Mr.S.Alaguraja

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined B.Sc. Mathematics and Chemistry on or after June 2020)
PROGRAMME CODE : UPH

Course Code	Course Title	Category	L	T	P	Credit
UPH20GE21/ UPH20GE41	**BASIC ELECTRONICS**	**Generic elective**	**4**	**-**	**-**	**4**

Year	Semester	Int. Marks	Ext. Marks	Total
First / Second	Second/Fourth	25	75	100

Preamble

- Know the physics behind semiconductors and the working of rectifiers in depth.
- Understand the basics of transistors and their characteristics.
- Acquire the skill of computing addition, subtraction, multiplication and division using binary numbers.
- Learn the working of basic as well as universal logic gates and their characteristics.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Gain a sound knowledge in semiconductor Physics, types of diodes, working of rectifiers and filters.	75%	70%
CO2	Understand the formation of transistors and their characteristics.	75%	70%
CO3	Learn the fundamentals of number system viz., -Binary, decimal and Hexadecimal numbers.	75%	70%
CO4	Construct logic gates using discrete components and IC`s and to calculate their output voltage.	75%	70%
CO5	Apply De Morgan`s theorem in Boolean algebra and the role of binary adders.	75%	70%

Mapping of Course Outcomes with Programme Outcomes

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	L	S	S	M	-
CO2	L	M	M	-	-	S
CO3	L	S	S	S	M	L
CO4	S	S	M	L	S	-
CO5	S	M	M	S	L	S

Mapping of Course Outcomes with Programme Specific Outcomes

#	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	L	L
CO2	S	L	L	M	L
CO3	S	S	M	M	L

CO4	M	M	L	L	S
CO5	S	L	L	S	M

Blooms taxonomy: Assessment Pattern

Bloom's category	CA		End of Semester
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Course Title: Basic Electronics

ANALOG ELECTRONICS

Unit I: SEMICONDUCTOR

Semiconductor Physics – intrinsic, extrinsic semiconductor – Band Energy Diagram - Energy Gap – Majority and Minority Carriers – Potential Barrier. Semi conductor diodes: Introduction – Types – PN junction – Biasing – Diode types – Characteristics – Rectifiers – Filters.

Unit II: TRANSISTORS

Transistors – Biasing – Transistor as an amplifier – Current flow in a CE PNP transistor – Static characteristics – Single stage amplifier – Frequency response – Feedback in amplifier – Characteristics of negative feedback.

DIGITAL ELECTRONICS

Unit III: NUMBER SYSTEMS

Binary number system: Conversion of decimal number into binary number – a Binary to decimal conversion – Binary addition – Binary subtraction – Binary multiplication and division – hexadecimal numbers – Binary to hexadecimal conversion – Hexadecimal to decimal conversion – Decimal to hexadecimal conversion – Binary coded decimal – Application of BCD code.

Unit IV: LOGIC GATES

Logic gates – Gate and switch – Basic logic gates and their implementation – Characteristics of logic gates – Calculation of output voltage in an OR logic gate &AND logic gate – The NOR logic gate – The NAND logic gate – The exclusive OR gate – Boolean equations of logic circuits.

Unit V BOOLEAN ALGEBRA

De Morgan's laws and its applications: Boolean algebra – De Morgan's laws – Applications – Binary adders

TEXTBOOK:

1. Ambrose , A. Vincent Devaraj, T. 1993. Elements of Solid State Electronics, Mera Publications [Unit I, Sections 3.2.1, 3.3, 3.4, 3.5, 4.1-4.5; Unit II, Sections 5.1- 5.4, 5.5.1, 5.6, 5.6.1, 6.9.1, 6.12, 7.1, 7.2, 7.3.1, 7.3.2]
2. Jose Robin G. ,Ubald Raj, A. 1994. Electronics II, Indira Publication [Units III, IV & V: Chapter 1, 2 (p.22-54) & Chapter 3]

Web Resources:

1. https://en.wikipedia.org/wiki/Transistor
2. https://en.wikipedia.org/wiki/Logic_gate
3. https://www.electronics-tutorials.ws/diode/diode_1.html
4. https://en.wikipedia.org/wiki/Rectifier

Course designers:

1. Mrs.R.Sribala
2. Dr.J.Suvetha Rani
3. Mr.S.Alaguraja

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined B.Sc. Mathematics and Chemistry on or after June 2020)
PROGRAMME CODE : UPH

Course Code	Course Title	Category	L	T	P	Credit
UPH20GL21/ UPH20GL41	**ALLIED PRACTICAL**	**Generic Elective lab**	**-**	**-**	**2**	**2**

Year	Semester	Int. Marks	Ext. Marks	Total
First / Second	Second/Fourth	40	60	100

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Identify the link between theory and practical	80%	80%
CO2	Develop the skill of performing experiments accurately	80%	80%
CO3	Report observations and analyses in a scientific manner	80%	80%
CO4	Appreciate the applications of transistors and diodes	80%	80%
CO5	Analyze observations and make meaningful conclusions	80%	80%

Mapping of Course Outcomes with Programme Outcomes

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	S	L	M
CO2	M	S	M	S	M	M
CO3	S	M	S	S	L	M
CO4	L	S	M	S	M	S
CO5	S	M	S	S	L	M

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	L	L
CO2	S	L	L	M	L
CO3	S	S	M	M	L
CO4	M	M	L	L	S
CO5	S	L	L	S	M

List of experiments

1. Compound pendulum
2. Torsion pendulum
3. Sonameter I and II laws
4. Uniform bending using pin and microscope
5. Non –uniform bending using pin and microscope

6. Melde’s string
7. Surface tension using capillary rise
8. Surface and interfacial tension- drop weight method
9. Co-efficient of viscosity- using burette
10. N and λ-Grating
11. Gates- discrete components
12. Zener diode characteristics
13. Dispersive power
14. Newton’s rings
15. Air wedge
16. Sonameter AC mains
17. Carey Foster’s bridge
18. Bridge rectifier
19. Conversion of galvanometer into voltmeter
20. Gates using ICs

M.Sc. Physics

(Programme Code: PPH)

Programme outcome-PO (Aligned with Graduate Attributes)- Master of Science (M.Sc.,)

Knowledge

Acquire an overview of concepts, fundamentals and advancements of science across a range of fields, with in-depth knowledge in at least one area of study. Develop focused field knowledge and amalgamate knowledge across different disciplines.

Complementary skills

Students will be able to engage in critical investigation through principle approaches or methods and through effective information search and evaluation strategies. Employ highly developed conceptual, analytical, quantitative and technical skills and are adept with a range of technologies;

Applied learning

Students will be able to apply disciplinary or interdisciplinary learning across multiple contexts, integrating knowledge and practice. Recognize the need for information; effectively search for, evaluate, manage and apply that information in support of scientific investigation or scholarly debate;

Communication

Communicate effectively on scientific achievements, basic concepts and recent developments with experts and with society at large. Able to comprehend and write reports, documents, make effective presentation by oral and/or written form.

Problem solving

Investigate, design and apply appropriate methods to solve problems in science, mathematics, technology and/or engineering.

Environment and sustainability

Understand the impact of the solutions in ethical, societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

Teamwork, collaborative and management skills.

Recognise the opportunities and contribute positively in collaborative scientific research. Engage in intellectual exchange of ideas with researchers of other disciplines to address important research issues

THIAGARAJAR COLLEGE, MADURAI – 9.
(Re-Accredited with 'A' Grade by NAAC)
Department of Physics

"LIGHT"

(Learn with focus; **I**nnovate for a cause; be **G**rateful; be **H**umane; **T**ransform dreams into reality)

VISION
To provide an ambient environment for teaching and research in physics with focus on achieving academic excellence
MISSION
• *To contribute to develop and sustain teaching and evaluation methods in physics learning in tune with emerging trends in science* • *To constantly explore and enhance research potential among faculty and students to promote innovation* • *To bridge the gap between curriculum based learning and career readiness/employability of physics graduates* • *To create a conscientious awareness among students about issues pertaining to welfare of society and environment.*

Programme Educational Objectives (PEO)

The objectives of this programme is to equip/prepare the students to

PEO1	A successful career in academia, government, industry, corporates or as an entrepreneur, or as self-employed.
PEO2	Continue to learn and advance in academia to undertake higher education with focus on research and development
PEO3	Communicate effectively by way presenting a brief lecture on a specific topic in physics or writing scientific reports, projects, dissertation and engage in debates and discussion
PEO4	Acknowledge the importance of participation in co-curricular and extra-curricular activities to nurture and grow leadership skills, be socially sensitive to contemporary issues and play a constructive role in the welfare of the society

Programme specific outcomes- M.Sc., Physics

On the successful completion of M.Sc., Physics the students will be able to

PSO1	Explain the fundamental principles and concepts of various major areas of theoretical and experimental research
PSO2	Comprehend fundamental concepts of physics through advanced laboratory experiments and qualify them to work in scientific and research laboratories
PSO3	Explore problem solving skills and compete in state and national level competitive exams.
PSO4	Gain exposure to methods of research through a mandatory individual project work to be undertaken during the last semester.
PSO5	Plan and execute an experiment through careful observations, precise measurements, analyses, interpretation and effectively communicate the results by way of presenting a brief lecture on a science topic or writing scientific reports, projects, dissertation and engage in debates and discussions

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A++' Grade by NAAC)

DEPARTMENT OF PHYSICS

M.Sc., Physics (w.e.f. 2020 batch onwards)

COURSE STRUCTURE: PROGRAMME CODE: PPH

Semester – I

Course	Code	Title of the Paper	Hrs ++	Credits	Total No. of Hours	Max. Marks CA	Max. Marks SE	Total Marks
Core -1	PPH20C11	Classical Mechanics	5	4	75	25	75	100
Core -2	PPH20C12	Statistical Mechanics	5	4	75	25	75	100
Core 3	PPH20C13	Advanced Electronics	5	4	75	25	75	100
Elective1	PPH20CE1 A/B	Mathematical Physics-I / Computer simulations	5	5	75	25	75	100
Lab	PPH20CL211	General Experiments	5	-	75	-	-	-
Lab	PPH20CL22	Electronics Experiments	5	-	75	-	-	-
Total			**30**	**17**	**450**	**100**	**300**	**400**

Semester – II

Course	Code	Title of the Paper	Hrs. ++	Credits	Total No. of Hours	Max. Marks CA	Max. Marks SE	Total Marks
Core 4	PPH19C21	Solid State Physics -I	5	4	75	25	75	100
Core -5	PPH19C22	Electromagnetic theory	5	4	75	25	75	100
Core - 6	PPH19C23	Quantum mechanics-I	5	4	75	25	75	100
Elective2	PPH20CE21 A/B	Mathematical physics II/ Molecular biophysics	5	5	75	25	75	100
Lab -I	PPH20CL21	General Experiments	5	5	75	40	60	100
Lab -II	PPH20CL22	Electronics Experiments	5	5	75	40	60	100
Total			**30**	**27**	**450**	180	**420**	**600**

Semester – III

Course	Code	Title of the Paper	Hrs. ++	Credits.	Total No. of Hours	Max. Marks CA	Max. Marks SE	Total Marks
Core 7	PPH20C31	Solid state physics -II	5	5	75	25	75	100
Core 8	PPH20C32	Quantum mechanics II	5	5	75	25	75	100
Core 9	PPH20C33	Nuclear physics	5	5	75	25	75	100
Core 10	PPH20C34	Microprocessor and Micro Controllers	5	4	75	25	75	100
Lab	PPH120CL41	Advanced Experiments	5	-	75	-	-	-
PJ	PPH20PJ	Project	7	-	75	-	-	-
Total			**30**	**19**	**450**	**100**	**300**	**400**

Semester – IV

Course	Code	Title of the Paper	Hrs. ++	Credits.	Total No. of Hours	Max. Marks CA	Max. Marks SE	Total Marks
Core 11	PPH20C41	Spectroscopy	5	5	75	25	75	100
Core12	PPH20C42	Nanoscience	5	5	75	25	75	100
Core 13	PPH20C43	Optical communication and networking	5	4	75	25	75	100
Elective3	PPH20CE41 A/B	X-ray crystallography /Astrophysics	5	5	75	25	75	100
Lab	PPH120CL41	Advanced Experiments	5	5	75	40	60	100
PJ	PPH20PJ	Project	5	3	75	40	60	100
Total			**30**	**27**	**450**	**180**	**420**	**600**

* Credit will be awarded at the end of II/IV Semester
++ 1 Hour for Class Test.

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined M.Sc. Physics on or after June 2020)
PROGRAMME CODE: PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20C31	**SOLID STATE PHYSICS – II**	**Core 7**	**5**	**-**	**-**	**5**

Year	Semester	Int. Marks	Ext. Marks	Total
Second	Third	25	75	100

Preamble

- Recognize the different types of magnetic materials and Magnetic Resonance.
- Identify the fundamentals of solid state particles viz., Plasmons, Polaritons, Polarons an excitons.
- Realize dielectrics and ferroelectrics by classical and quantum treatment.
- Know different types of defects and dislocations in crystals.

Prerequisite

Basic knowledge on dielectrics and magnetism.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	gain knowledge on the nature of diamagnetic and paramagnetic materials	70%	70%
CO2	Confer the basic concepts of ferromagnetism and to analyze nuclear magnetic resonance.	70%	70%
CO3	Summarize the essentials of the solid state particles Plasmons, Polaritons, excitons and about Raman effect in crystals	70%	70%
CO4	Compare the dielectric and ferroelectric nature of materials.	70%	70%
CO5	Analyze various types of point defects (Schottky, Frenkel) and dislocations occurring in crystals.	70%	70%

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	L	M	L	L
CO2	S	M	M	L	M	L	L
CO3	S	L	M	S	L	S	L
CO4	S	S	M	S	M	-	M
CO5	S	M	M	S	-	L	L

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**M**	**L**	**-**	**-**	**L**
CO2	**-**	**L**	**-**	**L**	**L**
CO3	**M**	**-**	**L**	**-**	**-**
CO4	**L**	**-**	**L**	**M**	**-**
CO5	**L**	**-**	**M**	**L**	**-**

Blooms taxonomy: Assessment Pattern

Blooms Taxonomy			
	CA		**End of Semester Marks**
	I Internal Marks	**II Internal Marks**	
Knowledge -K1	15% (9)	15% (9)	15% (20)
Understand -K2	15% (9)	15% (9)	15% (20)
Apply-K3	30% (18)	30% (18)	30% (40)
Analyze-K4	20% (12)	20% (12)	20% (25)
Evaluate-K5	20% (12)	20% (12)	20% (25)
	60	**60**	**130**

Course Title: Solid State Physics – II

Unit I: DIAMAGNETISM AND PARAMAGNETISM

Diamagnetism: Langevin diamagnetism equation –Quantum theory of diamagnetism of mononuclear systems –**Paramagnetism**: Quantum theory of paramagnetism: Rare earth ions – Hund rules – Iron group ions – Crystal field splitting – Quenching of the orbital angular momentum –Cooling by isentropic demagnetization: Nuclear demagnetization – Paramagnetic susceptibility of conduction electrons.

Unit II: FERROMAGNETISM AND MAGNETIC RESONANCE

Ferromagnetism: Ferromagnetic order: Curie point and the exchange integral (Curie-Weiss law, Heisenberg model, Exchange energy) –Magnons: Quantization of spin waves– Thermal excitation of magnons – Ferromagnetic domains: Anisotropy energy – Transition region between domains – Origin of domains – Coercivity and Hysteresis – **Magnetic Resonance:**Nuclear magnetic resonance: Equations of motion – Line width – Motional narrowing – Hyperfine splitting – Examples: paramagnetic point defects – knight shift

Unit III: PLASMONS, POLARITONS, POLARONS AND EXCITONS

Plasmons: Electrostatic screening: Screened Coulomb potential, Pseudopotential component U(O), Mott metal-insulator transition, Screening and phonons in metals. **Polaritons:**Lyddane-Sachs-Teller (LST) relation. Electron-electron interaction: Fermi liquid – Electron – electron collisions –Electron – phonon interactions: **Polarons.Excitons:**Frenkelexcitons – Alkali halides – Molecular crystals – Weakly bound (Mott-Wannier) excitons – Exciton condensation into electron-hole drops (EHD). Raman effect in crystals.

Unit IV: DIELECTRICS AND FERROELECTRICS

Dielectrics: Macroscopic electric field: Depolarization field E_1 – Local electric field at an atom – Dielectric constant and polarizability (Clausius-Mossotti relation) – Electronic polarizability – Structural phase transition – **Ferroelectrics:** Ferroelectric crystals – Classifications of ferroelectric crystals – Displacive transitions – Soft optical phonons – Anti-ferro electricity –

Ferroelectric domains – Piezoelectricity.

Unit V: POINT DEFECTS AND DISLOCATIONS:

Point defects: Lattice vacancies (Schottky and Frenkel defects) – Diffusion – Color centers – F centers – Other centers in alkali halides. **Dislocations :**(Edge dislocation, Screw dislocation) – Burgers vectors – stress fields of dislocations – Low-angle grain boundaries – dislocation densities – dislocation multiplication and slip. Dislocation and crystal growth –Whiskers. Hardness of materials.

TEXT BOOK:

1. Kittel. C, 1996. Introduction to Solid State Physics, VII ed., John Wiley & Sons, ISBN: 81-265-1045-5.
   Unit – I Chapter- 11; Unit – II Chapter- 12 &13;
   Unit – III Chapters- 14 &15; Unit – IV Chapter- 16
   Unit – V Chapters- 20 &21

REFERENCE BOOKS:

1. Myers, H.P. 1998.Introductory Solid State Physics, II ed., Viva Low – priced Student Edition, Viva Books Pvt. Ltd.
2. Omar, M. A. 2006. Elementary Solid State Physics, Pearson Education, , ISBN 81- 7758-377-8.
3. Ibach, H. &Luth,H. 1991.Solid State Physics – An Introduction to Theory and Experiment, Narosa Publishing House.
4. Pillai, S.O. 2007.Solid State Physics, revised VI Edition, New Age International
5. Srivatsava, J.P. 2007. Elements of Solid State Physics , II ed., Phi Publishers, , ISBN 978-81-203-2847-1.

Web Resources:

1. https://en.wikipedia.org/wiki/Ferroelectricity
2. https://en.wikipedia.org/wiki/Paramagnetism
3. https://en.wikipedia.org/wiki/Crystallographic_defect
4. https://en.wikipedia.org/wiki/Polariton

Course Designers:

1. Mr.M.Venkatachalam
2. Dr.R.Srinivasan

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined M.Sc. Physics on or after June 2020)
PROGRAMME CODE: PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20C32	**QUANTUM MECHANICS – II**	**Core - 8**	**5**	**-**	**-**	**5**

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Third	25	75	100

Preamble

- Understanding of advanced quantum mechanical concepts on perturbation, scattering and radiation.
- Acquire the knowledge on identical particles, its spin matrices and wave equations.
- Understand the formulation of relativistic wave equation.
- Get knowledge on the formulation of quantum field theory

Prerequisite

Firm knowledge on fundamentals of perturbation and scattering theory and to possess basic knowledge on transition probabilities.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Realize the perturbation theory and its applications	70%	70%
CO2	Attain knowledge on approximation methods employed in solving quantum mechanical problems	70%	70%
CO3	Identify the different components of spin and symmetry	70%	70%
CO4	comprehend the concepts of relativistic wave equations	70%	70%
CO5	Acquire knowledge on the formulation of quantum theory of radiation	70%	70%

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	L	L	-	M
CO2	S	M	M	L	L	-	M
CO3	S	L	M	M	L	S	M
CO4	S	S	M	M	M	-	M
CO5	S	M	M	M	L	L	L

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**M**	**M**	**L**	**M**	**L**

CO2	**M**	**L**	**S**	**L**	**M**
CO3	**L**	**M**	**M**	**M**	**L**
CO4	**M**	**L**	**L**	**M**	**-**
CO5	**S**	**L**	**-**	**L**	**-**

Blooms taxonomy

Blooms Taxonomy			
Category	**Continuous Assessment**		**End of Semester Marks**
	I Internal Marks	**II Internal Marks**	
Knowledge -K1	15% (9)	15% (9)	15% (20)
Understand -K2	15% (9)	15% (9)	15% (20)
Apply-K3	30% (18)	30% (18)	30% (40)
Analyze-K4	20% (12)	20% (12)	20% (25)
Evaluate-K5	20% (12)	20% (12)	20% (25)
Total Marks	**60**	**60**	**130**

Course Title : Quantum Mechanics - II

Unit I: TIME DEPENDENT QUANTUM APPROXIMATIONS

Time-Dependent perturbation theory – First order perturbation – Perturbation constant in time – Physical significance – Transition probability – Fermi's golden rule – Harmonic perturbation – Adiabatic approximation – Sudden approximation.

Unit II: QUANTUM THEORY OF SCATTERING

General Formulation of Scattering Theory Born Approximation – Condition for validity of Born Approximation – Scattering by a screened coulomb potential: Rutherford's scattering formula from Born approximation – Partial wave analysis (Theory only).

Unit III: IDENTICAL PARTICLES AND SPIN

Identical particles – Physical meaning of identify – Symmetric and antisymmetric wave functions – Construction from unsymmetrized function – Distinguishability of identical particles – Exclusion principle – Connection with statistical mechanics – Pauli's spin matrices for an electron and their properties – Electron spin matrices for an electron and their properties – Electron spin functions – Symmetric and antisymmetric wave function of a hydrogen molecule.

Unit IV: RELATIVISTIC WAVE EQUATIONS

Schrodinger's relativistic equation for a free particle – Klein-Gordon equation – E.M. potentials – Separation of the equation – Energy levels in a Coulomb field – Dirac's relativistic equation – Dirac matrices – Free particles solution – Charge and current densities – Magnetic moment of the electron – Spin angular momentum of the electron – Approximate reduction (spin-orbit energy) – Negative energy states.

Unit V: QUANTUM THEORY OF RADIATION

Absorption and Emission of Radiation: The Electromagnetic field – The Hamiltonian operator – Electric Diploe Approximation – Einstein's A & B Coefficients – Selection rules – Rayleigh scattering – Raman scattering.

Text Books:

1.Schiff, L.I., 1968, Quantum Mechanics , III ed., McGraw Hill, ISBN-0-07-085643-5.
2.Satyaprakash& Swati Satya, 2006, Quantum Mechanics ,KedarNath Ram Nath& Co.

3.Quantum Mechanics, G. Aruldhas, Prentice Hall of India, 2013, ISBN 978 -81- 203- 3635 -3. Chapter 12
4.Quantum Mechanics Theory and Applications, AjoyGhatak and S. Lokanathan, Macmillan, 2004.

References:

1. Mathews, P.M. &Venkatesan, K 1978. A Text Book of Quantum Mechanics , Tata McGraw Hill, ISBN 0-07-096510-2.
2. Bransden, B.H. &Joachain, C.J. 2005. Quantum Mechanics ,IIed, Pearson Education, ISBN 81-297-0470-6.
3. Merzbacher, E. 2004. Quantum Mechanics , III ed., John Wiley, ISBN 9971-51-281-5.
4. Ghatak, A. 1996.Introduction to Quantum Mechanics , Macmillan, SBN 0333-92419-3.

Web Resources:

1. https://www.lorentz.leidenuniv.nl/QT/exercises/QTclass_6.pdf
2. https://en.wikipedia.org/wiki/Scattering_theory
3. https://en.wikipedia.org/wiki/Identical_particles
4. *https://en.wikipedia.org/wiki/Klein–Gordon_equation*
5. *https://whatis.techtarget.com/definition/quantum-theory*

Course Designers:

1. Dr.N.Srinivasan
2. Dr.R.Dhanalakshmi

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined M.Sc. Physics on or after June 2020)
PROGRAMME CODE : PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20C33	NUCLEAR PHYSICS	Core - 9	5	-	-	5

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Third	25	75	100

Preamble

- Deliberate the fundamental concepts in Nuclear Physics.
- Appreciative the Theories involved in the nuclear forces and reactions
- Identify with various theories and mechanisms of radioactive decay.
- Appreciate the high energy neutron physics and elementary particles

Prerequisite

Elementary knowledge on nucleus, nucleus models, reactions and elementary particles.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Understand the basic structure and properties of nucleus including the nuclear shell model.	70 %	65%
CO2	Develop the theory of nuclear forces and its experimental evidence	70 %	65%
CO3	Acquire the knowledge of various nuclear decays and radioactivity	70 %	65%
CO4	Apply the knowledge of nuclear reactions for producing fission and Heavy ion reactions	70 %	65%
CO5	Classify the elementary particles, their interactions and Quarks.	70 %	65%

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	M	M	-	-	L
CO2	S	L	L	L	-	M	-
CO3	S	-	-	L	L	-	S
CO4	M	M	S	S	L	-	L
CO5	S	L	L	L	S	-	M

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	-	L	-
CO2	L	-	M	-	-

CO3	**M**	**-**	**L**	**-**	**L**
CO4	**M**	**L**	**M**	**S**	**L**
CO5	**L**	**M**	**-**	**-**	**L**

Blooms taxonomy

Blooms Taxonomy			
Category	**Continuous Assessment**		**End of Semester Marks**
	I Internal Marks	**II Internal Marks**	
Knowledge -K1	15% (9)	15% (9)	15% (20)
Understand -K2	15% (9)	15% (9)	15% (20)
Apply-K3	30% (18)	30% (18)	30% (40)
Analyze-K4	20% (12)	20% (12)	20% (25)
Evaluate-K5	20% (12)	20% (12)	20% (25)
Total Marks	**60**	**60**	**130**

Title of the paper : NUCLEAR PHYSICS

Unit I: NUCLEUS

Nuclear size – Mirror nuclei – Elastic scattering of electrons by nuclei – Muonic X-rays – Electric multipole moments – Spheroidal nuclei – Nuclear magnetic moment – The Schmidt model – Nuclear shell Model: Magic numbers – The independent particle model Nuclear ground state configurations and spins – Low-lying energy levels.

Unit II: NUCLEAR FORCE

The short range force – General form of the nucleon-nucleon potential –Exchange forces – Meson theory of nuclear forces – Experimental evidence – Low energy nucleon-nucleon scattering.

Unit III: RADIOACTIVE DECAY

The Q-value for alpha decay- Coulomb potential barrier - One dimensional potential barrier problem – Gamow's theory of $\alpha\alpha$-decay –alpha particle energy spectrum – Fermi's theory of beta decay – Classification of nuclear transitions – Parity violation in beta decay – Electric & magnetic multipole radiation – Selection rules for multipole radiation – Internal conversion – Nuclear isomers.

Unit IV: NUCLEAR REACTIONS

The compound nucleus model – The optical model – The direct reaction model: Deuteron pick-up reaction – Nuclear fission – Heavy ion reactions: Stability of heavy nuclei – the shell effects – quantum electrodynamics of strong fields.

Unit V: SUB-NUCLEAR PHYSICS

Proliferation of elementary particles - classification of elementary particles and their interactions – Short lived resonance states – Gellmann-Okuba mass formula – Quarks as building blocks of hadrons – Baryon magnetic moments – Discovery of heavier quarks – Colour degree of freedom.

TEXT BOOK:

1. Devanathan, V. 2006. Nuclear Physics, Narosa Publishing House, ISBN: 10-81-7319-704-0.

REFERENCE BOOKS:

1. Roy, R.R. & Nigam, B.P. 1996. Nuclear Physics – Theory and Experiment, New Age International, ISBN 0-85226-788-6.
2. Krane, K.S. 1987. Introductory Nuclear Physics, John Wiley & Sons, ISBN: 97-80471-80553-3.
3. Heyde, K. 2005. Basic Ideas and Concepts in Nuclear Physics, II ed., Overseas Press, ISBN 81-88689-08-4.

4. Lilley, J. 2001. Nuclear Physics – Principles and Applications, John Wiley & Sons, ISBN 9-812-53004-5.
5. Krane, K.S. 1987.Introductory Nuclear Physics, John Wiley & Sons, ISBN: 9780471805533.

Web Resources:

1. https://brilliant.org/wiki/nuclear-decay/
2. https://en.wikipedia.org/wiki/Quark
3. https://en.wikipedia.org/wiki/Nuclear_force
4. https://en.wikipedia.org/wiki/Nuclear_shell_model

Course Designers:

1. Dr.R.V.Krishna Kumar
2. Dr. G.Arivazhagan

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined M.Sc. Physics on or after June 2020)
PROGRAMME CODE : PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20C34	**MICROPROCESSOR AND MICROCONTROLLERS**	Core - 10	**4**	**1**	**-**	**4**

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Third	25	75	100

Preamble

- Realize the architecture of microprocessors and methodology of programming.
- Initiate the student able to use microprocessor in different applications.
- Make them to solve the arithmetic operations using microprocessor.
- Explore the interfacing using the microcontroller.

Prerequisite

Strong knowledge on algorithms, instruction sets and interfacing techniques.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Familiar with the evolution of 8085 microprocessor	70 %	65%
CO2	Realize the architecture of microprocessors	70 %	65%
CO3	Work out the arithmetic operations using microprocessor	70 %	65%
CO4	Familiar with the evolution of microcontrollers	70 %	65%
CO5	Exercises the applications of microprocessor	70 %	65%

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**S**	**S**	**S**	**M**	**S**	**L**	**S**
CO2	**S**	**S**	**S**	**L**	**M**	**M**	**S**
CO3	**S**	**S**	**S**	**L**	**S**	**-**	**S**
CO4	**S**	**M**	**M**	**M**	**S**	**L**	**-**
CO5	**M**	**S**	**S**	**S**	**S**	**L**	**S**

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**L**	-	**L**	-	-
CO2	S	L	**M**	**L**	**L**
CO3	-	-	**L**	-	-
CO4	**L**	L	**L**	M	-
CO5	**M**	-	-	**L**	**L**

Blooms taxonomy

Blooms Taxonomy			
Category	Continuous Assessment		End of Semester Marks
	I Internal Marks	II Internal Marks	
Knowledge -K1	15% (9)	15% (9)	15% (20)
Understand -K2	15% (9)	15% (9)	15% (20)
Apply-K3	30% (18)	30% (18)	30% (40)
Analyze-K4	20% (12)	20% (12)	20% (25)
Evaluate-K5	20% (12)	20% (12)	20% (25)
Total Marks	**60**	**60**	**130**

Title of the paper: MICROPROCESSOR AND MICROCONTROLLERS

Unit I:

Evolution of microprocessors-Various languages- Mnemonics- RAM-ROM- Main memory – secondary memory- buses- computers- large small network- LAN- CAD- voice recognition- AI- Block diagram of 8085- pin out diagram- Explanation- Registers- 8085 Instructions- Opcode- operand- words

Unit II:

Instruction cycle- fetch cycle- timing diagram – Machine cycle- T-states- opcode fetch operation- MVI, r data -memory read- Memory write- groups and instruction- explanation of various groups with examples- various addressing modes- stacks –PUSH operation- subroutine

Unit III:

ALP-simple program- 8 bit addition- timing diagram- 8 bit subtraction- sum 16 bits- 8bit decimal subtraction- one's complement of 16 bit number- Two's complement of 16 bit number- largest number in an array- smallest number in an array-Arrays in ascending order- arrays in descending order- square root of a number

Unit IV:

Microprocessor applications- speed of motor- stepper motor- traffic control- 8086 operating modes- status flags- registers-addressing modes- 8085/8086 CPU architecture- Execution unit- general registers-arithmetic and logic unit- flag registers- bus interface unit- instruction queue- instruction pointer- segment registers.

Unit V:

Single chip microcontrollers- intel 8051 series microcontrollers(MCS-51) –MCS151 and MCS 251 high performance CHMOS microcontrollers- Intel 8096 series microcontrollers (MCS96) – Brief description of Intel 8096 family members- 32 bit microcontrollers- Rupi44 family microcontroller with on-chip communication controller- I/O processor- co-processor

Text Books:

1. Ram, B. 1993. Microprocessor and its applications, IV edition, Dhanpat Rai publicationsLtd.
   Unit I Ch. 1.1, 5.1 to 5.3, 1.6, 1.7, 1.10 to 1.23, 3.1
   Unit II Ch. 3., 3.3, 4.1 to 4.3, 5.5, 5.63
   Unit III Ch. 6.1to 6.3, 6.5, 6.6, 6.10, 6.12, 6.21, 6.22, 6.24, 6.36
2. Srinath, N.K. 2012, 8085 Microprocessor programming and interfacing, PHI learning private limited, New Delhi.
   Unit IV Ch.13.
3. Badri Ram, 2001. Advanced Microprocessors and interfacing, Tata McGraw Hill Publishing Ltd., New Delhi ISBN: 0-07-043448-4
   Unit V Ch. 6.1, 6.3 and 6.4

References:

1. Aditya P. Mathur, 1985. Introduction to Microprocessors, 2nd Edition, Tata McGraw Hill Ltd., New Delhi.

Web Resources:

1. *www.zseries.in/.../8085%20microprocessor/history%20of%20microprocessor.php*.
2. *https://www.geeksforgeeks.org/instruction-cycle-8085-microprocessor/*.
3. *https://www.technicalsymposium.com/microprocessor_lab.pdf*.
4. *https://en.wikipedia.org/wiki/Intel_MCS-51*.
5. *https://www.quora.com/What-are-the-various-applications-of-microprocessors*.
6. https://en.wikipedia.org/wiki/Intel_8086.

Course Designers:

1. Dr. R.Vijayalakshmi
2. Dr. S.Rajakarthihan

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined M.Sc. Physics on or after June 2020)
PROGRAMME CODE : PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20C41	**SPECTROSCOPY**	**Core 11**	**5**	**-**	**-**	**5**

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Fourth	25	75	100

Preamble

- To provide the technical aspects in major types of spectroscopy in relation to the identification and structure elucidation of organic compounds.

Prerequisite

Detailed understanding of various basic principles involved in molecular spectra viz., rotation, vibration, electronic spectra and basic principles in Raman, NMR and ESR.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Comprehend the aspects of Infrared spectroscopy and its instrumentation.	70 %	70%
CO2	Brief about the basics of Raman spectroscopy , its Vibrational activity in various types of molecules.	70 %	70%
CO3	understand the theory and principles of electronic spectroscopy	70 %	70%
CO4	Know the physics behind NMR spectroscopy and Fourier transform NMR spectroscopy.	70 %	70%
CO5	Analyze the theory of E.S.R. spectroscopy and the techniques behind it.	70 %	70%

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	M	S	S	-	L
CO2	S	M	S	S	M	-	L
CO3	S	M	M	L	M	L	-
CO4	S	M	M	S	M	L	-
CO5	S	S	S	M	M	S	-

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**M**	**L**	**-**	**-**	**L**
CO2	**L**	**-**	**-**	**M**	**-**
CO3	**L**	**M**	**L**	**-**	**-**
CO4	**-**	**-**	**L**	**L**	**L**
CO5	**M**	**-**	**-**	**-**	**-**

Blooms taxonomy

Blooms Taxonomy			
Category	Continuous Assessment		End of Semester Marks
	I Internal Marks	II Internal Marks	
Knowledge -K1	15% (9)	15% (9)	15% (20)
Understand -K2	15% (9)	15% (9)	15% (20)
Apply-K3	30% (18)	30% (18)	30% (40)
Analyze-K4	20% (12)	20% (12)	20% (25)
Evaluate-K5	20% (12)	20% (12)	20% (25)
Total Marks	**60**	**60**	**130**

Title of the paper: SPECTROSCOPY

Unit I: INFRARED SPECTROSCOPY

Energy of a diatomic molecule – simple harmonic oscillator – Anharmonic oscillator – diatomic vibrating rotator – vibrations of polyatomic molecules – fundamental vibrations and their symmetry – influence of rotations on the spectra of polyatomic molecules – linear molecules – symmetric top molecules – skeletal vibrations-group frequencies-techniques and instrumentation – double and single beam operation.

Unit II: RAMAN SPECTROSCOPY

Pure rotation Raman spectra – linear molecules – symmetric top molecules – vibrational Raman spectra – Raman activity of vibrations – rules of mutual exclusion overtone and combination – vibrational Raman spectra – rotational fine structure – nature of polarized light – vibration of spherical top molecules – techniques and instrumentation- the Fourier transform spectroscopy.

Unit III: ELECTRONIC SPECTROSCOPY OF MOLECULES

Electronic spectra of diatomic molecules- the Born-Oppenheimer Approximation vibrational Coarse Structure: Progressions- intensity of Vibrational-Electronic Spectra: the Franck-Condon Principle- Rotational fine structure of electronic-vibration transitions, electronic spectra of polyatomic molecules- change of shape of excitation-chemical analysis by electronic spectroscopy-the Re-emission of energy by an excited molecule, techniques and instrumentation.

Unit IV: NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

The nature of spinning particles – Interaction between spin and a magnetic field – population of energy levels – Larmor precession and relaxation time – Fourier Transform spectroscopy in NMR – Chemical shift – the coupling constant – coupling between several nuclei – chemical analysis by N.M.R. techniques – exchange phenomena.

Unit V: ELECTRON SPIN RESONANCE SPECTROSCOPY

Introduction- position of E.S.R absorptions: the g-factor-hyperfine structure of E.S.R absorptions- double resonance in E.S.R- fine structure in E.S.R spectra- technique of E.S.R spectroscopy

TEXT BOOK

C. N. Banwell, E. M. McCash, Fundamentals of molecular spectroscopy, fourth ed., Tata Mcgraw-HillEducation (India) Private Limited, New Delhi.

REFERENCE BOOKS

1. G. Aruldhas, Molecular structure and spectroscopy, Prentice-Hall of India private Limited, New Delhi.
2. P. S. Sindhu, Molecular spectroscopy, New Age International (P) Limited, Publishers, second ed., New Delhi.
3. P. S. Kalsi, Spectroscopy of Organic Compounds, New Age International (P) Limited, Publishers, seventh ed., New Delhi.

Web Resources:

1. https://en.wikipedia.org/wiki/Infrared_spectroscopy
2. https://en.wikipedia.org/wiki/Raman_spectroscopy
3. https://en.wikipedia.org/wiki/Electron_spectroscopy
4. https://en.wikipedia.org/wiki/Nuclear_magnetic_resonance_spectroscopy

Course Designers:

1. Dr. G.Arivazhagan
2. Mrs.R.Sribala

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined M.Sc. Physics on or after June 2020)
PROGRAMME CODE : PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20C42	**NANOSCIENCE**	**Core -12**	**5**	**-**	**-**	**5**

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Fourth	25	75	100

Preamble

- Acquire a qualitative idea on the postulates and concepts of nanophysics.
- Introduce the students to the rapidly developing field of nanoscience and technology with special focus on the methods of synthesis, characterization techniques and applications of nanomaterials with physics emphasis
- Learn the structures, properties, characterization and applications of nanomaterials.

Prerequisite

Knowledge on basic concepts of nanophysics and have an idea on general characterization techniques of nano materials.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Comprehend the postulates and concepts of nanophysics with clarity	80%	70%
CO2	Grasp the principles, fabrication and design of Carbon Nano-Tubes and their application	80%	70%
CO3	Examine the properties of materials using various characterization tools	80%	70%
CO4	Apprehend the theoretical and experimental aspects of quantum wells, wires and dots	80%	70%
CO5	Realize the techniques of nanomachines and nanodevices, expected to provide the necessary understanding in nanotechnology and the students must be able to perform their project works related to the synthesis and characterization of nanomaterials by direct experience	80%	70%

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	M	S	S	M	-	S
CO2	M	S	S	M	-	S	S
CO3	S	S	S	M	-	L	S
CO4	M	M	S	S	L	S	-
CO5	M	S	S	S	L	S	L

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	S	L	-	L
CO2	M	M	-	L	-
CO3	L	M	-	-	L
CO4	L	M	-	-	L
CO5	M	L	-	L	-

Blooms taxonomy: Assessment Pattern

Blooms Taxonomy			
	CA		End of Semester Marks
	I Internal Marks	II Internal Marks	
Knowledge -K1	15% (9)	15% (9)	15% (20)
Understand -K2	15% (9)	15% (9)	15% (20)
Apply-K3	30% (18)	30% (18)	30% (40)
Analyze-K4	20% (12)	20% (12)	20% (25)
Evaluate-K5	20% (12)	20% (12)	20% (25)
	60	**60**	**130**

Course Title: Nanoscience

Unit I: INTRODUCTION TO PHYSICS OF THE SOLID STATE AND PROPERTIES OF INDIVIDUAL NANO PARTICLES

Size dependence of Properties - Crystal structure – Face-centered cubic nanoparticles - Tetrahedrally bonded semiconductor crystals - Lattice vibrations. Metal Nanoclusters: Magic Numbers-Theoretical Modeling Of Nanoparticles-Geometric Structure-Electronic Structure-Reactivity Fluctuations-Magnetic Clusters-Bulk To Nanotransition, Semiconducting Nanoparticles: Optical Properties- Photofragmentation- Coulombic Explosion

Unit II: CARBON NANOSTRUCTURES

Introduction – Carbon Molecules – Nature of the Carbon bond – New Carbon Structures – Small Carbon Clusters – Discovery of C60 Structure of C60 and its Crystal – Alkali doped C60 – Superconductivity in C60 Larger and Smaller Fullerenes – Other Buckyballs – Carbon nanotubes – Fabrication – Structure – Electric Properties – Vibrational Properties – Mechanical Properties.

Unit III: NANOSTRUCTURED FERROMAGNETISM

Basics of Ferromagnetism – Effect of Bulk Nanostructuring of Magnetic Properties – Dynamics of Nanomagnets – Nanopore containment of Magnetic particles – NanocarbonFerromagnets – Giant and Colossal Magnetoresistance – Ferrofluids.

Unit IV:APPLICATION OF CARBON NANOTUBES & QUANTUM WELLS, WIRES, AND DOTS

Field Emission and Shielding – Computers – Fuels – Chemical Sensors – Catalysis – Mechanical Reinforcement. Quantum Wells, Wires and Dots: Preparation of Quantum nanostructures – Size and Dimensionality Effects – Excitons – Single Electron Tunneling – Applications – Infrared Detectors – Quantum Dot Lasers – Superconductivity.

Unit V: NANOMACHINES AND NANODEVICES

Micro electro mechanical systems (MEM) – Nano electromechanical Systems (NEMS): Fabrication – Nanodevices and Nanomachines – Molecular and Supra molecular Switches.

Text Books:

Charles P. Poole Jr& Frank J. Owens, 2011.Introduction to Nanotechnology II reprint, Wiley India. ISBN 13- 978-8126510993

References:

1. Richard Booker & Earl Baysen, 2005.Nano Technology, Wiley.

Web Resources:

1. nptel.ac.in/syllabus/syllabus_pdf/115101007.pdf.
2. https://www.electrochem.org/dl/interface/sum/sum06/sum06_p27.pdf.
3. www.wtec.org/loyola/nano/06_03.htm.
4. https://nptel.ac.in/courses/115106076/Module%207/Module%207.pdf.
5. http://www.acclab.helsinki.fi/~knordlun/nanotiede/nanosc9nc.pdf

Course Designers:

1. Dr. R.Srinivasan
2. Dr. R.Dhanalakshmi

Thiagarajar College (Autonomous) :: Madurai – 625 009

Department of Physics

(For those joined M.Sc. Physics on or after June 2020)

PROGRAMME CODE : PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20C43	**OPTICAL COMMUNICATIONAND NETWORKING**	**Core - 13**	**4**	**1**		**4**

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Fourth	25	75	100

Preamble

- Explore the distortions in optical fiber communication – viz attenuation, losses, and dispersion.
- Gain knowledge in various segments of optical fiber communication sources, detectors, receivers and amplifiers
- Realize the function of networks
- Analyze the performance of network.

Prerequisite

Basic knowledge on Light propagation, Electromagnetic waves and wave guides, Maxwell equations, and Types of optical fibers.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Understand the attenuation, different types of losses and dispersion in fiber optic communication	70%	60%
CO2	Reconnoiter of optical sources and detectors in OFC	70%	60%
CO3	Comprehend the Receivers, signals and various amplifiers; Reckon the noises and Errors in transmission	70%	60%
CO4	Acquire the knowledge on the concepts of optical network and its application in SONET/SDH/WDM networks	70%	60%
CO5	Able to measure and trouble shoot the communication network in small and large scale. Develop a design and monitor the performance of the network	70%	60%

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	L	-	-	M
CO2	S	M	S	L	-	M	S
CO3	S	S	S	L	L	-	L
CO4	M	M	S	L	L	-	L
CO5	M	L	S	-	-	-	L

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	-	-	-
CO2	M	S	S	L	-
CO3	-	-	L	M	S
CO4	-	S	M	L	L
CO5	M	-	-	M	M

Course Title: Optical Communication and Networking

Unit I: ATTEUNATION AND DISPERSION

Attenuation– Attenuation units- absorption- scattering losses-Bending losses- core and cladding losses- signal dispersion in fibers-overview of dispersion origins –factors contributing to dispersion-Material Dispersion –Waveguide dispersion – dispersion in single mode fibers.

Unit II: SOURCES AND DETECTORS

Optical sources: Light Emitting Diodes - LED structures – light source materials - quantum efficiency and LED power - laser diodes – laser diode modes and threshold conditions – external quantum efficiency - Optical Detectors: PIN Photo detectors - Avalanche photo diodes - Photo detector noise – Noise sources , Signal to Noise ratio

Unit III: RECEIVER AND AMPLIFIERS

Fundamental receiver operation – digital signal operation – error sources – front end amplifier – digital receiver performance – probability of error – receiver sensitivity – quantum limit – eye diagram – eye pattern features – BER and Q-factor measurements – burst mode receivers – analog receivers – Optical amplifiers – basic applications and types of optical amplifiers – general applications – amplifier types – Erbium doped fiber amplifiers – amplification mechanism - EDFA architecture – amplifier noise – optical SNR.

Unit IV: OPTICAL NETWORKS

Optical Networks - network concepts – network terminology – network categories – network layers – optic layers - SONET / SDH Transmission formats and speeds – Optical interfaces – SONET / SDH – RINGS - SONET / SDH networks - Optical switching – optical cross connect – wavelengthconversionwavelengthrouting–opticalpacketswitching–opticalburstswitching-WDMNetworkexamples–Wideband Long-haul WDM Networks – Narrow band metro WDM Networks

Unit V: MEASUREMENT AND MONITORING

Measurement standards–basic test equipment –test-support lasers – optical spectrum analyzer – multiple-function testers – optical power attenuators – optical transport network (OTN) tester – visual fault indicator. Optical power measurements –definition of optical power – Optical power meters. Optical performance monitoring –management architecture and functions – optical layer management – OPM functions – network maintenance –fault management – OSNR monitoring. Optical fiber system performance measurements – bit-error rate testing – OSNR estimation – Q-factor estimation –OMA measurement – timing jitter measurement.

TEXT BOOK:

1. Gerd Keiser. 2013. Optical Fiber Communications, Fifth Edition. Mc Graw Hill ISBN-13: 978-1-25-900687-6; ISBN-10:1-25-900687-5

REFERENCE BOOKS:

1. John M. Senior, 2007.Optical Fiber Communication, Second Edition ,PearsonEducation.
2. Gower, J. 2001. Optical Communication System, Prentice Hall ofIndia,
3. Rajiv Ramaswami, 2004. Optical Networks , Second Edition,Elsevier.
4. Govind P. Agrawal, 2004.Fiber-optic communication systems, third edition, John Wiley&sons.
5. Khare, R.P. 2007. Fiber Optics and Optoelectronics, Oxford UniversityPress.

Web Resources:

1. https://en.wikipedia.org/wiki/Optical_fiber
2. https://en.wikipedia.org/wiki/Dispersion
3. https://en.wikipedia.org/wiki/Optical_networking
4. https://en.wikipedia.org/wiki/Avalanche

Course Designers:

1. Dr.R.Vijayalakshmi
2. Mr.M.Venkatachalam

Thiagarajar College (Autonomous) :: Madurai – 625 009

Department of Physics

(For those joined M.Sc. Physics on or after June 2020)

PROGRAMME CODE : PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20CE41(A)	X-RAY CRYSTALLOGRAPHY	**Core Elective**	5	-	-	**5**

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Fourth	25	75	100

Preamble

The course provides an overview of the theoretical concepts and experimental principles involved in the study crystalline material, particularly single crystals. The content focuses on the experimental techniques involved in the collection of data and the theoretical foundations involved in solving the crystal structures. The course also exposes the students to some basic features of macromolecules whose structures are precisely known through the study of their crystals.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Comprehend the underlying theoretical concepts and mathematical foundations essential to understand the geometry of crystals and X-ray diffraction from crystals.	70%	60%
CO2	Classify crystals based on their optical properties, determine their quality and suitability for further study using experimental X-ray methods for intensity data collection.	70%	60%
CO3	Assess the importance of various factors that affect the X-ray intensities and the necessity to employ appropriate methods to deal with them.	70%	60%
CO4	Evaluate the role of various theoretical techniques employed in treating the X-ray intensity data to begin with an appropriate starting model till there is good agreement between calculated and observed models.	70%	60%
CO5	Appreciate the role of X-ray crystallography in the study of macromolecules such as DNA, proteins and also the structure of viruses.	70%	60%

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	M	L	-	M
CO2	S	S	L	L	M	-	-
CO3	M	L	M	S	-	-	L
CO4	M	S	S	L	M	-	-
CO5	M	M	M	L	-	S	M

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**M**	**L**	-	-	**L**
CO2	**L**	-	**M**	-	-
CO3	**M**	-	L	-	**L**
CO4	**L**	**M**	-	**L**	-
CO5	**M**	**L**	-	M	**L**

Blooms taxonomy: Assessment Pattern

Blooms Taxonomy			
Category	**Continuous Assessment**		**End of Semester Marks**
	I Internal Marks	**II Internal Marks**	
Knowledge -K1	15% (9)	15% (9)	15% (20)
Understand -K2	15% (9)	15% (9)	15% (20)
Apply-K3	30% (18)	30% (18)	30% (40)
Analyze-K4	20% (12)	20% (12)	20% (25)
Evaluate-K5	20% (12)	20% (12)	20% (25)
Total Marks	**60**	**60**	**130**

Course Title: X-RAY CRYSTALLOGRAPHY

Unit I Geometry and diffraction of crystals : Lattices – Designation of points, lines and planes –Reciprocal lattice – Symmetry – Crystal systems – Primitive and non-primitive cells – Indexing in the hexagonal system – Bragg's law – Laue's equations – Reciprocal lattice and diffraction – Diffraction directions– Scattering by an electron – Scattering by an atom – Scattering from a unit cell – Structure factor calculation.

Unit II Experimental techniques : Optical classification of crystals : Uniaxial crystals – Birefringence – Biaxial crystals – Interference figures – Direction of scattering of X-rays by crystals : Laue's equations for X-ray scattering – Bragg's treatment of X-ray diffraction – Equivalence of Laue's and Bragg's treatment of X-ray diffraction – X-ray techniques : Laue method – Oscillation method – Ewald's construction – Weissenberg method – Precession method – Single-crystal X-ray diffractometry : Instrument geometry – Rotation of the crystal into a diffracting position – Transformation from Miller indices to geometry – Data collection – Twinning.

Unit III Factors affecting X-ray intensities: Diffraction from a rotating crystal – Absorption of X-rays – Primary extinction – Secondary extinction – The temperature factor – Anomalous scattering

Unit IV The determination of crystal structures: Trial-and-error methods – The Patterson function – The heavy-atom method – Isomorphous replacement – The application of anomalous

scattering –**Direct methods:** Inequality relationships – Sign relationships – General phase relationships.

Unit V Macromolecular structure

Nucleic Acid Structure – The chemical structure of nucleic acids – Conformational possibilities of monomers and polymers – The double helical structure of DNA – Polymorphism of DNA – DNA supercoiling and unusual DNA structures – The structure of transfer RNA – Protein Structure: Amino acids and the primary structure of proteins- The peptide bond and secondary structure of proteins Tertiary structure – supersecondary and domain structure – Quaternary structure – Virus structure

Text Books

Unit I - Cullity, B.D. & Stock, S.R., *Elements of X-ray diffraction* (3rd ed.), Pearson, 2014. Pages 31-52, 97-105, 126-146

Unit II - Ladd, M.F.C. & Palmer, R.A., *Structure Determination by X-ray Crystallography* (3rd ed.), Springer, 1993. Chapter 3

Unit III - Woolfson, M.M., *An Introduction to X-ray Crystallography* (2nd ed.), Cambridge University Press, 1997. Chapter 6

Unit IV - Woolfson, M.M., *An Introduction to X-ray Crystallography* (2nd ed.), Cambridge University Press, 1997. Chapter 8

Unit V-*Biophysics*,Pattabhi, V. & Gautam, N. Kluwer Academic Publishers, 2002. Chapter 10

References:

1. Stout G.H. , Jensen, L.H.: *X-ray Structure Determination* - A Practical Guide. John Wiley & Sons, 1989.
2. Glusker J.P. Trueblood K.N., *Crystal Structure Analysis* - A Primer (2nded), Oxford University Press, 1985.
3. Hammond, C., *The Basis of Crystallography ad Diffraction* (3rd ed.), IUCr Texts in Crystallography, Oxford Science Publishers, 2009.
4. Giocovazzo, C. (Ed.), *Fundamentals of Crystallography*, IUCr Texts in Crystallography, Oxford Science Publishers, 2000.
5. Sherwood, D. &Cooper, J. Crystals, X-rays and Proteins, Oxford University Press, 2011.

Web Resources:

https://www.iucr.org/education/pamphlets
http://crystals.otterbein.edu/
http://prism.mit.edu/xray/oldsite/resources.htm
https://www.ccdc.cam.ac.uk/

Course Designers:

1.Dr.N. Srinivasan
2. Dr.R.V.Krishnakumar
3. Dr.V. RajniSwamy

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined M.Sc. Physics on or after June 2020)
PROGRAMME CODE : PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20CE41(B)	**ASTROPHYSICS**	**Elective -3**	**5**	**-**	**-**	**5**

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Fourth	25	75	100

Preamble

- Understand the methods of collecting stellar data and appreciate how they are used in classifying the stars.
- Know the life of a star from its birth till its death.
- Elaborate the Astronomical Instruments.

Prerequisite

The basic idea of stars, planets, stellar distances, dimensions, chemical compositions, and evolution of stars. Knowledge on Milky way and other galaxies are highly appreciable.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Acquire knowledge on the fundamentals of stars	70%	60%
CO2	Understand the concepts of laws of radiation and Important relations between stellar parameters	70%	60%
CO3	Recognize the concepts of internal structure of stars	70%	60%
CO4	Familiar with stellar evolution	70%	60%
CO5	Providing phenomenological theories on astronomical instruments	70%	60%

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**S**	**S**	**M**	**-**	**-**	**-**	**L**
CO2	**S**	**M**	**M**	**M**	**L**	**S**	**L**
CO3	**S**	**M**	**S**	**L**	**S**	**S**	**S**
CO4	**S**	**S**	**M**	**M**	**-**	**M**	**-**
CO5	**S**	**M**	**L**	**-**	**-**	**L**	**-**

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**M**	**L**	**-**	**-**	**L**
CO2	**L**	**-**	**M**	**M**	**-**
CO3	**M**	**-**	L	**-**	**L**

CO4	**L**	**M**	**-**	**L**	**-**
CO5	**M**	**L**	**-**	**-**	**L**

Blooms taxonomy: Assessment Pattern

Blooms Taxonomy			
Category	**Continuous Assessment**		**End of Semester Marks**
	I Internal Marks	**II Internal Marks**	
Knowledge -K1	15% (9)	15% (9)	15% (20)
Understand -K2	15% (9)	15% (9)	15% (20)
Apply-K3	30% (18)	30% (18)	30% (40)
Analyze-K4	20% (12)	20% (12)	20% (25)
Evaluate-K5	20% (12)	20% (12)	20% (25)
Total Marks	**60**	**60**	**130**

Title of the paper: ASTROPHYSICS

Unit I: FUNDAMENTALS Identification of stars – Spherical coordinates – The Altazimuth system – The local equatorial system – The Universal equatorial system – Conversion of coordinates – Magnitude scale – Measurement of apparent luminosity – Various magnitude systems – Corrections for observed magnitudes – Measurement of terrestrial distances – Measurement of distances within the solar system – Trigonometric parallaxes of stars – Geometrical methods – The method of luminosity distance.

Unit II : STARS Laws for radiation in thermodynamic equilibrium – Application of radiation law to stellar photospheres – Defining temperatures of stars by matter waves – Spectral classification of stars – Explanation of MK spectra – Peculiar stellar spectra – Kepler's third law – Binary stars – Discription of a binary system – Visual binaries – Spectroscopic binaries – Eclipsing binaries – Stellar radii – Important relations between stellar parameters.

Unit III :INTERNAL STRUCTURE OF STARS Equation of stellar structure – Polytropic models – Temperature distribution in polytropes – Stellar energy sources – Stellar opacity – Preliminary models of main sequence stars – Models of real stars – Structure of white dwarfs.

Unit IV: STELLAR EVOLUTION
The virial theorem – Evolution near the main sequence – Star formation – Pre-main sequence contraction Post-main sequence evolution – Nucleosynthesis – Superdense remnants – Evolution of close binary systems.

Unit V: ASTRONOMICAL INSTRUMENTS AND SPACE ASTRONOMY Astronomical Instruments: Optical telescopes – Optical photometric instruments and techniques – Optical spectroscopy – Radio telescopes – Infrared Astronomy – Space Astronomies : Infrared Astronomy – Ultraviolet Astronomy – X-ray Astronomy – Gamma ray Astronomy – The Hubble space telescope.

TEXT BOOK:

1. Abhyankar, K.D. 2007. Astrophysics Stars and Galaxies, , University Press, , ISBN:8173713812.

REFERENCE BOOK:

1. Barbieri, C. 2007. Fundamentals of Astronomy , Taylor & Francis, , ISBN: 0750308869.

Web Resources:

1. *https://www.tecepe.com.br/nav/inav_stars.htm*
2. www.astronomy.ohio-state.edu/~depoy/courses/AST172...NOTES/.../structure3.html
3. https://cosmic-watch.com/history-of-astronomical-instruments/

Course Designers:

1. Dr.R.V.Krishna Kumar

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined M.Sc. Physics on or after June 2020)
PROGRAMME CODE: PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20CL41	Advanced Experiments	LAB	-	-	5	5

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Third & Fourth	40	60	100

Preamble

The course enables students to comprehend the fundamental concepts of detector, Interferometer and the application of various instruments with practical observations.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Exp. Prof. %	Exp. Attmt. %
CO1	Understand the experimental ideas related with Interferometer	80%	80%
CO2	Identify the link between theory and designing workable circuits	80%	80%
CO3	Troubleshoot any simple electronic circuits	80%	80%
CO4	Appreciate the applications of OP-AMPs, Microprocessor	80%	80%
CO5	Report observations and analyses in a scientific manner	80%	80%

Mapping of Course Outcomes with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**S**	**S**	**M**	**-**	**-**	**-**	**L**
CO2	**S**	**M**	**M**	**M**	**L**	**S**	**L**
CO3	**S**	**M**	**S**	**L**	**S**	**S**	**S**
CO4	**S**	**S**	**M**	**M**	**-**	**M**	**-**
CO5	**S**	**M**	**L**	**-**	**-**	**L**	**-**

Mapping of Course Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**M**	**-**	**L**	**S**
CO2	**M**	**M**	**S**	**L**	**S**
CO3	**M**	**S**	**S**	**S**	**S**
CO4	**S**	**M**	**M**	**-**	**S**
CO5	**M**	**L**	**L**	**-**	**S**

List of experiments

1. Filters (I order, II order Low and high pass filters, Band pass filters)
2. Study of JK Flip-Flop.
3. Synchronous counter to count any desired sequence.
4. Shift Register (SISO, PIPO)
5. Half Adder, Full Adder, Half Subtractor, Full Subtractor.
6. Karnaugh map simplification
7. Differentiator, Integrator, Comparator, Triangular wave generator.
8. BCD to seven segment display.
9. Simultaneous equation
10. Schmidt Trigger (using 555)
11. UJT relaxation oscillator.
12. Fibre optic communication
13. Interpretation of powder photograph and determination of lattice constant of a crystal.
14. Finding Debye-Waller factor by Wilson-plot techniques
15. Cell dimension using Oscillation and zero layer Weissenberg photograph
16. Fraunhoffer diffraction using Laser
17. Michelson Interferometer
18. Fabry Perot Interferometer
19. G.M.Counter

MICROPROCESSOR

1. Microprocessor problems for 8 bit addition
2. Microprocessor problems for 8 bit subtraction(binary)
3. Microprocessor problems for 8 bit subtraction(decimal)
4. Microprocessor problems for 8 bit multiplication(binary)
5. Finding a largest number in an array of data
6. Finding a smallest number in an array of data
7. Sorting an array of data in ascending order
8. Sorting an array of data in descending order
9. Finding 1's complement of data
10. Finding 2's complement of data

C and C ++ programming and MS EXCEL- Relevant programmes

Each experiment is planned for 9 hrs and each of this experiment can be divided into many number depending on the hours of work

Thiagarajar College (Autonomous) :: Madurai – 625 009
Department of Physics
(For those joined M.Sc. Physics on or after June 2020)
PROGRAMME CODE: PPH

Course Code	Course Title	Category	L	T	P	Credit
PPH20PJ41	Project	PJ	-	-	12	3

Year	Semester	Int. Marks	Ext.Marks	Total
Second	Third & Fourth	40	60	100

Individual projects done by the students under the guidance of faculty members