MANNAR THIRUMALAI NAICKER COLLEGE

PASUMALAI, MADURAI– 625 004

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

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

B.Sc., Physics

SYLLABUS AND REGULATIONS

UNDER
CHOICE BASED CREDIT SYSTEM (CBCS)
(For those who joined during 2018-2019 and after)

Qualification for Admission

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu with Physics as one of the subject in Higher Secondary Education.

Duration of the Course

The Students shall undergo the prescribed B.Sc (Physics) course of study for a period of three academic years (six semesters).

Subject of Study

Part I: Tamil
Part II: English
Part III:
1. Core Subjects
2. Allied Subjects
3. Electives

Part IV :
1. Non Major Electives
2. Skill Based Subjects
3. Environmental Studies
4. Value Education

Part V :
Extension activities

The scheme of Examination

The components for continuous internal assessment are:

Two tests and their average	--15 marks
Seminar /Group discussion	--5 marks
Assignment	--5 marks
Total	--25 marks

Pattern of the questions paper for the continuous Internal Assessment

(For Part I, Part II, Part III , NME & Skilled Paper in Part IV)

The components for continuous internal assessment are:

Part –A

Six multiple choice questions (answer all) 6 x01= 06 Marks

Part –B

Two questions (‘either …. or ‘type) 2 x 07=14 Marks

Part –C

One question out of two 1 x 10 =10 Marks

Total 30 Marks

Pattern of the question paper for the Summative Examinations:

Note: Duration- 3 hours

Part –A

Ten multiple choice questions 10 x01 = 10 Marks

(No Unit shall be omitted; not more than two questions from each unit.)

Part –B

Five Paragraph questions (‘either …. or ‘type) 5 x 07 = 35 Marks

(One question from each Unit)

Part –C

Three Essay questions out of five 3 x 10 =30 Marks

(One question from each Unit)

Total 75 Marks

The Scheme of Examination (Environmental Studies and Value Education)

Two tests and their average	--15 marks
Project Report	--10 marks*
Total	--25 marks

** The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

Question Paper Pattern

Pattern of the Question Paper for Environmental Studies & Value Education only) (Internal)

Part –A

(Answer is not less than 150 words)

Four questions (‘either …. or ‘type) 4 x 05=20 Marks

Part –B

(Answer is not less than 400 words)

One question (‘either …. or ‘type) 1 x 10=10 Marks

Total 30 Marks

Pattern of the Question Paper for Environmental Studies & Value Education only) (External)

Part –A

(Answer is not less than 150 words)

Five questions (either or type) 5 x 06 =30 Marks

(One question from each Unit)

Part –B

(Answer is not less than 400 words)

Three questions out of Five 3 x 15 = 45 Marks
each unit (One question from each Unit)

Total 75 Marks

Minimum Marks for a Pass

40% of the aggregate (Internal +Summative Examinations).
No separate pass minimum for the Internal Examinations.
27 marks out of 75 is the pass minimum for the Summative Examinations.

PROGRAMME EDUCATION OUTCOMES:

PEO1: The accumulation of facts of nature and the ability to develop an understanding and knowledge of the basic Physics.

PEO2: The ability to use this knowledge to analyze new situations and learn skills and interpret the results and make predictions for the future developments.

PEO3: Apply knowledge of Physics in theoretical and laboratory skills to unfamiliar contexts to identify and analyse problems in Physics

PEO4: Demonstrate Physics-related technological skills that are relevant to employment opportunities.

PROGRAMME OUTCOMES

PO1: Disciplinary knowledge and skills: Capable of demonstrating

(i) good knowledge and understanding of major concepts, theoretical principles and experimental findings in Physics and its different subfields like Astrophysics ,Atomic Physics,Nano Physics, Nuclear Physics, Condensed matter Physics, including broader interdisciplinary subfields like Chemistry, Mathematics, Environmental studies, Computer science, etc.

(ii) ability to use modern instrumentation and laboratory techniques to perform experiments in almost all the fields of Physics.

PO2: Critical thinker and problem solver: Ability to employ critical thinking and efficient problem solving skills in all the basic areas of Physics.

PO3: Conduct Investigations of Problems : Capability for asking relevant questions relating to the problems in the field of Physics, and planning, executing and reporting the results of a experimental investigation.

PO4: Skilled project manager: Capable of identifying resources required for a project, and manage a project through to completion, while observing responsible and ethical scientific conduct; and safety and laboratory regulations and practices.

PO5: National and international perspective: The graduates should be able to develop a national as well as international perspective for their career in the chosen field of the academic activities.

PO6: Life-long learners: Capable of self-directed learning for improving skill development in all areas of physics.

PO7: Professional Ethics: The graduate should be capable of demonstrating ability to think and analyze rationally with scientific outlook and identify ethical issues related to one's work and avoid misrepresentation of data.

PROGRAMME SPECIFIC OUTCOMES

PSO1: To equip the students with specific knowledge and skills required for higher education.

PSO2: To enable the students to know the basic concepts and to enable the students find employment in public and private sector undertakings.

PSO3: To Cover the Concepts,Definitions, Properties matter, Electricity, Electromagnetism, Astro Physics, Atomic Physics, Nuclear and Particle Physics, Digital Electronics, Material Science and Microprocessors.

PSO4: To help the students to analyze the circuit models and to design the circuit

COURSE PATTERN

Study Component	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	Total Hours	Total Credits	No. Of Courses	Total marks
Part –I Tamil	6(3)	6(3)	6(3)	6(3)			24	12	4	400
Part – II English	6(3)	6(3)	6(3)	6(3)			24	12	4	400
Part –III										
Core Subjects	4(4)	4(4)	4(4)	4(4)	5(5) 5(5)	5(5) 5(5)	36	36	8	800
Core Elective					4(4)	4(4)	8	8	2	200
Core Subject(P) Project	2(0)	2(2)	2(0)	2(2)	3(0) 3(0) 2(0)	3(5) 3(6) 2(4)	24	19	5	500
Allied Subject - I	6(4)	6(4)	4(4)	4(4)	-	-	20	16	4	400
Allied Subject – I (T) **Allied Subject – I (P)**	**4(4)** **2(0)**	**4(3)** **2(1)**	**4(4)** **2(0)**	**4(3)** **2(1)**			**16** **8**	**14** **2**	**4** **2**	**400** **200**
Allied Subject - II (T) Allied Subject - II (P)			4(3) 2(0)	4(3) 2(2)	4(3) 2(0)	4(3) 2(2)	16 8	12 4	4 2	400 200
Part – IV										
Skill Based Subject	2(2) 2(2)	2(2) 2(2)			2(2)	2(2)	12	12	6	600
Non Major Elective			2(2)	2(2)			4	4	2	200
EVS/ Value Education	2(2)	2(2)					4	4	2	200
Part – V										
Extension activities				0(1)			0	1	1	100
Total	**30 (20)**	**30 (22)**	**30 (19)**	**30 (24)**	**30 (19)**	**30 (36)**	**180**	**140**	**44**	**4400**

SEMESTER – I

Subject Code	Title of the Paper	No. of Courses	Hours/ Week	Credits	Maximum Marks		
					Int	Ext	Tot
	Part- I Tamil Subject						
18UTAG11	தற்கால கவிதையும் உரைநடையும்	1	6	3	25	75	100
	Part – II English Subject						
18UENG11	Exploring Language Through Literature-I	1	6	3	25	75	100
	Part-III Core Subject						
18UPHC11	Properties of matter, Thermodynamics and Acoustics	1	4	4	25	75	100
18UPHCP1	Major Physics Practical - I	-	2	-	-	-	-
	Part-III Allied Subject						
18UMTA11	Allied Mathematics – I	1	6	4	25	75	100
18UPHA11	**Allied Physics – I Mechanics, Properties of Matter and Relativity**	**1**	**4**	**4**	**25**	**75**	**100**
18UPHAP1	**Allied Physics Practical - I**	**-**	**2**	**-**	**-**	**-**	**-**
	Part-IV Skill Subject						
18UPHS11	Basic Instrumentation	1	2	2	25	75	100
18UPHS12	Basics of C Programming	1	2	2	25	75	100
	Part-IV Mandatory Subject						
18UEVG11	Environmental Studies	1	2	2	25	75	100
	Total	**7**	**30**	**20**	**175**	**525**	**700**

For B.Sc Mathematics Students

SEMESTER – II

Subject Code	Title of the Paper	No. of Courses	Hours/ Week	Credits	Maximum Marks		
					Int	Ext	Tot
	Part- I Tamil Subject						
18UTAG21	பக்தி இலக்கியமும் நாடகமும்	1	6	3	25	75	100
	Part – II English Subject						
18UENG21	Exploring Language Through Literature-II	1	6	3	25	75	100
	Part-III Core Subject						
18UPHC21	Electricity and Magnetism	1	4	4	25	75	100
18UPHCP1	Major Physics Practical - I	1	2	2	40	60	100

	Part-III Allied Subject							
18UMTA21	Allied Mathematics – II	1	6	4	25	75	100	
18UPHA21	**Allied Physics – II**	**1**	**4**	**3**	**25**	**75**	**100**	**For B.Sc Mathematics Students**
18UPHAP1	**Thermal Physics and Sound**	**1**	**2**	**1**	**40**	**60**	**100**	
	Allied Physics Practical - I							
	Part-IV Skill Subject							
18UPHS21	Basic Photography	1	2	2	25	75	100	
18UPHSP1	Programming in C - Lab	1	2	2	40	60	100	
	Part-IV Mandatory Subject							
18UVLG21	Value Education	1	2	2	25	75	100	
	Total	**8**	**30**	**22**	**230**	**570**	**800**	

SEMESTER – III								
Subject Code	**Title of the Paper**	**No. of Courses**	**Hours /Week**	**Credits**	**Maximum Marks**			
					Int	**Ext**	**Tot**	
	Part- I Tamil Subject							
18UTAG31	காப்பிய இலக்கியமும் சிறுகதையும்	1	6	3	25	75	100	
	Part – II English Subject							
18UENG31	Exploring Language Through Literature-III	1	6	3	25	75	100	
	Part-III Core Subject							
18UPHC31	Optics and Spectroscopy	1	4	4	25	75	100	
18UPHCP2	Major Physics Practical – II	-	2	-	-	-	-	
	Part-III Allied Subject							
18UMTA31	Allied Mathematics-III	1	4	4	25	75	100	**For B.Sc Mat**
18UCHA31	Allied Chemistry – I Organic Chemistry	1	4	3	25	75	100	
18UCHAP1	Allied Chemistry Practical – I Volumetric Analysis Practical	-	2	-	-	-	-	
	Part-IV Non Major Elective							
18UPHN31	Physics for everyday life	1	2	2	25	75	100	
	Total	**6**	**30**	**19**	**150**	**450**	**600**	

SEMESTER – IV							
Subject Code	**Title of the Paper**	**No. of Courses**	**Hours/ Week**	**Credits**	**Maximum Marks**		
					Int	**Ext**	**Tot**
18UTAG41	**Part- I Tamil Subject** பழந்தமிழ் இலக்கியமும் புதினமும்	1	6	3	25	75	100
18UENG41	**Part – II English Subject** Exploring Language Through Literature-IV	1	6	3	25	75	100
	Part-III Core Subject						
18UPHC41	Atomic Physics	1	4	4	25	75	100
18UPHCP2	Major Physics Practical – II	1	2	2	40	60	100
	Part-III Allied Subject						
18UMTA41	Allied Mathematics – IV	1	4	4	25	75	100
18UCHA41	Allied Chemistry - II Inorganic Chemistry	1	4	3	25	75	100
18UCHAP1	Allied Chemistry Practical –I Volumetric Analysis Practical	1	2	2	40	60	100
18UPHN41	**Part IV –Non Major Elective** Physics of Electrical Appliances	1	2	2	25	75	100
18UEAG40 – 18UEAG49	**Part V- Extension Activity**	1	0	1	100	-	100
	Total	**9**	**30**	**24**	**330**	**570**	**900**

SEMESTER – V							
Subject Code	**Title of the Paper**	**No. of Courses**	**Hours /Week**	**Credits**	**Maximum Marks**		
					Int	**Ext**	**Total**
18UPHC51	**Part-III Core Subject** Classical and Statistical Mechanics	1	5	5	25	75	100
18UPHC52	Analog Electronics	1	5	5	25	75	100
18UPHE51	**Part III: Elective Subject** Nuclear Physics	1	4	4	25	75	100
18UPHE52	Condensed Matter Physics	1	4	4	25	75	100
18UPHE53	Astrophysics	1	4	4	25	75	100
18UPHCP3 18UPHCP4	Non-Electronics Practical Electronics Practical	-- --	3 3	-- --	--	--	--
18UPHPR1	Project	--	2	--	--	--	--
18UCHA51	**Part-III Allied Subject** Allied Chemistry – III Physical Chemistry	1	4	3	25	75	100
18UCHAP2	Allied Chemistry Practical-II Organic Analysis	--	2	--	--	--	--
18UPHS51	**Part-IV Skill Subject** Gemology	1	2	2	25	75	100
	Total	**5**	**30**	**19**	**125**	**375**	**500**

SEMESTER – VI							
Subject Code	**Title of the Paper**	**No. of Courses**	**Hours/ Week**	**Credits**	**Maximum Marks**		
					Int	**Ext**	**Total**
18UPHC61	**Part-III Core Subject** Quantum Mechanics and Relativity	1	5	5	25	75	100
18UPHC62	Digital Electronics	1	5	5	25	75	100
18UPHE61	**Part III: Elective Subject** Nanophysics	1	4	4	25	75	100
18UPHE62	Medical Instrumentation	1	4	4	25	75	100
18UPHE63	Optoelectronics and Fibre optic communication	1	4	4	25	75	100
18UPHCP3	Non - Electronics Practical	1	3	5	40	60	100
18UPHCP4	Electronics Practical	1	3	6	40	60	100
18UPHPR1	Project	1	2	4	40	60	100
18UCHA61	**Part-III Allied Subject** Allied Chemistry – IV Applied and Analytical Chemistry	1	4	3	25	75	100
18UCHAP2	Allied Chemistry Practical-II Organic Analysis	1	2	2	40	60	100
18UPHS61	**Part-IV Skill Based** Basics in Microprocessors	1	2	2	25	75	100
	Total	**9**	**30**	**36**	**285**	**615**	**900**

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DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part III**	**: Core**
Semester	**: V**	**Hours**	**: 05**
Subject Code: 18UPHC51		**Credits**	**: 05**

CLASSICAL AND STATISTICAL MECHANICS

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Define Frame of reference, Degrees of freedom, coordinate systems, Phase space and energy distribution

CO2: Elaborate conservation laws, constraints, cyclic coordinates ensembles, velocity distribution law.

CO3: Understand the concepts of microstate, macro state, ensemble, phase space, thermodynamic probability and Fermi-Dirac statistics.

CO4: Examinecentre of mass of frame of reference, Langrangians's equations from D'Alembert's principle, Hamilton's equations in coordinate systems, Boltzmann theorem on entropy and probability, three distribution laws.

CO5: Importance of conservation of energy ,principle of virtual work, momentum and cyclic coordinates, quantum statistics, Bose-Einstein statistics

Unit I

Space and Time (Frame of reference)-Newton's Laws of motion- Inertial frames-Gravitational Mass – Mechanics of particle- Conservation Laws-Conservation of linear momentum- Conservation of angular momentum- Conservation of energy – work, kinetic energy and work energy theorem- Conservative force and potential energy. Mechanics of a System of particles - External and internal forces- Centre of mass- Conservation of linear momentum- Centre of mass of frame of reference- Conservation of angular momentum-Conservation of energy –Kinetic energy- Potential energy- Conservation theorem.

Unit II

Basic concepts, coordinate systems - Degrees of freedom—configuration space. Constraints- Holonomic constraints- Non holonomic constraints, Examples. Forces of constraints. Genaralised coordinates – Principle of virtual work – D'Alembert's principle-Langrangian's equations from D'Alembert's principle.

Unit III

Generalised momentum and cyclic coordinates- significance of translation and rotation cyclic coordinates – symmetry properties – Hamilton's Equations - Hamilton's Equations in different Coordinate systems. Examples of Hamiltonian dynamics – (Harmonic oscillator, motion of a particle in central force field)

Unit- IV

Macrostate and microstate systems-Ensembles- phase space - Thermo dynamic probability-Boltzmann's theorem on entropy and probability-Fundamental postulates of statistical mechanics-Statistical equilibrium

Unit-V

Need of Quantum statistics - Maxwell-Boltzmann statistics-Maxwell-Boltzmann energy distribution law - Maxwell-Boltzmann's velocity distribution law- Bose-Einstein statistics-Bose-Einstein distribution law- Fermi-Dirac statistics-Fermi-Dirac distribution law- - comparison of the three distribution laws.

Text Book-1:

1. Upadhyaya, **Classical Mechanics, Himalaya Publishing House, Delhi** 5th, Edition, 2005, Reprint-2017

Unit 1- Chapter - 1.1- 1.63, 1.7.1- 1.7.5, 1.7.8

Unit 2-Chapter - 2.1, 2.2, 2.3, 2.3.1-2.3.4, 2.4, 2.5, 2.6, 2.7.

Unit 3 – Chapter - 3.1, 3.2, 3.3.3, 3.5, 3.6, 3.7

Text Book-2:

1. Brijlal, N.Subrahmanyam, P.S.Hemne, **Heat Thermodynamics and statistical physics** S.Chand and Co, New Delhi, First Edition 1968, Reprint 2014.

Unit 4- Chapter – 9.7, 10.10.1-10.10.3, 10.4, 9.8, 10.15, 10.8, 11.2,

Unit 5-Chapter – 11.3, 11.6, 12.1, 12.2, 12.5, 12.8, 12.15.

Reference Books:

1. G.Aruldhas, **Classical Mechanics**, PHI Pvt. Ltd, New Delhi, Fourth Edition, 2013.
2. S.P.Kuila, **Fundamentals of Quantum Mechanics Statistical Mechanics & Solid State Physics,** Books and Allied (P) Ltd, Kolkatta, First Edition, 2013.
3. R.Takwle and P.S.Puranik, **Introduction to Classical mechanics**, TMH Publishers, New Delhi, 2nd Edition, 20

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DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part III**	**: Core**
Semester	**: V**	**Hours**	**: 05**
Subject Code: 18UPHC52		**Credits**	**: 05**

ANALOG ELECTRONICS

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Understand Thevenin's and Norton's Theorem, Two port Network Analysis , N type and P type semiconductors, NPN and PNP transistors, CE Amplifier, Hartley, Colpitt and Phase Shift Oscillator, Multivibrator , AM and FM Modulation,

CO2: Applying and deriving current ,voltage and power gain, input and output impedance of CE amplifier using 'h'parameter,Op-Amp for making adder, subtractor , differentiator and integrator

CO3: Analyse biasing of diodes and transistors

CO4: Evaluating Barkhausen criterion for oscillations

CO5: Construction of oscillators and astablemultivibrator using discrete components

Unit-I

Thevenin's Theorem – Norton's Theorem – Thevenin – Norton Conversion - Two port Network Analysis – 'h'Parameter only - Semiconductors – Types of semiconductor – p-n junction diode – Biasing a p-n junction – Zener diode characteristics – Voltage regulator using Zener diode.

Unit-II

Transistor – three types of transistor connection – Relation between α, β, γ – Load line (DC & AC) and Operating Point (Q point) – Biasing circuits – Base bias - Emitter Feedback bias –Voltage divider bias – Collector feedback bias – FET Parameters - FET characteristics.

Unit-III

Small signal CE Amplifier – Calculation of voltage gain, current gain, power gain, input and output impedance using h parameter – Frequency response of amplifier – Power amplifier –Push Pull amplifier (class B power amplifier)-OP AMP characteristics-OP AMP as adder, subtractor, differentiator and Integrator

Unit-IV

Feedback principle – Positive and Negative feedback – Barkhausen criterion – Transistor oscillators – Hartley, Colpitt and Phase Shift Oscillator with mathematical analysis - Astablemultivibrator using transistors with mathematical derivation.

Unit-V

Modulation – Types of modulation – Amplitude modulation – Modulation index - Modulated power output – Frequency Modulation– Expression for frequency modulated voltage - Block diagram of AM & FM transmitters and receivers – Digital Modulation.

Text Book:

1. G.Joserobin and A.Ubald Raj, **Analog Electronics and Digital Electronics**, Indira Publication, New Delhi, First edition, 2008.

Unit I Page No: 5-29, 38-63

Unit II Page No: 88 - 128

Unit III Page No: 138 - 154, 161 - 174, 183-191

Unit IV Page No: 207 - 239

Unit V Page No: 249 - 262, 264-266, 269-272, 279 -282

Reference Books:

1. V.K.Metha, **Principles of Electronics**, S.Chand and co., New Delhi, 2002.
2. B.L.Theraja ,**Basic Electronics,** S.Chandand co., New Delhi, 2003
3. Salivahanan, Sureshkumar, Vallavaraj, **Electronics Devices and Circuits**, Tata Mc. Graw Hill, New Delhi,2004
4. Ambrose & Vincent Devaraj, **Elements of Solid State Electronics,** Indra Publications, New Delhi, 1994.
5. J.J.Bophy, **Basic Electronics**, Tata Mc Graw Hill, New Delhi, IV edition, 1983.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class : B.Sc (Physics) **Part III : Elective**
Semester : V **Hours : 04**
Subject Code: 18UPHE51 **Credits : 04**

NUCLEAR PHYSICS

Course Outcomes
On successful completion of the course, the learners should be able to

CO1: Understand the nuclear forces, models of nuclear structure, elementary particles, laws of radio activity fission and fusion reactions, Types of nuclear reactors.
CO2: Application of nuclear binding energy, Synchrotron, synchrocyclotron, wavelength of crystal spectrometer, Thermo nuclear reaction, Radio isotopes .
CO3: Analyse nuclear models, chamber, internal conversion of energy, C-N cycle and P-P cycle, nuclear reactor.
CO4: Evaluate liquid drop model, photographic emulsion technique, neutrino theory and β decay, van Allen belts, electricity from nuclear energy.
CO5: Create knowledge in the particle accelerators, disintegration energy, Nuclear Transmutations, varies types, Radio isotopes.

Unit I –Nuclear Structure

General Properties of atomic nucleus – Nuclear Binding energy – Nuclear stability -– Yukawa's theory (No. derivation) – Theories of nuclear composition – Proton Electron hypothesis – Nuclear forces - Models of nuclear structure – Liquid drop model – Binding energy formula – Shell model

Unit II – Nuclear Accelerators and Detectors

Particle accelerators – Synchrocyclotron – Betatron–Detectors – Wilson cloud chamber – Bubble chamber – Elementary particles – Particles and AntiParticles – Conservation laws and symmetry.

Unit III – Radioactivity

Laws of radioactivity – Half life period – Mean life – Radio carbon dating – Alpha rays – Properties - Range – Geiger Nuttal law – Experimental determination of range – Alpha disintegration energy – Gamow's Theory of alpha decay – Beta rays – Neutrino theory of beta decay – Gamma rays – Origin – Internal conversion.

Unit IV – Nuclear Reactions

Nuclear transmutations by alpha particles , protons, deuterons, neutrons and electrons – Photo disintegration – Nuclear fission – Explanation for release of energy - Nuclear fusion

– (C- N cycle and P-P Cycle) - Thermo nuclear reactions – Controlled thermo nuclear reactions.

Unit V –Nuclear Energy

Production of electricity from Nuclear energy – Nuclear reactors – General features of nuclear reactor – Different types of nuclear reactors – Pressurized water reactors – Boiling water reactors – Fast Breeder reactors – Radiation hazards- Radio isotopes and their applications.

Text Book:

1. R.Murugesan and Kiruthiga Sivaprasath, **Modern Physics,** S.Chand and Co., New Delhi Sixteenth Edition, 2012.

Unit I : Chapter: 27 (Section: 27.1 - 27.12)
Unit II: Chapter: 29 (Section: 29.7, 29.9 and 29.11)
Chapter: 30 (Section: 30.5, 30.6, 30.8)
Chapter: 38 (Section 38.1, 38.2 and 38.6)
Unit III: Chapter: 31 (Section: 31.4, 31.10 - 31.12, 31.16, 31.22 - 31.25, 31.30, 31.31 and 31.35)
Unit IV: Chapter: 34 (Section: 34.7)
Chapter 35 (Section 35.2 - 35.4, 35.7 - 35.9)
Chapter 37 (Section 37.1, 37.5, 37.6 and 37.10)
Unit V: Chapter 35 (Section: 35.5 and 35.6)
Chapter 36 (Section 36.1 - 36.3)
Chapter 32 (Section 32.1 - 32.5)

Reference Books:

1. D.C.Thayal, **Nuclear Physics**, Himalaya Publishing House, NewDelhi, 2004.

2. I. Kaplan,**Nuclear Physics,** Tata McGraw Hill, NewDelhi,1995.

3. ArtherBeiser, **Perspective of Modern Physics**, Tata McGraw Hill, NewDelhi, 1997.

4. D.I.Sehgal, K.I.Chopra, and N.K.Sehgal, **Modern Physics,** Sultan Chand and Sons Publications, 7th Edition, New Delhi, 1993.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part III**	**: Elective**
Semester	**: V**	**Hours**	**: 04**
Subject Code: 18UPHE52		**Credits**	**: 04**

CONDENSED MATTER PHYSICS

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Understand crystal structure, free electron theory of metals, types of magnetism, polar and non polar dielectrics, properties of semiconductor**.**

CO2: Application of Miller indices, conductivities of metals, Langevin's theory of dia and para magnetism, Intrinsic and Extrinsic semiconductor.

CO3: Analyse the structure of diamond and zinc blende, Widemannfranz law, magnetic materials, types of polarization, carrier concentration.

CO4: Evaluate specific heat theories of solids, BCS theory, hard and soft magnetic materials, frequency and temperature dependence, variation of Femi level.

CO5: Create knowledge in the forming crystal structure

Unit I:

Crystal lattice – Unit cell – Bravais lattice –Miller indices– Crystal structures and calculation of packing factor (SC,BCC,FCC) –Structure of diamond and Zinc blende – Specific heat theories of solids – Einstein's theory of specific heat– Debye's theory of specific heat

Unit II:

Free electron theory of metals – Electron drift, mobility, mean free path, relaxation time, electrical and thermal conductivities of metals – Widemann Franz law – Super conductivity – Properties of Superconductors - BCS theory - Applications of super conductors (Squids, Magneticlevitaion)

Unit III:

Different types of magnetism – Dia, para, ferro, anti ferro and ferimagnetism – Langevin's theory of dia and para magnetism – Weiss theory of ferro magnetism – Magnetic materials – Properties and applications – Hard and soft magnetic materials – Ferrites.

Unit IV:

Dielectrics – Polarization – Polar and non polar dielectrics – Dielectric constant – Polarisability – Clausius - Mosotti relation - Different types of polarization –electronic, ionic, orientational, space charge polarizations – Dependence of polarization on frequency and temperature – Dielectric loss – Dielectric strength and break down.

Unit V:

Semiconducting materials-General properties of the semiconductors-Classification of semiconductors-Intrinsic semiconductor-Carrier concentration derivation-Variation of Fermi level with temperature-Extrinsic semiconductor-Carrier concentration in n-type and p-type semiconductor-Variation of Fermi level with temperature and impurity concentration-Direct and Indirect band gap semiconductors

Text Book:

1. Dr. M. Arumugam, **Material Science** , Anuradha Publications, III Revised Edition, Reprint 2016.

   Unit – I : Page No., 3.1 – 3.2, 3.4-3.5, 3.7-3.8, 3.18-3.21, 3.24, 3.26, 4.37-4.48

   Unit – II: Page No., 4.2, 5.5 – 5.9, 5.16 – 5.20, 8.1- 8.5, 8.12, 8.15.

   Unit – III: Page No., 7.1 – 7.14, 7.23 – 7.29

   Unit – IV: Page No., 6.1 – 6.14, 6.17 – 6.20

2 Dr. M. Arumugam, Solid State Physics, Anuradha Publication, First Edition, 2004.

   Unit – V: Page No., 9.1 - 9.17

Reference Books:

1. R. K. Puri and V.K. Babbar, **Solid state physics**, S.Chandand Co, I Edition, 1997.
2. Halliday Resnick, Jearl Walker, **Principles of physics** (9^{th} Edition), Wiley India Pvt. Ltd., New Delhi, 2012.
3. Dr. P. Mani, **Engineering Physics– II**, Dhanam Publications, Nineth Edition, Reprint November 2015.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part III**	**: Elective**
Semester	**: V**	**Hours**	**: 4**
Subject Code: 18UPHE53		**Credits**	**: 4**

ASTROPHYSICS

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Understand basic concepts of positional astronomy like astronomical coordinate system, astronomical techniques, various types of optical telescopes and telescope mountings, various types of detectors and their use with telescopes and Physics of sun and our solar system.

CO2: Measure distances, time, temperature and radius of star.

CO3: Analysis of speed of light, Chandrasekhar's Limit and differential Rotation of Sun.

CO4: Evaluate aperture, focal length and magnification or power of telescopes.

CO5: Develop ideas on Future of Universe.

UNIT: I Sky

Understanding the Sky-Constellation – Birth of Modern Astronomy – Geocentric Theory – Heliocentric Theory.

UNIT: II Light and Telescopes

The Speed of Light – The Constancy of the Speed of Light – The Special Theory of Relativity – Telescopes – Aperture – Focal length – Magnification or Power – Types of Optical telescopes – Reflecting Telescopes – Refracting Telescopes – Telescope Mountings – Radio Telescopes – Infrared Telescopes – Ultraviolet, X- Ray and Gamma Telescopes.

UNIT:III Our Solar system

Planets – Terrestrial Planets – The Jovian Planets – Mercury – Venus – Earth and the Moon – Mars – Jupiter – Saturn – Uranus – Neptune – Dwarf Planets and Kuiper Belt – Kepler's Laws – Comets – Asteroids – Meteoroids – Meteors – PHOs. Stars: Star Formation – The Hertzsprung – Russell (HR) Diagram – Chandrasekhar's Limit – Distance Determination. Parallax Method of Stars – Limitation of Distance Measurement Using Stellar Parallax – Absolute and Apparent Magnitude – Star Death.

UNIT: IV SUN

Sun Structure – Temperature at Various Zones – Sunspots, Solar Flares and Evershed Effect – Differential Rotation of Sun – Prominences – Granules – Nuclear Fusion – Seasons – Moon – Lunar eclipse – Solar Eclipse – Binary Stars.

UNIT: V Cosmology

Astronomy and cosmology – Expansion of the Universe – Cosmic Ray Background – The Steady State alternative – Dark Matter and Dark Energy – Big Bang and Big Crunch – Pulsating Theory – Galaxies – Closed, Open and Flat universe – Future of Universe – Cosmology, Philosophy and Theology.

Text Book:

1. Dr. S. Stephen Rajkumar Inbanathan, **Introduction to Astronomy for Beginners**, 2019.

UNIT –I	**:**	Chapter–1 & 2
UNIT–II	**:**	Chapter –3
UNIT–III	**:**	Chapter –4 & 5 (5.1 to 5.5)
UNIT–IV	**:**	Chapter –5 (5.6 to 5.10)
UNIT–V	**:**	Chapter –6

Reference books:

1. Jay M. Pasachoff, **ASTRONOMY From the earth to the universe**, saunders college publishing, 2006.

2. DianahL. Moche, **ASTRONOMY A self- teaching guide**, John Wiley & sons, Inc, 2015.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part III**	**: Core**
Semester	**: V&VI**	**Hours**	**: 03**
Subject Code: 18UPHCP3		**Credits**	**:-**

NON – ELECTRONICS PRACTICAL

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Understand the function of instruments like spectrometer and spot galvanometer
CO2: Relate analyse angle of incidence and emergence
CO3: Find wavelength of light and particle size using laser
CO4: Compare the impedance and power factor of LR and CR circuits
CO5: Justify, Bridge circuits, Grating, LCR circuits

ANY 14 EXPERIMENTS

1. Spectrometer	-	i-d curve
2. Spectrometer	-	i – i’
3. Grating	-	Minimum deviation method
4. Spectrometer	-	Cauchy’s Constants
5. Spectrometer	-	Hartmann’s Interpolation formula
6. L.C.R	-	Series resonance circuit
7. L.C.R	-	Parallel resonance circuit
8. Spot Galvanometer	-	Determination of (M) Mutual induction
9. Spot Galvanometer	-	Comparison of (M) Mutual inductances
10. Anderson’s Bridge (AC Method)	-	Self inductance
11. Maxwell’s Bridge (AC Method)	-	Self inductance
12. Owens Bridge (AC Method)	-	Self inductance
13. Spot Galvanometer	-	Absolute Capacity of a Condenser
14. Spot Galvanometer	-	High resistance by Leakage
15. Impedance and Power factor	-	L.R.circuit
16. Laser	-	Determination of wavelength of and particle size

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part III**	**: Core**
Semester	**: V&VI**	**Hours**	**: 03**
Subject Code: 18UPHCP4		**Credits**	**:-**

ELECTRONICS PRACTICAL

Course Outcomes
On successful completion of the course, the learners should be able to

CO1: Understand functions of operational amplifier, Half adder, Full adder
CO2: Show the various Rectifier circuit, Diode, Transistor characteristics
CO3: Use various stages of amplifier circuits and oscillator – Frequency
CO4: Learn the circuit connections using various electronic components by individual soldering method
CO5: Interpret Cathode Ray Oscilloscope, Trainer Board Circuits, 8085 Microprocessor

ANY 14 EXPERIMENTS

1.	Zener Diode	–	Characteristics
2.	Transistor	–	Characteristics C.E mode
3.	Determination Band gap	-	Semiconductor
4.	Zener	-	Voltage Regulator
5.	Single Stage Amplifier	-	Gain and Bandwidth
6.	Hartley Oscillator	-	Frequency and Inductance of pair of coils
7.	Astable Multivibrator	-	Discrete Components only
8.	Logic Gates	-	Discrete Components only
9.	OPAMP	–	Integrator and Differentiator
10.	Astable Multivibrator	-	IC 555
11.	Universal NOR Gate	-	IC 7402
12.	Universal NAND Gate	-	IC 7400
13.	Half Adder, Full Adder		
14.	Four Bit Binary Adder		
15.	Four Bit Binary Subtractor		
16.	8085 Microprocessor	-	Add and Subtract Two 8 bit numbers

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part III**	**: Core**
Semester	**: V&VI**	**Hours**	**: 02**
Subject Code: 18UPHPR1		**Credits**	**: -**

PROJECT

Course Description

The Project is conducted by the following Course Pattern.

Internal

Presentation Submission	**40**

External

Project Report Viva Voce	**60**
Total	**- 100**

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class : B.Sc., (Physics) **Part IV : Skill**
Semester : V **Hours : 02**
Subject Code : 18UPHS51 **Credits : 02**

GEMOLOGY

Course Outcomes:

On successful completion of the course, the learners should be able to

CO1: Define Scratch test, Hardness, Gem, crystalline and Amorphous materials, carving, lap materials

CO2: Explain Polariscope, Dichroscope, mineral crystallization, Mineral groups, Gem nomenclature, gem structure chart

CO3: Apply Moh scale for crystals, Gas crystallization, natural and man made gems, Faceting style, medical field

CO4: Distinguish types of tests on gems, pearl, emerald, diamond and colored stones, round cut and step cut, weights and measure

CO5: Justify acid test, durability of crystal, rock formation, organic and inorganic cushion shapes, standard gem sizes.

Unit-I: Introduction to Gemology

Definitions - gemology, gemologist, Gem– different type of tests on gems- quality scratch test, acid test .

Identification of GemsHardness and wear ability.

Polariscope Dichroscope, Refractive index, specific gravity (definition and formula), Hardness definition, Moh scale of hardness, Moh scale for different crystals, durability of crystals, wearing and worn of crystals, hardness and scratching (with quartz as example), cleavage.

Unit-II : Gem formation

Definition of gem, pearl, amber, opal, emerald.- Making of crystals-five requirements of crystallization-Mineral crystallization- igneous, metamorphic, and sedimentary- rock formation(rock cycle)- Magma crystallization-Gas crystallization-Environmental Changes Contact Metamorphism-Regional Metamorphism-Surface Water-Gems Formed in the Earth's Mantle.

Unit-III: Classification of Gems

Precious and Semiprecious, Diamonds and Colored Stones, Natural and Man Made, Organics and Inorganics, Crystalline and Amorphous Materials, Aggregates, Rocks, Minerals, Species and Varieties, Series and Blends, Mineral Groups.

Unit-IV: Types of gem cutting.

Tumbling, Cabochon cutting, Faceting, Carving, cleavage, Gem nomenclature, Shapes, Faceting styles- round cut, Brilliant cut, step cut, cushion shaped , barion cut, Portugese cut, Fantasy cut.

Unit-V: Physical Properties and Medical applications of gems:

Chalcedony, Diamond, Pearl, choosing a diamond, Birthstone list, weights and measure, Gem structure chart, standard gem sizes, gem stone size chart, lap materials Medical applications of various gems, seven Chakras of human body and chakra healing using gems.

Text Book:

1. Jayabalakrishnan.S.S. **"Gemology"** First edition 2020 Shanlax Publications, Madurai.

Unit - I	1, 1.1 – 1.4
Unit - II	2, 2.1 – 2.13
Unit – III	3, 3.1 – 3.12
Unit – IV	4.1 – 4.10
Unit – V	5.2, – 5. 4, 5.5 – 5.10, 6, 6.1 – 6.4, 6.6

Reference Books:

1. Cally Hall., **Handbook on Gemstones** –Dorling Kindersley Hand book Ist edition, London, 2000.
2. Smithsonian**., Rock and Gem**, Penguin Random House, Ist edition 2005.

E-Books from Library N –List

1. Anderson, Basil W. (1990) ***Gem Testing***. Rev. by E. A. Jobbins.10th ed., Butterworth, London.
2. Anderson, Basil W., and James Payne. (1998) ***The Spectroscope and Gemology.*** Gem Stone Press, Woodstock, VT.
3. Field, J.E., ed. (1992) ***Properties of natural and synthetic diamond. Academic Press,*** London, New York.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part III**	**: Core**
Semester	**: VI**	**Hours**	**: 05**
Subject Code: 18UPHC61		**Credits**	**: 05**

QUANTUM MECHANICS AND RELATIVITY

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Define De Broglie wavelength, eigen values and functions, free particle, frame of reference, rest energy

CO2: Derive Planck's law of radiation Schrodinger equation, particle in a box, principle of relativity, mass energy equivalence

CO3: Utilize Planck's law of radiations, properties of the wave functions, finite square well potential, Galilean transformation, Einstein's postulates

CO4: Analyze inadequacy of classical mechanics, orthogonal wave functions, ether hypothesis, barrier penetration problems, addition of velocities

CO5: Importance of De Broglie waves, Schrodinger wave equation time dependent and independent, Michelson Morley experiment, Lorentz transformation equations

Unit-I : Wave Properties

Planck's Quantum theory- Planck's Hypothesis- Derivation of Planck's law of Radiation- Inadequacy of classical mechanics -Matter wave-Expression for de-Broglie Wavelength- Other Expressions for de-Broglie Wavelength- Phase velocity(or Wave Velocity) of de-Broglie Waves- Group Velocity- Expression for Group Velocity- Experimental study of matter-Heisenberg's uncertainty principle.

Unit-II : Schrodinger Equation:

Derivation of Time-Dependent form of Schrodinger equation - Time-Independent form of Schrodinger equation- Eigen values and Eigen Functions-Operator for momentum Properties of the wave function- Orthogonal wave function- Normalised wave function.

Unit-III : Applications of Schrodinger Equation:

The free particle-The particle in a box: Infinite square well potential - Finite square potential well-Rectangular potential well-Potential step-The Barrier penetration problem-Tunnel effect-Linear Harmonic oscillator.

Unit-IV : Newtonian Relativity:

Frame of reference- Newtonian Principle of Relativity- Galilean Transformation of Equations-The ether hypothesis – The Michelson-Morley Experiment.

Unit-V : Special Theory of Relativity:

Einstein postulates- The Lorentz transformation equations- Length Contraction- Time dilation- Relative of simultaneity- Addition of velocities- Variation of mass with velocity- Mass energy equivalence- Relation between total energy, the rest energy, and the momentum.

Text book:

1. R.Murugesan, Er.Kiruthiga Sivaprasath, **Modern Physics,** S.Chand, New Delhi, Revised edition 17th Revised Edition, 2014.

Unit – I: 6.7, 7.1, 7.2, 7.2.1- 7.2.5, 7.3, 7.5.

Unit – II: 8.1, 8.1.1.

Unit – III: 8.2, 8.3, 8.4, 8.5, 8.7, 8.8, 8.8.1, 8.9.

Unit – IV: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6.

Unit – V: 1.7, 1.8, 1.9, 1.10.11.1, 1.12, 1.13, 1.14(1.14.1).

Reference Books:

1. R.Sathiyapraksh, **Quantum Mechanics**, Ratan Praksan Mandir, New Delhi, 1994.
2. Seghal Chopra and SeghalSultan, **Modern Physics**, S.Chand and Co, New Delhi, 1998
3. R. Murugesan , **Mechanics and Relativity**, Properties of Matter, Practical Physics, First Edition, Madurai, August 2006.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc. (Physics)**	**Part III**	**: Core**
Semester	**: VI**	**Hours**	**: 05**
Subject Code: 18UPHC62		**Credits**	**: 05**

DIGITAL ELECTRONICS

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Understanding of number systems, Boolean functions, logic gates, flip flops and Sequential Circuits.

CO2: Applying Binary number system to Sequential Circuits.

CO3: Synthesis of Boolean functions, simplification and construction of digital circuits by employing Boolean algebra.

CO4: Synthesising and simplifying the Boolean equations for Sequential Circuits

CO5: Constructing logic gates, flip flops, adders, subtractors, multiplexer, encoder, decoder, Astablemultivibrater using IC 555, D/A and A/D converters.

UNIT – I

Number system – Binary, decimal, octal, hexadecimal – conversion from one to other - Binary addition, subtraction, multiplication, division – 1's and 2's complement subtraction – 9's and 10's complements – Binary coded decimal (B C D) – BCD addition - weighted Binary codes and 8421 code – Non-weighted codes – excess 3 code and gray code – Alpha numeric code (ASCII code only) Boolean logic operations (OR ,AND, NOT) – Basic laws of Boolean algebra (Boolean addition, subtraction & multiplication)-Properties (commutative, associative, distribution, absorption laws, consensus laws, principle of duality) – De Morgan's theorems – simplification of Boolean expressions.

UNIT – II

Positive and negative logic – logic gates – OR, AND, NOT, NOR, NAND, EXOR, EXNOR – universal gates – Logic families – RTL (NOT gate) – DTL (NOR and NAND gates) – TTL (NAND gate) – Half adder – Full adder – Half subtractor – Full subtractor – 4 bit binary adder – 4 bit binary subtractor.

UNIT – III

Flip flops – RS flip flop (using NOR logic and NAND logic) – clocked RS flip flop – D flip flop – edge triggering – JK flip flop – JK master slave flip flop - Counters- Types of counters - 4 bit binary ripple counter – Shift register- Ring counter

UNIT – IV

Multiplexer – 4 to 1 multiplexer– De-multiplexer - 1 to 4 de-multiplexer –Decoder – 3 to 8 decoder –BCD to decimal decoder – BCD to seven segment decoder – Encoder - Decimal to BCD encoder.

UNIT – V

Timer IC 555 block diagram, mono and astablemultivibrator – Digital to analog converter (D/A) – Binary Ladder type - Analog to digital converter (A/D) - Successive approximation type .

Text book:

1. S.Salivahanan, S.Arivazhagan, **Digital Circuits and Design,** Vikas Publishing House Pvt. Ltd., 4th Edition, Noida, 2012.

Unit I: Chapter 1 [1.1, 1.2 (1.2.1 to 1.2.7), 1.4, 1.5 (1.5.1 to 1.5.5), 1.6, 1.7, 1.8 (1.8.1), 1.9(1.9.1, 1.9.2, 1.9.5), 2.1, 2.2, 2.3 (2.3.1, 2.3.2, 2.3.3), 2.4 (2.4.1 to 2.4.4), 2.5].

Unit II: Chapter 3 [3.1, 3.2, 3.3(3.3.1 to 3.3.8), 4.5, 4.7, 4.9 (4.9.1), 5.3, 5.4, 5.6, 5.7, 5.8 (5.8.1, 5.8.2)]

Unit III: Chapter 7 [7.3, 7.3.1, 7.4, 7.5, 7.6, 7.10.2, 8.2, 9.1 (9.1.1), 9.2, 9.3].

Unit IV: Chapter 6 [6.1, 6.2, 6.2.1, 6.4, 6.4.1, 6.5, 6.5.2, 6.5.6, 6.5.9, 6.7, 6.7.2].

Unit V: Material will be given by the Department

Reference Books:

1. Malvino and Leach, **Principles of Digital Electronics**, Tata McGraw – Hill Edition, Fifth Edition, New York, 2004.
2. R.P.Jain, **Modern Digital Electronics**, Tata McGraw – Hill Edition, Fourth Edition, New Delhi, 2011.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part III**	**: Elective**
Semester	**: VI**	**Hours**	**: 04**
Subject Code: 18UPHE61		**Credits**	**: 04**

NANOPHYSICS

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Understand the energy band, synthesis of nano material, basic principle of electron Microscope structure of nano material, application of nanomaterial.

CO2: Application of electrical conduction in metals, lithographic peocers and its limitations Scanning electron microscope, X-ray diffraction medicine energy sector**.**

CO3: Analyse the free electron model preparation of Nanomaterial, X-ray analysis, types types of method-next generation computer.

CO4: Evaluate electron transport in semiconductors, Molecular beam epitaxy, Transmission electron Microscope, X-ray line shape analysis, water purification

CO5: Develop idea on low dimensional system, other process, other microscope, small angle x-ray Scattering

UNIT – I

Energy bands-density of states at low-dimensional structures –electrical conduction in metals- classical theory-the drude model-quantum theory –the free electron model-conduction in insulators-electron transport in semiconductors – various conduction mechanisms in 3D (bulk), 2D (thin film)and low dimensional systems .

UNIT – II

Top-down vs bottom up technique-lithographic process and its limitations-nonlithographic techniques- plasma arc discharge- sputtering-evaporation-chemical vapour deposition-pulsed laser deposition- molecular beam epitaxy- sol-gel technique-eletectrodeposition-other process

UNIT – III

Basic principles of electron microscopy – scanning electron microscope (SEM) –energy dispersive X-ray ananlysis (EDX)- Transmission electron microscope (TEM)- Scanning Tunneling Microscope (STM) - Atomic Force Microscope (AFM) (Qualitative analysis only)

UNIT – IV

Structure of nanomaterials- X-ray diffraction-(XRD)- the laue method- rotating crystal method- powder method -determination of grain size (Scherrer's formula) -.X-ray line shape analysis –analysis of some commercially important oxides – small angle X-ray scattering (SAXS)

UNIT – V

Applications of nanomaterials – medicine-energy sector- next generation computer- high sensitivity sensors- water purification- communication- food – fabric industry – environment- automobiles – ceramic industry – molecular machine –nanobiometrics

Text Book:

1. K.K. Chattopadhyay, A.N. Banerjee**, Introduction to Nanoscience and Nanotechnology**, PHI learning Private, 2012.

   Unit – I : Page No., 36 - 60

   Unit – II : Page No., 109-161

2. M.A. Shah , Tokeer Ahmad **Principles of Nanoscience and nanotechnology** Naroa publishing house Pvt. Ltd., 2013

   Unit – III : Page No., 67 - 86

   Unit – IV : Page No., 93-109

   Unit – V : Page No., 155-184

Reference Books:

1. C. Dupas, P. Houdy, M. Lahmani, **Nanoscience Nanotechnologies and Nanophysics,** Springer, 2006.

2. Amretashis Sengupta,Chandan Kumar Sarkar, **Introduction to Nano,** Springer, 2015.

3. S.M. Lindsay, **Introduction to Nanoscience**, Oxford University Press, 2010.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc., (Physics)**	**Part III**	**: Elective**
Semester	**: VI**	**Hours**	**: 04**
Subject Code: 18UPHE62		**Credits**	**: 04**

MEDICAL INSTRUMENTATION

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Recalling and Understanding concepts of the basics of electrode, colorimeter, Shortwave, Microwave, ultrasonic waves

CO2: Differentiate the Electrode types, Internal and External Defibrillators , Single channel, multichannel telemetry system, Thermograph , Endoscopes ,Lasers in Medicine , Computer Tomography

CO3: Build the knowledge in the field of Electro Cardiography , Electromyography , Respiratory Rate Measurement , Dializers , Nuclear imaging Techniques , Physiological monitoring system in space station

CO4: Utilization of Micropipet , Blood cell counter, Pacemakers, Electro Surgical Diathermy , Telemedicine.

CO5: Influence of Electro Oculography , oxygenerators , Cryogenics Applications , Design of Bio Telemetry , Pulse measurement

Unit – I: Electro – Physiology and Bio – Potential Recording

Origin of Bio – Potentials – Primary, Secondary active transport – Bio-electric potentials – Bio-potential Electrodes – Types of Electrodes – i)Metallic Electrode ii) Micropipet – Depth electrode – Needle electrode – Surface electrode - Chemical electrodes – Basic components of Bio Medical system – Types of amplifiers – Electro Cardiography(ECG) – Electro Encephalography(EEG) Electromyography(EMG) – Electro Oculography(EOG) – Electro Retinography (ERG)

Unit – II: Bio-chemical and Non-Electrical parameter Measurement

Colorimeter and photometers – Auto analyzer – Blood flow Measurements – Cardiac output Measurement – Respiratory Rate Measurement – Blood pressure Measurements – Temperature measurement – Pulse measurement – Blood cell counter.

Unit –III Assist Devices

Pacemakers – Types, Components, specificatons, methods of stimulation, Difference between Internal and External – Defibrallators – AC Defibrillation, DC Defibrillation, Dual peak and synchronizer DC Defribriattor, Dializers – Haemodialysis, Peritoneal Dialysis, Difference between Extracorporeal and Intracorporal Dialysis – Heart Lung Machine Model, - Cardio vascular Circulation, Blood pumps, oxygenerators

Unit – IV Physical Medicine and Biotelemetry

Diathermy – Shortwave, Microwave, ultrasonic, and Electro Surgical Diathermy – Bio Telemetry – Design of Bio Telemetry – Radio Telemetry systems – Single channel, multichannel telemetry system – Problems in implant Telemetry – Advantages of Bio Telemetry – Physiological monitoring system in space station – E Health – Electrical safety.

Unit – V Recent Trends in medical Instrumentation:

Thermograph – Endoscopes – Lasers in Medicine – Cryogenics Applications - Nuclear imaging Techniques – Computer Tomography – Principle, working, applications – Telemedicine-Ultrasound scanning.

Text Book:

1. R.LakshmiRekha, C.Ravikumar, **Medical Electronics**, Suchitra Publications, Second Edition 2016.

Unit –I	Chapter 1.1.1, - 1.1.1.1, 1.1.1.2, 1.1.2.6, 1.2-1.9
Unit –II	Chapter 2.4 – 2.12
Unit –III	Chapter 3 – 3.1 – 3.4.
Unit –IV	Chapter: 4.1 – 4.3
Unit –V	Chapter: 5.1 – 5.5.

Reference Books:

1. R.S. Khandpur, **Hand Book of Biomedical Instrumentation**, Tata McGraw-Hill, First Edition, New Delhi, 1999.
2. L. Cromwell, F.J. Welbell, E.J. Pfeiffer, **Biomedical Instrumentations and Measurements,** PHI Ltd, New Delhi, Second Edition, 2006.
3. John G. Webster, Editor**, Medical Instrumentation Application and Design.** John Willey and Sons. INC, Third Edition, Singapore, 1998.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc., (Physics)**	**Part III**	**: Elective**
Semester	**: VI**	**Hours**	**: 04**
Subject Code: 18UPHE63		**Credits**	**: 04**

OPTOELECTRONICS AND FIBREOPTIC COMMUNICATION

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Understand multimode fibre, losses in fibre, LED materials, optical couplers, fibre optic sensors
CO2: Illustrate propagation of light in an optical fibre, bending losses, PN junction photo detector, splicing procedure, Ruby laser
CO3: Justify acceptance angle and cone, waveguide dispersion, photodiode, photo transistor, bi-conically tapered directional coupler, transmitter for communication
CO4: Importance of optical fibre, dispersion techniques, semiconductor laser diodes, offset butt-joint directional coupler, fibre based modems
CO5: Classify step index fibre, gradded index fibre, glass fibre and Plastic fibre, PIN photo diode ,Avalanche photo diode, beam splitting and bi-conically tapered directional coupler

Unit-I Optical Fibres

Importance of optical fibres-propagation of light waves in an optical fibre-basic structure of an optical fibre and propagation of light wave through it- acceptance angle and acceptance cone of a fibre-numerical aperture (General)- fibre: Classification-stepped index fibre-graded index multimode fibre.

Unit-II Fibrelosses and Dispersion

Losses in fibres- scattering losses-adsorption losses-bending losses-fibre materials-glass fibres-plastic fibres-Dispersion in an optical Fibre-Inter-modal dispersion-Material chromatic dispersion-Wave guide dispersion.

Unit-III Sources and Detection

LED (Light Emitting Diode)- structures of LED- LED materials- Fibre LED coupling-semiconductor laser diode - Characteristics of photo-detectors- photo emissive photo-detector-Avalanche photo-diode-Photo transistor.

Unit-IV Optical couplers

Types of optical couplers-biconically tapered directional coupler- offset butt-joint directional coupler-beam splitting directional coupler- splicing of fibre-steps involved in splicing procedure-loss comparition

Unit-V Lasers & Communication system

Laser principle – Characteristics of Laser radiation – Different kinds of Lasers – Ruby Laser – He-Ne Laser –Carbandioxide laser-Fibre optic communication system block diagram-Transmitter for fibre optic communication-laser transmitter-fibre optic receiver-repeaters-fibre based modems-trans receiver- fibre optic sensors.

Text Books

1. Subir Kumar Sarkar, **Optical Fibres and Fibre Optic Communication Systems**, S.Chand & Company Ltd.

   Unit –I : Chapter 1.2, 1.3, 2.2-2.5, 3.1, 3.2, 3.5

   Unit – II : Chapter 8.3, 8.4, 8.6, 8.7

   Unit-III : Chapter 9.1, 9.2, 9.2.1-9.2.3, 9.2.5, 9.3.3, 10.2, 10.3, 10.8, 10.9

   Unit-IV : Chapter 12.2, 12.2.1-12.2.3, 13.1, 13.4, 13.6

   Unit –V : Chapter 15.1, 15.2, 15.6, 15.12, 15.15, 15.16, 16.2

2. P.K. Palanisamy, **Semicinductor Physics and optoelectronics**, Second edition Scitech Publications(india) Pvt Ltd.

   Unit-II : Chapter 5.13, 5.13.1-3, 5.14, 5.14.1, 5.14.2

3. Dr.M.Arumugam, **Material Science**, Anuradha Publications, Third edition, 2016.

   Unit- V : Chapter 10.9.1-10.9.3

Reference Books

1. G.Keiser, **Optical Fiber Communication**, TMH. Ltd, New Delhi, First Edition, 2010.
2. S.C.Gupta**, Optical Fiber Communication and is Applications**, PHI Learning Pvt.Ltd, New Delhi, First Edition, 2004.
3. Dr. M. Arumugam, **Optical Communication**, Anuradha publications
4. S.Salivahanan, N. Sureskumar and A. Vallavaraj, **Electronic Devices and Circuits**, Tata McGraw-Hill Publishing Company Ltd, New Delhi, Second Edition, 2011.
5. A.P.Godse, U.A.Bakshi**, Electronic Devices**, Technical Publication, Pune, First Edition, 2009.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part III**	**: Core**
Semester	**: V&VI**	**Hours**	**: 03**
Subject Code: 18UPHCP3		**Credits**	**: 05**

NON – ELECTRONICS PRACTICAL

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Understand the function of instruments like spectrometer and spot galvanometer
CO2: Relate and analyse angle of incidence and emergence
CO3: Find wavelength of light and particle size using laser
CO4: Compare the impedance and power factor of LR and CR circuits
CO5: Justify, Bridge circuits, Grating, LCR circuits

ANY 14 EXPERIMENTS

1. Spectrometer	-	i-d curve
2. Spectrometer	-	i – i’
3. Grating	-	Minimum deviation method
4. Spectrometer	-	Cauchy’s Constants
5. Spectrometer	-	Hartmann’s Interpolation formula
6. L.C.R	-	Series resonance circuit
7. L.C.R	-	Parallel resonance circuit
8. Spot Galvanometer	-	Determination of (M) Mutual induction
9. Spot Galvanometer	-	Comparison of (M) Mutual inductances
10. Anderson’s Bridge (AC Method)	-	Self inductance
11. Maxwell’s Bridge (AC Method)	-	Self inductance
12. Owens Bridge (AC Method)	-	Self inductance
13. Spot Galvanometer	-	Absolute Capacity of a Condenser
14. Spot Galvanometer	-	High resistance by Leakage
15. Impedance and Power factor	-	L.R.circuit
16. Laser	-	Determination of wavelength of and particle size

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class : B.Sc (Physics) **Part III : Core**
Semester : V&VI **Hours : 03**
Subject Code: 18UPHCP4 **Credits : 06**

ELECTRONICS PRACTICAL

Course Outcomes
On successful completion of the course, the learners should be able to

CO1: Understand functions of operational amplifier, Half adder, Full adder
CO2: Show the various Rectifier circuit, Diode, Transistor characteristics
CO3: Use various stages of amplifier circuits and oscillator – Frequency
CO4: Learn the circuit connections using various electronic components by individual soldering method
CO5: Interpret Cathode Ray Oscilloscope, Trainer Board Circuits,8085 Microprocessor

ANY 14 EXPERIMENTS

1.	Zener Diode	–	Characteristics
2.	Transistor	–	Characteristics C.E mode
3.	Determination Band gap	-	Semiconductor
4.	Zener	-	Voltage Regulator
5.	Single Stage Amplifier	-	Gain and Bandwidth
6.	Hartley Oscillator	-	Frequency and Inductance of pair of coils
7.	Astable Multivibrator	-	Discrete Components only
8.	Logic Gates	-	Discrete Components only
9.	OPAMP	–	Integrator and Differentiator
10.	Astable Multivibrator	-	IC 555
11.	Universal NOR Gate	-	IC 7402
12.	Universal NAND Gate	-	IC 7400
13.	Half Adder, Full Adder.		
14.	Four Bit Binary Adder		
15.	Four Bit Binary Subtractor		
16.	8085 Microprocessor	-	Add and Subtract Two 8 bit numbers

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class : B.Sc (Physics)	**Part III : Core**
Semester : V & VI	**Hours : 02**
Subject Code: 18UPHPR1	**Credits : 04**

PROJECT

Course Description

The Project is conducted by the following Course Pattern.

Internal

Presentation Submission	**40**

External

Project Report Viva Voce	**60**
Total	**- 100**

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Physics)**	**Part IV**	**: Skill**
Semester	**: VI**	**Hours**	**: 02**
Subject Code: 18UPHS61		**Credits**	**: 02**

BASICS IN MICROPROCESSORS

Course Outcomes

On successful completion of the course, the learners should be able to

CO1: Define address bus, instruction, looping, counters and time delays and stack
CO2: Describe Pins and signals, logic instruction, 16 Bit arithmetic instruction, loop technic, traffic signal control program
CO3: Write Architecture of microprocessors, Branch instruction. Arithmetic operations related to memory, time delay one register loop, subroutine
CO4: Functioning of bus organizations, addressing modes, looping counting and indexing,
CO5: Assess microprocessors operations, Data transfer instruction, Arithmetic operations, time delays and counters, subroutine program, Counter design with time delay.

Unit-I **Architecture**

Microprocessor initiated operations and Bus organization-pins and signals-Architecture

Unit-II **Instruction set**

8085 Instruction-Data transfer instruction-Addressing modes-Arithmetic and logic instruction-Branch instruction.

Unit-III **Assembly language program**

Looping counting and Indexing-16 bit arithmetic instruction-Arithmetic operations related to memory-Logic operations.

Unit-IV **Counters and time delays**

Counters and time delays-Time delay using one register-Loop within a loop technique-Counter design with time delay.

Unit-V **Stack and Subroutine**

Stack-subroutine-traffic signal control program.

Text book

1. Ramesh S Gaonkar **Microprocessor Architecture, programming, and Applications with the 8085**, , VthEdn., Penram International publishing (India) private limited.2011.

Unit I : Section 3.1, 3.1.1, 3.1.2, 3.3, 4.1, 4 .1.1-4.1.3, 4.1.5

Unit II : Section 6.1, 6.1.1, 6.2, 6.2.1, 6.2.2, 6.3, 6.3.1-6.3.3, 6 .4, 6.4.1-6.4.4

Unit-III : Section 7.1, 7.2, 7.2.1-7.2.4, 7.2.6, 7.3, 7.3.1, 7.4, 7.4.1, 7.5, 7.5.1, 7.5.3

Unit-IV : Section 8.1, 8.1.1, 8.1.3, 8.1.5

Unit-V : Section 9.1(Pages 296-302), 9.2, 9.2.1(Upto to page 314)

Reference Books:

1. B.Ram, Dhanbath Rai **Fundamentals of microprocessors and microcomputers**, Publications, VIth Edn., 2006.
2. A.P. Mathur. "**Introduction to microprocessor**", III Edition, TMH 2004.
3. N.Mathivanan. "**Microprocessors, PC hardware and interfacing**", Prentice Hall of India, New Delhi, 2005.