UNDERGRADUATE (UG) PROGRAMME OUTCOMES (POs)

Undergraduate (B.A., **B.Sc.,** B.Com., B.C.A., B.B.A., etc.,) is a 3 – year degree Programme with 6 semesters consisting the following Programme Outcomes (POs) under various criteria including critical thinking, problem solving, effective communication, societal/ citizenship/ ethical credibility, sustainable growth and employable abilities.

PO1	**Critical Thinking**: Intellectual exploration of knowledge towards actions in clear and rational manner by understanding the logical connections between ideas and decisions.
PO2	**Problem Solving**: Understanding the task/ problem followed by planning and narrow execution strategy that effectively provides the solution.
PO3	**Effective Communication**: Knowledge dissemination by oral and verbal mechanisms to the various components of our society.
PO4	**Societal/ Citizenship/ Ethical Credibility**: Realization of various value systems/ moral dimensions and demonstrate the empathetic social concern as well as equity in all the decisions, executions and actions.
PO5	**Environmental Concern and Sustainable Growth**: Understanding the emerging environmental challenges and provide the possible contribution in sustainable development that integrates environment, economy and employment.
PO6	**Skill Development and Employable Abilities**: Adequate training in relevant skill sector and creating employable abilities among the under graduates.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of **B.Sc. Physics** programme**,** the students are expected to

PSO1	acquire core knowledge in Physics, including major areas of Classical Mechanics, Quantum Mechanics, Electromagnetism, Optics, Electronics, Modern physics, Thermal physics and Mathematical methods.
PSO2	develop the proficiency in the acquisition of data using a variety of laboratory instruments and in the analysis and interpretation of such data.
PSO3	have learnt laboratory skills enabling them to take measurements in physics laboratory and analyse the measurements to draw valid conclusion.
PSO4	be capable of oral and written scientific communication and will prove that they can think critically and work independently.
PSO5	realize and develop an understanding of the impact of physics and science on society.
PSO6	discover of physics concepts in other disciplines such as mathematics , computer science, chemistry etc.,

SOURASHTRA COLLEGE, MADURAI – 625004

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B.Sc. PHYSICS – SYLLABUS

(Under CBCS based on OBE)(with effect from 2021 – 2022)

B.Sc. PHYSICS – COURSE STRUCTURE

SEMESTER – I

S. No.	Subject Code	Subject Title	Hrs./ week	Exam (Hrs.)	CA	SE	Total	Credits
1.	21UACT11	**Part – I: Tamil** – கவிதையும் சிறுகதையும்	6	3	25	75	100	3
	21UACH11	**Hindi** – Hindi – I						
	21UACS11	**Sanskrit** – Sanskrit – I						
2.	21UACE11	**Part – II: English** – English For Enrichment – I	6	3	25	75	100	3
3.	21UPSC11	**Part – III: Core – 1:** Mechanics & Relativity	5	3	25	75	100	5
4.	21UPSS11	**Part – IV: Skill – 1:** Laser Physics	2	3	25	75	100	2
5.	21UPSA11	**Part – III: Allied – I:** Ancillary	4	3	25	75	100	4
6.		**Part – III: Core :** Major Practical 1 *	3	–	–	–	–	–
7.		**Part – III: Allied :** Ancillary Practical – I *	2	–	–	–	–	–
8.	21UACVE1	**Part – IV:** Value Education	2	3	25	75	100	2
		TOTAL	30	**TOTAL CREDITS**				**19**

*** Practical exam will be conducted in the second semester.**

SEMESTER – II

S. No.	Subject Code	Subject Title	Hrs./ week	Exam (Hrs.)	CA	SE	Total	Credits
1.	21UACT21	**Part – I: Tamil** – செய்யுளும் புதினமும்	6	3	25	75	100	3
	21UACH21	**Hindi** – Hindi – II						
	21UACS21	**Sanskrit** – Sanskrit – II						
2.	21UACE21	**Part – II: English** – English For Enrichment – II	6	3	25	75	100	3
3.	21UPSC21	**Part – III: Core – 2:** Properties of Matter and Sound	5	3	25	75	100	5
4.	21UPSS21	**Part – IV: Skill – 2:** C Programming	2	3	25	75	100	2
5.	21UPSA21	**Part – IV: Allied – II:** Ancillary	4	3	25	75	100	4
6.	21UPSCP1	**Part – III: Core :** Major Practical 1	3	3	40	60	100	2
7.	21UPSAP1	**Part – IV: Allied :** Ancillary Practical–I	2	3	40	60	100	2
8.	21UACES1	**Part – IV:** Environmental Studies	2	3	25	75	100	2
		TOTAL	30	**TOTAL CREDITS**				**23**

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B.Sc. PHYSICS – SYLLABUS

(Under CBCS based on OBE)(with effect from 2021 – 2022)

SEMESTER – III

S. No.	Subject Code	Subject Title	Hrs./ Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UACT31	**Part – I: Tamil** – காப்பியமும் நாடகமும்	6	3	25	75	100	3
	21UACH31	**Hindi** – Hindi – III						
	21UACS31	**Sanskrit** – Sanskrit – III						
2.	21UACE31	**Part – II: English** – English For Enrichment – III	6	3	25	75	100	3
3.	21UPSC31	**Part – III: Core – 3:** Electricity & Electromagnetism	4	3	25	75	100	4
4.	21UPSC32	**Part – III: Core – 4:** Heat & Thermodynamics	4	3	25	75	100	4
5.	21UCYA31	**Part – III: Allied 2: T** Allied Chemistry – I	4	3	25	75	100	4
6.	21UPSN31	**Part – IV: NME:** Fundamentals of Physics – I	2	3	25	75	100	2
7.	21UPSCP2	**Part – III: Core:** Major Practical – 2*	2	–	40	60	100	–
8.	21UCYAP2	**Part – III: Allied 2: P*** Volumetric Analysis	2	–	40	60	100	–
		Total Hours	**30**		**Total Credits**			**20**

*** Practical exam will be conducted only in the even semester.**

SEMESTER – IV

S. No.	Subject Code	Subject Title	Hrs./ Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UACT41	**Part – I: Tamil** – சங்க இலக்கியமும் அற இலக்கியமும்	6	3	25	75	100	3
	21UACH41	**Hindi** – Hindi – IV						
	21UACS41	**Sanskrit** – Sanskrit – IV						
2.	21UACE41	**Part – II: English** – English For Enrichment – IV	6	3	25	75	100	3
3.	21UPSC41	**Part – III: Core – 5:** Optics & Spectroscopy	4	3	25	75	100	4
4.	21UPSC42	**Part – III: Core – 6:** Mathematical Methods	4	3	25	75	100	4
5.	21UCYA41	**Part – III: Allied 2: T** Allied Chemistry – II	4	3	25	75	100	4
6.	21UPSN41	**Part – IV: NME:** Fundamentals of Physics – II	2	3	25	75	100	2
7.	21UPSCP2	**Part – III: Core:** Major Practical – 2	2	3	40	60	100	2
8.	21UCYAP2	**Part – III: Allied 2: P** Volumetric Analysis	2	3	40	60	100	2
9.		**PART –V:** Extension Activities	–	–	–	–	100	1
		Total Hours	**30**		**Total Credits**			**25**

SEMESTER – V

S. No.	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UPSC51	**Part – III: Core – 7:** Atomic Physics & Quantum Mechanics	5	3	25	75	100	5
2.	21UPSC52	**Part – III: Core – 8:** Nuclear Physics	4	3	25	75	100	4
3.	**Part – III: Elective – 1:**		5	3	25	75	100	5
	21UPSE51	Analog Electronics						
	21UPSE52	Microprocessor Fundamentals						
	21UPSE53	Energy Physics						
4.	21UPSS51	**Part – IV: SBS – 3:** Biophysics	2	3	25	75	100	2
5.	21UPSS52	**Part – IV: SBS – 4:** Opto Electronics	2	3	25	75	100	2
6.	21UPSCP3	**Part – III: Core: Major Practical – 3:** Analog Electronics Practical	6	3	40	60	100	5
7.	21UPSCP4	**Part – III: Core: Major Practical – 4:** Biophysics Practical	6	3	40	60	100	5
8.	21USSY51	Soft Skills (Self – Study)	–	–	–	–	100	–
		Total Hours	**30**		**Total Credits**			**28**

***One elective course to be chosen from THREE courses**

SEMESTER – VI

S. No.	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UPSC61	**Part – III: Core – 9:** Solid State Physics	4	3	25	75	100	4
2.	**Part – III: Elective – 2:**		5	3	25	75	100	5
	21UPSE61	Classical and Statistical Mechanics						
	21UPSE62	Spectroscopy						
	21UPSE63	Astrophysics						
3.	**Part – III: Elective – 3:**		5	3	25	75	100	5
	21UPSE64	Digital Electronics and Communication						
	21UPSE65	Problem Solving Skill in Physics						
	21UPSE66	Radiation Safety						
4.	21UPSS61	**Part – IV: SBS – 5:** Medical Physics	2	3	25	75	100	2
5.	21UPSS62	**Part – IV: SBS – 6:** Nanophysics	2	3	25	75	100	2
6.	21UPSCP5	**Part – III: Core: Major Practical – 5:** Digital Electronics Practical	6	3	40	60	100	5
7.	21UPSCP6	**Part – III: Core: Major Practical – 6:** General Practical	6	3	40	60	100	5
8.	21UGKY61	General Knowledge (Self – Study)	–	–	–	–	100	–
		Total Hours	**30**		**Total Credits**			**28**

***One elective course to be chosen from THREE courses**

COURSE STRUCTURE – V SEMESTER

S. No.	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UPSC51	**Part – III: Core – 7:** Atomic Physics & Quantum Mechanics	5	3	25	75	100	5
2.	21UPSC52	**Part – III: Core – 8:** Nuclear Physics	4	3	25	75	100	4
3.	**Part – III: Elective – 1:**		5	3	25	75	100	5
	21UPSE51	Analog Electronics						
	21UPSE52	Microprocessor Fundamentals						
	21UPSE53	Energy Physics						
4.	21UPSS51	**Part – IV: SBS – 3:** Biophysics	2	3	25	75	100	2
5.	21UPSS52	**Part – IV: SBS – 4:** Opto Electronics	2	3	25	75	100	2
6.	21UPSCP3	**Part – III: Core: Major Practical – 3:** Analog Electronics Practical	6	3	40	60	100	5
7.	21UPSCP4	**Part – III: Core: Major Practical – 4:** Biophysics Practical	6	3	40	60	100	5
8.	21USSY51	Soft Skills (Self – Study)	–	–	–	–	100	–
		Total Hours	**30**		**Total Credits**			**28**

***One elective course to be chosen from THREE courses**

CA – Class Assessment (Internal)

SE – Summative Examination

SBS – Skill Based Subject

T – Theory

P – Practical

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSC51	ATOMIC PHYSICS AND QUANTUM MECHANICS	CORE – 7	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	V	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

The intention of the course is to impart knowledge, skills and attitudes required to understand the principles of atomic structure, structure of electron with their properties and quantum mechanics.

COURSE OBJECTIVES:

The main objective of this course is to impart the knowledge of atomic structure and models along with their properties to the students and to make them understand the basic concept of quantum mechanics.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	know the various atom model and the structure of atom in atomic physics and understand the concept of quantum numbers.	Upto K2
CO 2	understand the properties of electron and its behavior in the atoms.	Upto K2
CO 3	know about the concept of matter waves, debroglie hypothesis and understand the Heisenberg uncertainty principle and experiments for their proof	Upto K2
CO 4	acquire the knowledge of postulates of quantum mechanics and inadequacy of classical mechanics and derive the Schrodinger wave equation and applications.	Upto K3
CO 5	apply the schrodinger wave equation to solve many problems like particle in a box, barrier penetration, Harmonic oscillator etc.,	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

ATOMIC PHYSICS AND QUANTUM MECHANICS

UNIT – I:

Introduction – Thomson's atom model – Rutherford model of the atom – Theory of alpha particle scattering – Rutherford scattering formula – Bohr atom model –Bohr's theory of Hydrogen atom – Energy levels and Excitation potential and Ionization potential – Davis and Goucher's method –Bohr Sommerfield theory – Sommerfield's relativistic atom model – Explanation for the fine structure of Hα line – vector atom model – Relativistic variation of atomic mass – application to fine structure of spectral lines – Vector atom model– Quantum numbers – coupling schemes – Pauli's exclusion principle – Arrangement of electrons in atoms

UNIT – II:

Magnetic dipole moment due to orbital motion of the electron – magnetic dipole moment due to electron spin – Stern and Gerlach experiment – Optical spectra – spectral terms and notations – selection rules –Fine structure of sodium D lines –Zeeman effect – theory and experiment – quantum theory of Zeemann effect – Anamolous Zeemann effect – Stark effect – Paschen Back effect

UNIT – III:

Planck's quantum theory of radiation – Dual nature of matter and radiation – De–Broglie's hypothesis of matter waves – Expression for wavelength – Davisson's and Germer experiment – G.P. Thomson experiment with relativistic correction – concept of wave packet – Group velocity and wave velocity and their relation – Heisenberg's Uncertainty principle – Experimental illustration – Determination of position with γ – Ray microscope– Diffraction of an electron beam by a single slit.

UNIT – IV:

In adequacy of Classical Mechanics – Basic postulates of quantum mechanics – Derivation of time dependent and time independent Schrodinger's equations –properties of wave function – Physical significance of wave function– orthogonal and normalized wave functions– Eigen functions and Eigen values.

UNIT – V:

Simple applications of Schrodinger wave equation– The particle in a Box – Infinite square well potential – The Barrier penetration problem – Linear harmonic oscillator – The rigid rotator.

TEXT BOOK:

Modern Physics (sixth revised edition 1998 – S. Chand & Company Ltd.) by R. Murugeshan

Unit – I: **Chapter**. 4 Sections (4.1 to 4.5, 4.8, 4.10(2), 4.11 to 4.16)
Unit – II: **Chapter**. 4 Sections (4.18 to 4.20, 4.22, 4.23, 4.26 to 4.28)
Unit –III: **Chapter**. 7 Sections (7.1 to 7.4)
Unit – IV: **Chapter**. 7 Sections (7.7 to 7.9)
Unit – V: **Chapter**. 7 Sections (7.10, 7.12, 7.13, 7.15)

REFERENCE BOOKS:

1. ***Modern Physics*** by Seighal Chopra and Seighal
2. ***Quantum Mechanics*** by Satyaprakash

DIGITAL TOOLS:

1. https://ncert.nic.in/ncerts/l/leph204.pdf
2. https://farside.ph.utexas.edu/teaching/qmech/qmech.pdf

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	2	2	1
CO2	2	1	3	2	1	2
CO3	1	1	2	1	2	1
CO4	2	2	3	1	1	2
CO5	3	1	2	1	2	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSC52	NUCLEAR PHYSICS	CORE – 8	4	–	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	V	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

The main purpose of the course is to impart knowledge, skills and attitudes required to understand the information regarding the interior structure of nucleus and nuclear interaction or nuclear reactions includes radioactive decay, nuclear fusion and fission.

COURSE OBJECTIVE:

The objective of this course is to provide basic concept of nuclear theories and to study the atomic nuclei properties and their constituents and interactions. It helps to understand the various nuclear models, theory of cosmic rays and elementary particles.

COURSE OUTCOMES (COs):

On successful completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	acquire knowledge on the static properties of nuclei and to understand the background of various nuclear models	Upto K2
CO 2	identify the concept of radioactivity and to understand different modes of decay	Upto K2
CO 3	know the process of nuclear fission and fusion and its utilization	Upto K3
CO 4	illustrate the function of nuclear detectors and particle accelerators	Upto K3
CO 5	interpret the concept of cosmic rays and the basic interaction between fundamental particles	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

NUCLEAR PHYSICS

UNIT – I: Properties and Structure of Nuclei

Introduction to nucleus –General properties – binding energy – BE/A curve –Nuclear forces – characteristics –Meson theory of nuclear forces – Yukawa Potential –proton electron theory– proton neutron theory – – Nuclear models– liquid drop model– shell model

UNIT – II: Radioactivity

Definition– theory of radioactivity– properties of α, β and γ rays–Fundamental laws of radio activity –radioactive decay–Geiger law–Geiger Nuttal experiment–Alpha particle disintegration– e/m ratio of beta particle using Kaufmann experiment–Wave length of Gamma rays– neutrino and its properties–electron capture – nuclear isomers – applications– Radio carbon dating– radio isotopes – uses.

UNIT – III: Nuclear Reactions

Introduction–Nuclear fission –– Nuclear reactor–uses – atom bomb – Nuclear fusion– hydrogen bomb –plasma confinement –artificial transmutation–Q value of nuclear reaction–types of nuclear reaction

UNIT – IV: Neutrons, Nuclear Detectors and Particle Accelerators

Discovery of neutrons and basic properties–classifications– Detectors–G.M.Counter–bubble chamber–Wilson cloud chamber–Accelerators–linear accelerators–cyclotron–synchrocyclotron–betatron

UNIT – V: Cosmic Rays and Elementary Particles

Cosmic rays––primary and secondary cosmic rays –latitude, altitude and azimuth effects– longitudinal effect–north –south effect–seasonal and diurnal changes –cosmic ray showers – Elementary particles–introduction–particles and antiparticles–antimatter–the fundamental interaction –conservation law

TEXT BOOKS:

1. ***Atomic and Nuclear Physics*** by N. Subrahmanyam and Brijlal, S Chand & Co., New Delhi (1996).
2. ***Nuclear Physics*** by Tayal D.C., Himalaya Publishing House, Mumbai (2006).
3. ***Nuclear Physics*** by R.C. Sharma, K.Nath& Co., Meerut (2000)
4. ***Nuclear Physics*** by Irving Kaplan, Narosa Publishing house, New Delhi.

REFERENCE BOOKS:

1. ***Nuclear Physics*** by R.R. Roy and B.P. Nigam, New Age International (P) Ltd., New Delhi(1997).
2. ***Fundamentals of Elementary Particle Physics*** by Longo, McGraw–Hill.
3. ***Nuclei and Particles*** by Serge., W.A. Benjamin, USA
4. ***Elements of Nuclear Physics*** by ML Pandya and RPS Yadav, Kedarnath Ram Nath, Meerut. State Integrated Board of Studies – Physics UG

DIGITAL TOOL:

https://www.bhattadevuniversity.ac.in/docs/studyMaterial/UpakulMahanta_Physics_6thSem NuclearPhysics.pdf

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2	1	2	1
CO2	3	1	2	3	3	2
CO3	3	2	3	1	3	2
CO4	3	2	3	2	2	1
CO5	3	1	2	1	2	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

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B.Sc. PHYSICS – SYLLABUS

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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSE51	ANALOG ELECTRONICS	ELECTIVE – 1	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	V	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

The intention of the course is to impart knowledge, skills and attitudes required to understand the principles of operations of electronic circuits equipment and devices in the industries.

COURSE OBJECTIVES:

The primary objective of this course is to understand the operation of electronic semiconductor devices and its application in the construction of amplifiers and oscillators.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	apply the theorems to analyse complicated circuits and understand the basic concepts of semiconductor devices, active and passive components.	Upto K3
CO 2	understand transistor biasing, describe the methods of transistor biasing and circuit analysis.	Upto K3
CO 3	understand the importance of feedback in oscillators and to develop skill in constructing AC generators.	Upto K3
CO 4	explain special semiconductor devices that have been developed to exercise fine control over the large blocks of power in a system.	Upto K3
CO 5	understand the characteristics of operational amplifiers and to perform mathematical calculations	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

ANALOG ELECTRONICS

UNIT I: Linear circuit analysis and semiconductor diodes

Constant voltage source – constant current source – Maximum power transfer theorem – Thevenin's theorem – procedure for finding Thevenin Equivalent circuit – Norton's theorem – procedure for finding Norton Equivalent circuit – PN junction theory – V – I characteristics of a PN junction diode – Half wave rectifier – Bridge rectifier – Efficiency – filters – Shunt capacitor filter – pi filter – Zener diode – equivalent circuit – voltage regulator

UNIT II: Transistor Amplifier

Transistor – Different modes of operations – CB mode &CE mode – Two port representation of a transistor – h parameter – AC equivalent circuit using h parameters – analysis of amplifiers using h parameters (CE only) – RC coupled amplifier – transformer coupled amplifier – power amplifier – classification of amplifiers – Class A, Class B and Class C – Push pull amplifier – Emitter follower.

UNIT III: Oscillators and Multivibrator

Feedback principle – effect of negative and positive feedback – and Barkhaussen criterion – Hartley, Colpitt, Phase shift and using transistors – Expression for frequency – Astable Multivibrators, using transistors – Schmitt trigger.

UNIT IV: Special Semiconductor Devices

Clipping and clamping circuits – Differentiating circuit – Integrating circuit – Field effect Transistor FET – MOSFET – UJT – SCR – characteristics – FET as a VVR – UJT relaxation oscillator – SCR as a switch and rectifier

UNIT V: Operational Amplifier

Operational Amplifier – characteristics – parameters – applications – Inverting amplifier – Non inverting amplifier – Voltage follower – Adder – Subtractor – Integrator – Differentiator – Solving simultaneous equations – comparator – square wave generator – Wien bridge oscillator

TEXT BOOKS:

1. ***Principles of Electronics*** – V.K. Metha S.Chand&Co.,2102
2. ***Basic Electronics &Applied Electronics*** – A. Ubald Raj &G. Jose Robin 20004 Indira Publications

REFERENCE BOOKS:

1. ***Basic Electronics*** – B.L. Theaja – S. Chand & Co. 2003.
2. ***Electronics Devices & Circuits*** – Salivahanan Vallavaraj. Tata McGraw Hill – 2004.

DIGITAL TOOL:

https://mrcet.com/downloads/digital_notes/EEE/AE%20DIGITAL%20NOTES.pdf

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	1	2
CO2	3	3	1	2	1	1
CO3	2	2	3	1	2	2
CO4	3	1	2	1	3	1
CO5	3	1	2	1	2	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level

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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSE52	MICROPROCESSOR FUNDAMENTALS	ELECTIVE – 1	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	V	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

Microprocessor is a required course for UG Students in the Physics department. The purpose of the course is to teach students the fundamentals of microprocessor. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via microprocessor implementation.

COURSE OBJECTIVES:

To make the students

1. outline the history of computing devices
2. describe the architecture of 8085 microprocessor .
3. develop skill in programming techniques
4. understand the basic idea about the data transfer schemes and its applications.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the basic architecture of 8085 and discuss the pin description of 8085	Upto K3
CO 2	gain knowledge about the instruction set of 8085 and develop skill in programming techniques.	Upto K3
CO 3	understand interfacing concepts and explain timing diagram of 8085	Upto K3
CO 4	describe interfacing I/O port to 8085 and explain the operating modes	Upto K3
CO 5	apply the interrupts in 8085 for data transfer and remember the types of interrupts	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

MICROPROCESSOR FUNDAMENTALS

UNIT I: Architecture

Architecture of 8085 – registers, flags, ALU, address and data bus, demultiplexing address/data bus – control and status signals – control bus, Programmer's model of 8085 – Pin out diagram – Functions of different pins.

UNIT II: Programming Techniques

Instruction set of 8085 – data transfer, arithmetic, logic, branching and machine control group of instructions – addressing modes – register indirect, direct, immediate and implied addressing modes. Assembly language & machine language – programming techniques: addition, subtraction, multiplication, division, ascending, descending order, largest and smallest (single byte)

UNIT III: Interfacing memory to 8085

Interface – Memory interfacing – I/O interfacing – Block diagram of memory and I/O interfacing – 8085 interfacing pins – Interfacing 2k x 8 ROM and RAM, Timing diagram of 8085 (MOV Rd, Rs – MVI Rd, data(8)) .

UNIT IV: Interfacing I/O Ports to 8085

Interfacing input port and output port to 8085 – Programmable peripheral interface 8255 – flashing LEDs – 8255A programmable peripheral interface – ports of 8255A – operating modes – features of 8255A – Architecture of 8255A

UNIT V: Interrupts

Need for Interrupts – Types of Interrupts – Interrupts in 8085 – hardware and software interrupts – RIM, SIM instructions –priorities – simple polled and interrupt controlled data transfer – Interrupt driven data transfer scheme

TEXT BOOKS:

1. ***Microprocessor Architecture Programming and Application with 8085 / 8080 A***. by R.S. Gaonkar, Wiley Eastern Ltd. (1992).
2. ***Fundamental of Microprocessor 8085*** by V. Vijayendran, S. Viswanathan Publishers, Chennai (2003).
3. ***Fundamentals of Microprocessors and Microcomputers*** by B. Ram – Dhanpat RAI publication.

REFERENCE BOOKS:

1. ***Introduction to Microprocessor*** by AdityaMathur – Tata McGraw Hill Publishing Company Ltd.(1987).
2. ***Microprocessor and Digital System*** by Dougles V. Hall – 2nd Edition – McGraw Hill Company (1983).

DIGITAL TOOL:

https://vardhaman.org/wp–content/uploads/2021/03/Microprocessors–and–Microcontrollers.pdf

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	3	1	2	2
CO2	3	2	2	1	1	1
CO3	1	2	1	1	2	2
CO4	1	3	1	2	2	1
CO5	2	1	2	1	2	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSE53	ENERGY PHYSICS	ELECTIVE – 1	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	V	25	75	100

NATURE OF COURSE	Employability ☐	Skill Oriented ✓	Entrepreneurship ☐

COURSE DESCRIPTION:

This course intends to provide an understanding of the present energy crisis and to gain knowledge about various available energy sources.

COURSE OBJECTIVE:

This course helps the students to understand the importance of non–conventional energy sources, to gain knowledge about solar thermal, photovoltaic systems, wind and biomass energy and to learn about the necessity of energy storage.

COURSE OUTCOMES (COs):

On successful completion of the course, the students will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	acquire knowledge of conventional and non–conventional energy sources	Upto K3
CO 2	classify the different types of Solar Collectors	Upto K3
CO 3	understand the photovoltaic principle and apply it in the construction of solar cell	Upto K3
CO 4	outline the importance of biomass resources and describe the working of Biomass gasifier	Upto K2
CO 5	understand the importance of wind energy and explain the necessity of energy storage	Upto K2

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

ENERGY PHYSICS

UNIT – I: Introduction to Energy Sources

Energy Consumption and Standard of Living –Oil crisis of 1973 – Classification of Energy Resources – Conventional and non–conventional sources of energy– Energy chain – Importance of Non–Conventional energy sources– merits and demerits of conventional and non–conventional energy sources.

UNIT – II: Solar Thermal Energy

Solar Collectors – Classification – Comparison of Concentrating and Non concentrating type – Basic Principles of Liquid flat plate collector —Construction and working– Solar cooker – box type, Paraboloidal Dish Type – Solar water heating systems –Solar Furnace

UNIT – III: Photovoltaic Systems

Introduction – Photovoltaic principle – Solar Cell Characteristics – Types of Solar cells– Construction of Solar cell, Module, Panel and Array – Solar PV Systems –Application of Solar PV systems

UNIT – IV: Biomass Energy

Introduction– Usable forms of Biomass, their composition and fuel properties – Biomass Resources– Biomass conversion technologies–Biomass Gasification–Working of downdraft gasifier – Biogas production from waste bio mass – Advantages and disadvantages of biological conversion of solar energy.

UNIT – V: Wind Energy and Other Energy Sources

Introduction – Origin of winds– Wind Energy Conversion systems – Environmental aspects – Energy storage– necessity of Energy storage – Ocean thermal energy conversion–tidal power, advantages and limitations of tidal power generation– Fuel cells– and application of fuel cells– batteries– advantages of battery for bulk energy storage– Hydrogen Storage.

TEXT BOOK:

B.H. Khan, ***Non–Conventional Energy Resources*, Second Edition**, Tata McGraw Hill Education Private Limited, 2011

REFERENCE BOOKS:

1. Kothari D.P., K.C. Singal and Rakesh Ranjan, ***Renewable Energy Sources and Emerging Technologies,*** Prentice Hall of India, 2008
2. Chetan Singh Solanki, ***Solar Photvoltaics Fundamentals, Technologies and Applications***, 2nd Edition, PHI Learning Private Limited, 2011.
3. Rai G. D, ***Non – Conventional Energy Sources,*** 4th Edition, Khanna Publishers,2010.
4. Jeffrey M. Gordon, ***Solar Energy: The State of the Art,*** **Earthscan**, 2013.
5. Kalogirou S.A., ***Solar Energy Engineering: Processes and Systems***, 2nd Edition, Academic Press, 2013.
6. Zobaa A.F.and Ramesh Bansal, ***Handbook of Renewable Energy Technology***, World Scientific, 2011.

DIGITAL TOOLS:

1. https://www.vssut.ac.in/lecture_notes/lecture1428910296.pdf
2. https://mrcet.com/downloads/digital_notes/ME/IV%20year/Renewable%20Energy%20Sources.pdf

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	1	3	1
CO2	3	3	2	2	2	2
CO3	3	3	3	1	2	2
CO4	3	2	1	2	2	1
CO5	3	2	2	2	3	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

B.Sc. PHYSICS – SYLLABUS

(Under CBCS based on OBE)(with effect from 2021 – 2022)

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSS51	BIO PHYSICS	SBS – 3	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	V	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

Bio Physics is the study of living systems in terms of concepts and laws of Physics. This course, at the simplest level one can apply Physics in understanding the working of organ systems.

COURSE OBJECTIVE:

To outline the structures of muscles and bones and see how they work together during animal locomotion and to study the transport of O_2 and CO_2 in blood by diffusion.

COURSE OUTCOMES (COs):

On successful completion of the course, the students will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the force exerted by the vertebra to head stationary in the erect position and to illustrate rotational equilibrium and translational equilibrium with examples.	Upto K2
CO 2	employ the pressure flow relation for laminar blood flow using Poiseuille's formula	Upto K3
CO 3	explain the dynamics of gas transport in blood cells	Upto K2
CO 4	recall the characteristics of Sound	K1
CO 5	define the light and describe the nature of light and Physiology of the eye.	Upto K2

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3– APPLY

BIO PHYSICS

UNIT – I: Bio – Mechanics

Introduction – Biostatics – Forces and toques – Bio Physics of Muscles– Muscle power – Mass specific Muscle Power – Strength of bones.

UNIT – II: Bio Physics and Fluid Flow

Hemodynamics – Plasma skimming – Turbulence – Pressure flow relation – Fluid in Plants – Xylem transport – Phloem transport.

UNIT – III: Physics of Audition

Transverse and longitudinal waves – Physiological Characteristics of Sound – Human Ear.

UNIT – IV: Physics of Vision

Wave nature of light – Geometrical Optics – Refraction in Human eye – Gradient index – Lens – Chromatic aberration – Spherical aberration – Refractive Power of Eye.

UNIT – V: Bio Physics and Gas transport

Connective Transport of gases – Air way resistance – Transport of O_2 in blood – Transport of CO_2 in blood – Gas exchange in lungs.

TEXT BOOK:

***Elementary Bio Physics*.** P.K. SriVastava, Narosa Publishing House Pvt. Ltd., reprint 2006

REFERENCE BOOK:

***Introduction to Bio Physics*,** Dr. Pranab Kumar Banerjee, Dec 2010, S.Chand & Company

DIGITAL TOOL:

https://ia600204.us.archive.org/30/items/biophysicsconcep00case/biophysicsconcep00case.pdf

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	1	3	1
CO2	3	3	2	2	2	2
CO3	3	3	3	1	2	2
CO4	3	2	1	2	2	1
CO5	3	2	2	2	3	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSS52	OPTO ELECTRONICS	SBS – 4	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	V	25	75	100

NATURE OF COURSE	Employability ☐	Skill Oriented ✓	Entrepreneurship ☐

COURSE DESCRIPTION:

This course intends to provide the fundamental knowledge of optoelectronic devices and gives an idea about fibre optical communication system.

COURSE OBJECTIVE:

This course helps to give an introductory account of the basic principles of Optoelectronic devices and to acquire knowledge about the working of LASER, photo detectors, photo diodes and photo transistors, and to gain information about fibre optical communication system.

COURSE OUTCOMES (COs):

On successful completion of the course, the students will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	gain knowledge about the basic principles of LCD and LED.	K1
CO 2	explain the Principle, and characteristics of laser and describe the concept of holography	Upto K2
CO 3	illustrate the characteristics of photo detectors, photo diode and photo transistors.	Upto K2
CO 4	summarize the basic concepts of fibre optics and elaborate the transmission of light in a optical fibre.	Upto K2
CO 5	classify the types of optical fibres and discuss the advantages of fibre optic communication.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3– APPLY

OPTO ELECTRONICS

UNIT – I: Light Sources

Introduction – PN junction as a Light Source (LED) – LED materials – Advantages – LCD – Characteristics and working of LCD – Advantages.

UNIT – II: Laser

Laser – Introduction – characteristics of Laser – Spontaneous and stimulated emission– Einstein coefficients – condition for population inversion – construction and reconstruction of a hologram.

UNIT – III: Detectors

Photo detector – characteristics of photo detectors – PN junction photo detector – PIN photo diode – Avalanche photo diode – Photo transistor.

UNIT – IV: Optical Fibre

Introduction – principle of optical fibre – light transmission in an optical fibre – acceptance angle – Numerical aperture – Types of optical fibres (material, refractive index, and mode).

UNIT – V: Fibre Optical Communication System

Fibre optical communication system (Block diagram) – Fibre optic sensors – Advantages of fibre optical communication system.

TEXT BOOKS:

1. ***Semiconductor physics and Optoelectronics*** – P. K. Palanisamy, SCITECH Publication, Chennai 2002.
2. ***Optical fibres and Fibre Optic Communication*** – Sabir Kumar Sarkar IV Revised Edition 2003.

REFERENCE BOOK:

Opto Electronics – Wilson & Hawker, Prentice Hall of India 2004.

DIGITAL TOOLS:

1. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SPH1312.pdf
2. https://mrcet.com/downloads/digital_notes/ECE/III%20Year/FIBER%20OPTICAL%20COMMUNICATIONS.pdf

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	3	1
CO2	3	3	3	2	2	2
CO3	3	3	3	3	2	2
CO4	3	1	1	2	3	2
CO5	3	2	2	2	3	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSCP3	ANALOG ELECTRONICS PRACTICALS	CORE PRACTICAL – 3	–	6	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	V	40	60	100

MAJOR CORE PRACTICALS – ANALOG ELECTRONICS

LIST OF EXPERIMENTS

1. SCR Characteristics
2. FET Characteristics.
3. UJT Characteristics
4. Zener Diode Characteristics.
5. Bridge Rectifier with ∏ section filter.
6. Zener voltage Regulator.
7. Voltage Doubler and Trippler.
8. Single Stage Amplifier – Gain and Band width
9. Hartley Oscillator.
10. Colpitt's Oscillator.
11. Astable Multivibrator.
12. Clipper and Clamper using Discrete Components.
13. Differentiator and Integrator.
14. Logic Gates – Discrete Components.
15. Two Stage amplifier without feedback.

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSCP4	BIOPHYSICS PRACTICALS	CORE PRACTICAL – 4	–	6	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	V	40	60	100

MAJOR CORE PRACTICALS – BIOPHYSICS

LIST OF EXPERIMENTS

1. Determination of the refractive index of different Bio–fluids using a hollow prism
2. Determination of the refractive index of Bio–fluid using laser.
3. Effect of temperature on viscosity using Ostwald viscometer.
4. Measurement of blood pressure –demonstration and interpretation.
5. Determination of velocity of Sound in Bio–fluids using Ultrasonic interferometer.
6. Draw equipotential lines for a bio fluid.
7. Polari meter experiment – Determination of specific rotatory power of glucose solution.
8. Comparison of S.T. of Bio–fluid using capillary rise method.
9. Surface Tension of a Bio–fluid using drop weight method.
10. Determination of relative density of a Bio–fluid using Melde's apparatus.
11. Interfacial S.T. of a bio–fluid by the method of drops.
12. Refractive index of a solid and a liquid using vernier microscope.
13. Specific heat capacity of a liquid using Newton's law of cooling.
14. Determination of refractive index of Bio–fluid using liquid lens.
15. Determination of Relative density of solid and liquid using sonometer.
16. Determination of specific heat capacity of liquid using Joule's calorimeter.

SOURASHTRA COLLEGE, MADURAI – 625004

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B.Sc. PHYSICS – SYLLABUS

(Under CBCS based on OBE)(with effect from 2021 – 2022)

COURSE STRUCTURE – VI SEMESTER

S. No.	Sub. Code	Subject Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UPSC61	**Part – III: Core – 9:** Solid State Physics	4	3	25	75	100	4
2.		**Part – III: Elective – 2:**	5	3	25	75	100	5
	21UPSE61	Classical and Statistical Mechanics						
	21UPSE62	Spectroscopy						
	21UPSE63	Astrophysics						
3.		**Part – III: Elective – 3:**	5	3	25	75	100	5
	21UPSE64	Digital Electronics and Communication						
	21UPSE65	Problem Solving Skill in Physics						
	21UPSE66	Radiation Safety						
4.	21UPSS61	**Part – IV: SBS – 5:** Medical Physics	2	3	25	75	100	2
5.	21UPSS62	**Part – IV: SBS – 6:** Nanophysics	2	3	25	75	100	2
6.	21UPSCP5	**Part – III: Core: Major Practical – 5:** Digital Electronics Practical	6	3	40	60	100	5
7.	21UPSCP6	**Part – III: Core: Major Practical – 6:** General Practical	6	3	40	60	100	5
8.	21UGKY61	General Knowledge (Self – Study)	–	–	–	–	100	–
		Total Hours	**30**		**Total Credits**			**28**

***One elective course to be chosen from THREE courses**

CA – Class Assessment (Internal)

SE – Summative Examination

SBS – Skill Based Subject

T – Theory

P – Practical

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B.Sc. PHYSICS – SYLLABUS

(Under CBCS based on OBE)(with effect from 2021 – 2022)

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSC61	SOLID STATE PHYSICS	CORE – 9	4	–	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

This course gives an introduction to the structure of the solids and bonding in solids, their properties particularly electrical and magnetic properties. It also deals with X–rays and its production and properties.

COURSE OBJECTIVE:

The main objective of this course is to give an introductory account of X–rays and boding in solids along with their structural properties, electrical and magnetic properties.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	know about the structure of the solids and acquire knowledge of boding in solids and crystal lattice.	K1
CO 2	understand the production of X–rays with their properties and its application.	Upto K3
CO 3	acquire the knowledge about the properties of metals and their effect	K1
CO 4	study and know about the properties of magnetic materials along with the Langevin's theory of magnetism	Upto K2
CO 5	acquire the knowledge about the band theory of solids and dielectric properties of materials.	Upto K2

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

SOLID STATE PHYSICS

UNIT – I:

Bonding in solids – Types of bonds – ionic, covalent, metallic and vander wall's bonds – Binding energy of ionic crystals – cohesive energy – cohesive energy of ionic solids – application to sodium chloride crystal – evaluation of Madelung constant for sodium chloride. – Crystal structure – crystal lattice and Unit cell – Bravais lattice – Classification of crystals – Miller indices – simple structures – packing factor – structure of diamond and zinc blende – lattice vibrations – thermal properties – Heat capacity of solids – classical theory – Limitations – energy gap – isotope effect – London equations – AC & DC Josephson effects

UNIT – II:

X–rays – production and properties – continuous and characteristic x–ray spectra – main features – Duane and Hunt law – Mosley's law and its importance – Compton effect – theory and experiment – X–ray diffraction – Laue pattern – Bragg's law – Bragg's x–ray spectrometer for wavelength measurement – Powder crystal method.

UNIT – III:

Free electron theory of metals – Drude–Lorentz theory – Drift, mobility, mean free path, relaxation time of free electrons – electrical and thermal conductivities of metals – Weidemann and Franz law – sources of resistivity of metals – superconductivity – Types – Meissner effect – BCS theory – applications.

UNIT – IV:

Magnetic materials – Types – properties and applications – Hard and soft magnetic materials – Different types of magnetism – dia, para, ferro, antiferro and ferri magnetism – Langevin's theory of dia and para magnetism – Weiss theory of ferromagnetism – magnetostriction materials.

UNIT – V:

Band theory of solids –classification of insulators, Semiconductors, conductors – Dielectrics – polarization – Polar and non–polar dielectrics – Different types of polarization – electronic, ionic, orientational and space charge – Polarisability – Clasius–Mossotti relation – dependence of polarization on frequency and temperature – Dielectric materials – properties and applications – active and passive materials – Ferro electric and Piezo electric materials.

TEXT BOOKS:

1. ***Solid State Physics*** by Prof. P.K. Palanisamy, Scitech Publications (India) Pvt. Ltd. Chennai.2006
   Unit – I **Chapter 1:** Sections (1.1, 1.2, 1.3, 1.4, and 1.7)
   Chapter 6: Sections (6.1 to 6.10)
   Chapter 7: Sections (7.1 to 7.3)
   Unit – III **Chapter 8:** Sections (8.1 to 8.3, 8.9, 8.10)
   Unit – IV **Chapter 4**: Sections (4.1 to 4.6, 4.8 and 4.8.3)
   Unit – V **Chapter 5**: Sections (5.1 to 5.7)

2. ***Modern Physics*** by R. Murugeshan**,** S. Chand and Company Ltd, RamNagar, New Delhi
   Unit – II **Chapter 5:** Sections (5.1 to 5.14)
3. ***Solid State Physics*** by Saxena Gupta and Saxena from Prakati Prakashan Publications Pvt. Ltd.,
   Unit – III **Chapter 8:** Pages from 259 to 264

REFERENCE BOOKS:

1. ***Introduction To Solid State Physics*** by C.Kittel V edition
2. ***Solid State Physics*** by V.K. Puri and Babber

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	1	2	1	1
CO2	2	1	1	2	2	2
CO3	1	1	2	1	3	3
CO4	1	3	2	1	1	2
CO5	2	1	1	1	1	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level

SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

B.Sc. PHYSICS – SYLLABUS

(Under CBCS based on OBE)(with effect from 2021 – 2022)

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSE61	CLASSICAL AND STATISTICAL MECHANICS	ELECTIVE – 2	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

This course gives an introduction to the mechanics of a system of particles and helps to understand the usage of Lagrangian and Hamiltonian formulation and also deals with classical and quantum statistics.

COURSE OBJECTIVE:

The main objective of this course is to give an introductory account of mechanics of systems of particles and their equations of motion. It helps to understand the basic concepts about Lagrangian and Hamiltonian formulation and their applications and to study the concepts of classical and quantum statistics.

COURSE OUTCOMES (COs):

On successful completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	illustrate the mechanics of system of particles and their equations of motion.	Upto K2
CO 2	explain the Lagrangian formulation and able to solve various mechanical problems.	Upto K3
CO 3	understand the Hamiltonian formulation and adapt to various applications	Upto K3
CO 4	interpret the types of ensembles and explain the basic concepts in classical statistics.	Upto K2
CO 5	understand B.E. and F.D statistics and compare the classical and quantum statistics.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

CLASSICAL AND STATISTICAL MECHANICS

UNIT – I: Mechanics of a System of Particles

Mechanics of a system of particles– Conservation of linear momentum–Conservation of angular momentum – Conservation of energy – work–energy theorem Constraints – Types of constraints – Examples – Degrees of freedom–Generalized coordinates– Generalized displacement – Generalized velocities– Generalized Momentum.

UNIT – II: Lagrangian Formulations

Principle of virtual work, D'Alembert's principle, Lagrange's equation of motion from D'Alembert's principle for conservative and non conservative systems – Simple applications – simple pendulum – Atwood's machine – compound pendulum and linear harmonic oscillator

UNIT – III: Hamiltonian Formulations

Phase space– The Hamiltonian function H –Hamilton's Canonical equation of motion– Physical significance of H– Deduction of Canonical equation from a variational principle– Applications–Harmonic oscillator – simple pendulum – Compound pendulum.

UNIT – IV: Classical Statistics

Micro and macro states – The mu – space and gamma space – fundamental postulates of statistical mechanics – Ensembles – different types – Thermo dynamical probability – entropy and probability – Boltzmann's theorem – Maxwell–Boltzmann statistics – Maxwell – Boltzmann energy distributive law – Maxwell–Boltzmann velocity distributive law.

UNIT – V: Quantum Statistics

Development of Quantum statistics– Bose – Einstein and Fermi – Dirac statistics – Derivation of Planck's radiation formula from Bose – Einstein statistics – Free electrons in metal– Fermi gas–Difference between classical and quantum statistics.

TEXT BOOKS:

1. ***Classical Mechanics*** – Gupta, Kumar, Sharma, Thirtieth edition 2019, Pragati Prakashan Publ., Meerut. (For first 3 Units)
2. ***Heat & Thermodynamics*** – Brijlal & Subramaniam, Reprint 1998, S. Chand & Company Ltd. (For last 2 Units)

REFERENCE BOOKS:

1. ***Classical Mechanics*** – C. Upadhyaya, July 2005, Published by Himalaya Publishing House, Mumbai
2. ***Classical Mechanics***– Gupta, B.D., Satyaprakash, 1991, 9th ed., Kadernath Ramnath Publ., Meerut
3. ***Theoretical Mechanics*** – Murray R. Spiegal, 1981, Schaum's outline series, Mc Graw Hill Publ. Co., New Delhi.
4. ***Statistical Physics*** – Agarwal, S. Chand & co New Delhi 1996.

DIGITAL TOOLS:

1. http://math.huji.ac.il/~razk/Teaching/LectureNotes/LectureNotesMechanics.pdf
2. http://www.jamia–physics.net/lecnotes/statmech/
3. http://micro.stanford.edu/~caiwei/me334/

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	2	1	1
CO2	3	3	3	2	2	2
CO3	3	3	3	3	1	2
CO4	3	1	1	2	1	2
CO5	3	1	1	2	1	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSE62	SPECTROSCOPY	ELECTIVE – 2	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

This course intends to provide the fundamental knowledge of atomic and molecular spectra and the instrument techniques.

COURSE OBJECTIVE:

This course helps to give an introductory account of the basic principles of atomic and molecular spectra and to acquire knowledge about the various instrumentation techniques.

COURSE OUTCOMES (COs):

On successful completion of the course, the students will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	gain knowledge about the rotation spectra and analysis by microwave spectroscopy	K1
CO 2	summarize the different types of oscillators and study the analysis by Infra–red Spectroscopy	Upto K2
CO 3	apply the principles to explain spectra obtained due to energy level transitions in molecules	Upto K3
CO 4	illustrate the rotational fine structure of electronic vibrational transition.	Upto K2
CO 5	acquire knowledge about instrumentation and techniques in IR Spectrometer.	Upto K2

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

SPECTROSCOPY

UNIT – I: Microwave Spectroscopy

Rotation of molecules – Classification of molecules – Rotation spectra of diatomic molecules – Intensities of Spectral lines – Effect of Isotopic Substitution – Non–rigid rotator – Spectrum of a Non–Rigid Rotator –Polyatomic Molecules – Symmetric Top molecules – Asymmetric Top molecules –Techniques and Instrumentation – Chemical analysis by Microwave spectroscopy.

UNIT – II: Infrared Spectroscopy

I.R. Spectroscopy – Vibrating diatomic molecules – Simple Harmonic Oscillator – Anharmonic oscillator – Diatomic vibrating rotator – IR Spectrum of carbon monoxide – Interaction of rotations and vibrations – Vibration of Polyatomic molecules – Analysis by IR techniques.

UNIT – III: Raman Spectroscopy

Raman effect: Discovery – Quantum theory of Raman effect – Classical theory of Raman Effect –Pure rotational Raman Spectra– Linear molecules – Raman Spectrum of symmetric top molecules – Vibrational Raman spectra – Rule of mutual exclusion – Overtone and Combination Vibrations – Rotational Fine Structure – Polarization of light and the Raman Effect – Structure determination from IR and Raman spectroscopy.

UNIT – IV: Electronic Spectroscopy

Born – Oppenheimer approximation – Vibrational coarse structure: Progressions – Frank–Condon principle – Dissociation energy and Dissociation products – Rotational Fine Structure of Electronic Vibration Transitions – Fortrat diagram – Pre dissociation – Diatomic molecules.

UNIT – V: Instrumentation

Instrumentation and Techniques in Infrared spectroscopy – Sources – mono chromators – Sample cells – Detectors – Single beam Infra–red spectrometer – Double beam Infra–red spectrometer

TEXT BOOK:

Fundamentals of Molecular Spectroscopy – Colin N Banwell Elaine– M Mccash Fifth Edition

REFERENCE BOOKS:

1. ***Molecular Structure and Spectroscopy*** – G. Aruldhas, PHI Learning Pvt. Ltd, India.
2. ***Hand book of Analytical Instruments*** –R.S. Khandpur, Tata MC Grow Hill Ltd

DIGITAL TOOLS:

1. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCY1612.pdf
2. https://www.uou.ac.in/sites/default/files/slm/MSCCH–509.pdf

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	3	1
CO2	3	3	2	2	2	2
CO3	3	3	3	1	1	2
CO4	3	1	1	2	3	1
CO5	3	2	2	2	3	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

B.Sc. PHYSICS – SYLLABUS

(Under CBCS based on OBE)(with effect from 2021 – 2022)

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSE63	ASTRO PHYSICS	ELECTIVE – 2	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

During the course, the students will learn about the sun and the solar systems, the star and the galaxy, distant galaxies and the beginning of the universe.

COURSE OBJECTIVE:

To make the students explore the parent star, sun and its importance for sustaining life on the earth, to make them understand the solar atmosphere and its effect on the earth and other planets and to help them gain knowledge of astronomical instruments, telescope its mounting and image defects.

COURSE OUTCOMES (COs):

On successful completion of the course, the students will be able to

No.	Course Outcome	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the birth of modern astronomy, Kepler's law of Planetary motion and visualize the effect of the three laws on the orbit of planets, asteroids and comets.	Upto K2
CO 2	learn theoretical and practical aspects of modern telescopes, photometry and spectroscopy.	Upto K2
CO 3	understand the temperature, atmospheric pressure of a planet. Describe solar and lunar eclipses	Upto K2
CO 4	explain theoretical evolution of stars, white dwarfs. Understand the basic physics of black holes.	Upto K2
CO 5	discuss milky way galaxy and its structure and understand Big Bang theory	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

ASTROPHYSICS

UNIT – I:

Birth of Modern Astronomy – Geocentric and Heliocentric theories —– Kepler's laws of planetary motion – Newtonian gravitation – Celestial sphere – Planets – Terrestrial and Jovian planets (Planets individual description is not required in detail) – Asteroids– Meteorites – Comets.

UNIT – II:

Telescopes – Elements of telescope – Properties of images – Types of Optical telescopes – Refracting and Reflecting telescopes– Radio telescope –Spectrograph – Limitations – Photographic photometry – Photoelectric photometry – Spectrophotometry – Detectors and image processing.

UNIT – III:

Sun – Physical properties – Composition – Core – Nuclear Reactions – Photosphere – Chromosphere – Corona – Sunspots – Sunspot cycle – Solar Wind – Auroras – space weather effects – History of the Earth – Temperature of a planet – The atmosphere – Pressure and Temperature distribution – Magnetosphere – Eclipses – Solar and Lunar Eclipses.

UNIT – IV:

Classification of Stars – The Harvard Classification system – Luminosity of a Star – Hertzprung – Russel Diagram – Stellar evolution using the HR diagram – Theoretical evolution of stars – White Dwarfs – Neutron stars–Black holes – Event horizon – Basic physics of Black Holes.

UNIT – V:

Galaxy nomenclature – Types of Galaxies – Spiral – Elliptical – irregular galaxies – Milky Way Galaxy and its structure – Rotation and Mass Distribution – Rotation curve and Doppler shift – Star clusters – Galactic clusters – Pulsars – Cosmological Models – Big bang theory – Steady state theory – Hubble's law – Olber's paradox.

TEXT BOOKS:

1. Niclolas. A. Pananides and Thomas Arny, 1979, ***Introductory Astronomy***, Addison Wesley Publ. Co.
2. Mujiber Rahman, ***Concepts to Astrophysics***, Scitech Publications, Chennai.

REFERENCE BOOKS:

1. Abell, Morrison and Wolf, 1987, ***Exploration of the Universe***, 5th ed., Saunders College Publ.
2. Carrol and Ostlie, 2007, ***Introduction to Modern Astrophysics***, 2nd ed., Pearson International.
3. William J. Kaufmann, III, 1977, ***Macmillan Publishing Company***, London.
4. Abhyankar, K.D., Universities Press.

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	1	3	1
CO2	3	3	2	2	2	2
CO3	3	3	3		2	2
CO4	3	2	1	2	2	
CO5	3	2	2	2	3	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

B.Sc. PHYSICS – SYLLABUS

(Under CBCS based on OBE)(with effect from 2021 – 2022)

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSE64	DIGITAL ELECTRONICS AND COMMUNICATION	ELECTIVE – 3	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

Digital electronics is the study of electronic circuits that are used to process and control digital signals. The major focus of DE course is to expose students to the design process of combinational and sequential circuits. Digital electronics is that is the foundation of modern computers and digital communication.

COURSE OBJECTIVES:

The objective of this course is to provide fundamental concepts associated with the digital logic and circuit. To introduce the basic concepts and laws involved in the Boolean algebra and logic families and digital circuits. To familiarize with the number systems, logic gates, and combinational circuit and sequential circuits utilized in different digital circuits .The objective of communication is to provide basic idea to convert data into radio waves by adding information to an electronic carrier signal.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	**employ** the codes and number systems converting circuits and **compare** different types of logic families	Upto K3
CO 2	**learn** the minimization techniques to simplify the hardware requirements of digital circuits and implement it, **design** and **apply** for real time digital circuits.	Upto K3
CO 3	**understand t**he working mechanism and **design** guidelines of different combinational and sequential circuits .	Upto K3
CO 4	**express** basic concepts of modulation and demodulation in digital communication a**nalyse** the noise characteristics of a communication system.	Upto K3
CO 5	get a thorough **understanding** of communication and satellite systems and **knowledge** of satellite links .	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

DIGITAL ELECTRONICS AND COMMUNICATION

UNIT– I: Digital fundamentals

Number system and conversion –BCD code –1's and 2's complement – Binary subtraction by 1's and 2's complement – Basic laws of Boolean algebra – Boolean addition – Law's of Boolean Algebra – De Morgan's theorem – Statement and proof .

UNIT– II: Logic gates and Arithmetic circuits

Basic logic gates – NAND, NOR and EX–OR, EX–NOR gates – NAND and NOR as universal building blocks – Karnaugh map (2,3,4– variables)– SOP and POS applications – HALF adder FULL adder – 4 bit binary adder – HALF subtractor –FULL subtractor –4 bit parallel subtractor – BCD adder – Multiplexer – 4to1 MUX – De Multiplexer 1 to 4 DE MUX – Encoder – 8 to 3– Decoder 3to8 BCD TO seven segment decoder .

UNIT– III: Sequential logic circuit

RS FLIP–FLOP, clocked RS FLIP – FLOP , D FLIP – FLOP, JK FLIP – FLOP AND JK Master slave FLIP – FLOP – Shift Registers and Ring Counters – Digital to Analog – Analog to Digital .

UNIT– IV: Modulation and Demodulation

Amplitude Modulation Frequency Modulation –Phase Modulation and Pulse width Modulation – Detectors of AM, FM, PM, and PWM, PLL – Noice in communication systems.

UNIT– V: Digital and Satellite Communication

ASK, FSK, PSK, Modulation and Demodulation – Advantages and Disadvantages –of Digital Communication –Communication – Satellite systems –Telemetry –Tracking –and command system –Satellite links.

TEXT BOOKS:

1. ***Introduction to Integrated Electronics*** by V. Vijayendran , S. Viswanathan (Printers and Publishers) PVT. Ltd., Chennai –2005
2. ***Digital Electronics and Application*** by Malvino LEeach , Tata Mc Graw Hill , 4th edition (1992)

REFERENCE BOOKS:

1. ***Integrated Electronics*** by J. Millman and Halkias, Tata Mc Graw Hill, New Delhi(2001)
2. ***Digital Electronics by Practice using Integrated Circuits*** – R.P. Jain Tata Mc Graw Hill ,(1996)

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	–	2	–	1
CO2	2	–	3	2	1	–
CO3	3	1	–	2	3	–
CO4	2	1	1	–	2	1
CO5	2	3	1	1	2	–

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSE65	PROBLEM SOLVING SKILL IN PHYSICS	ELECTIVE – 3	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	☐	✓	☐

COURSE DESCRIPTION:

The intention of the course is to impart knowledge, skills and approaches about solving problems in core physics. Minimum of 25 problems based on various principles of physics are required in each unit.

COURSE OBJECTIVES:

The main objective of this course is to focus on the problem solving techniques in various fields of physics. It is helpful to appear research oriented entrance examination.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	get problem knowledge about translational and rotational mechanics	Upto K2
CO 2	develop the problem solving techniques in thermal physics	Upto K2
CO 3	know about the concept electricity and magnetism, problem solving and its applications	Upto K2
CO 4	highlight the importance of method of solving the problem in quantum mechanics	Upto K3
CO 5	show the output and application of general physics and mathematics while solving the	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

PROBLEMS SOLVING SKILLS IN PHYSICS

UNIT – I: Problems in Mechanics

Newton laws of motion for various systems (1, 2 and 3 dimension), Conservation laws and collisions, Rotational mechanics, central force, Harmonic oscillator, special relativity

UNIT – II: Problems in Thermal Physics

Kinetic theory– MB distribution–Laws of thermodynamics–Ideal Gas law Various Thermodynamic process– Entropy calculation for various process–Heat engine–TS and PV diagram–Free energies various relations

UNIT – III: Problems in Electricity & Magnetism Electrostatics

Calculation of Electrostatic quantities for various Magneto statics– Calculation of Magnetic quantities for various configuration, Electromagnetic induction, Poynting vector, Electromagnetic waves.

UNIT – IV: Problems in Quantum Mechanics

Origin of Quantum mechanics– Fundamental Principles of Quantum mechanics– potential wells and harmonic oscillator– Hydrogen atom.

UNIT – V: Problems in General Physics & Mathematics

Plotting the graphs for various elementary and composite functions–Elasticity Viscosity and surface tension– fluids–Buoyancy–pressure–Bernoulli's theorem– applications–waves and oscillations, Errors and propagation of errors.

Text Book:

1. ***Mechanics (in SI units)*** by Charles Kittel, Walter D Knight etc. (Berkeley Physics course–volume 1), Tata McGraw Hill publication, second edition.
2. ***Thermal Physics*** by S.C. Garg, RM Bansal & CK Ghosh. (Tata McGraw Hill Publications), 1st edition.
3. ***Electricity & Magnetism (in SI units)*** by E.M. Purcell, Tata Mcgraw hill Publication, 2nd Edition.
4. ***Quantum Mechanics*** by N. Zettili, Wiley Publishers, second edition.
5. ***Introduction to Quantum Mechanics*** by David. J. Griffith, Pearson Publications, second edition. Tamil Nadu State Council for Higher Education 59

REFERENCE BOOKS:

1. ***Fundamentals of Physics*** by Halliday & Resnick, Wiley Publications, 8th Edition.
2. ***Advanced Level Physics*** by Nelkon and Parker,CBS publishers, 7th edition
3. ***Play with Graphs*** by Amith Agarwal, Arihant Publications.
4. ***Properties of Matter*** by D.S. Mathur,

DIGITAL TOOL:

https://www.lehman.edu/faculty/dgaranin/Introductory_Physics/Introductory_Physics–Problem_solving.pdf

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	1	2	3
CO2	2	3	2	1	1	3
CO3	2	3	2	2	1	2
CO4	2	3	1	1	2	2
CO5	2	3	2	1	2	3

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSE66	RADIATION SAFETY	ELECTIVE – 3	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	25	75	100

NATURE OF COURSE	Employability ☐	Skill Oriented ✓	Entrepreneurship ☐

COURSE DESCRIPTION:

This course reveals the types of detectors used to measure high energy radiations as well as receptiveness to different approaches to problem solving.

COURSE OBJECTIVES:

This course helps to make awareness and understanding on radiation hazards and safety measures.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	explain about Nucleus, its energy states and radioactivity principles.	K1
CO 2	infer the Physics aspects of Interaction of ionizing radiation with matter.	Upto K2
CO 3	understand the function of scintillation detectors and methods of detection.	Upto K2
CO 4	apply radiation safety management in different situation.	Upto K3
CO 5	write the applications of nuclear techniques used in different fields.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

RADIATION SAFETY

UNIT – I: Basics of Atomic and Nuclear Physics

Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, Thecomposition of nucleus and its properties, mass number, isotopes of element, spin,binding energy, stable and unstable isotopes, law of radioactive decay, Mean life and half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission.

UNIT – II: Interaction of Radiation with Matter

Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources, Interaction of Photons –Photo–electric effect, Compton Scattering, Pair Production, Linear and Mass –Attenuation Coefficients, Interaction of Charged Particles: Heavy charged particles– Beth–Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles– Collision and Radiation loss (Bremsstrahlung), Interaction of Neutrons– Collision, slowing down and Moderation

UNIT – III: Radiation Detection and Monitoring Devices

Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC). Radiation detection: Basic concept and working principle of *gas detectors* (Ionization Chambers, Proportional Counter, Multi–Wire Proportional Counters (MWPC) and Gieger Muller Counter), *Scintillation Detectors* (Inorganic and Organic Scintillators), *Solid States Detectors* and *Neutron Detectors, Thermo luminescent Dosimetry.*

UNIT – IV: Radiation Safety Management

Biological effects of ionizing radiation, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub–critical system (ADS) for waste management

UNIT – V: Application of Nuclear Techniques

Application in medical science (e.g., MRI, PET, Projection Imaging Gamma Camera, radiation therapy), Archaeology, Art, Crime detection, Mining and oil. *Industrial Uses:* Tracing, Gauging, Material Modification, Sterilization, Food preservation

TEXT BOOKS:

1. W.E. Burcham and M. Jobes – ***Nuclear and Particle Physics*** – Longman (1995)
2. G.F.Knoll, ***Radiation Detection and Measurements.***

REFERENCE BOOKS:

1. ***Thermoluninescense Dosimetry***, Mcknlay, A.F., Bristol, Adam Hilger
2. W.J. Meredith and J.B. Massey, ***Fundamental Physics of Radiology.*** John Wright and Sons, UK, 1989.
3. Martin and S.A. Harbisor, ***An Introduction to Radiation Protection***, John Willey &Sons, Inc. New York, 1981.
4. W.R. Hendee, ***Medical Radiation Physics,*** Year Book – Medical Publishers Inc. London, 1981.

DIGITAL TOOL:

https://archive.org/details/nuclear–and–particle–physics–w.–e.–burcham–m.–jobes/page/14/mode/2up?view=theater

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	3	2	1
CO2	2	3	1	1	2	2
CO3	3	2	2	2	1	2
CO4	3	2	1	2	2	2
CO5	2	3	2	1	1	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSS61	MEDICAL PHYSICS	SBS – 5	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	25	75	100

NATURE OF COURSE	Employability ☐	Skill Oriented ✓	Entrepreneurship ☐

COURSE DESCRIPTION:

This course helps to study the application of physics in medical field. It uses physics concepts in preclusion, diagnosis and treatment of disease through bio medical instruments

COURSE OBJECTIVE:

The objective of this course is to make the students understand the basics about the biological systems in our body, their behaviour, and the diagnostic devices.

COURSE OUTCOMES (COs):

On successful completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	acquire knowledge about the structure of our body	Upto K2
CO 2	understand the hearing and visualization function of our body	Upto K2
CO 3	describe the function of bio medical instruments and its applications	Upto K3
CO 4	obtain information about X rays and scanning devices	K1
CO 5	elucidate the concept of biological recording system and its outputs	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

MEDICAL PHYSICS

UNIT – I: Anatomy

An introduction to human body–Basic Anatomical Terminology– Standard anatomical position, Planes, Familiarity with terms like – Superior, Inferior, Anterior, Posterior, Medial, Lateral, Proximal, Distal. – Forces on and in the Body – Physics of the Skeleton

UNIT – II: Bio Mechanics, Audition and Vision

Pressure system of the body– Physics of Cardiovascular system– Electricity within the Body – Sound in medicine– Physics of the Ear and Hearing– Light in medicine– Physics of eyes and vision.

UNIT – III: Transducers

Performance of Characteristics of transducer– static and dynamic active transducers – (a) piezoelectric type (b) photovoltaic type Passive transducer– (a) resistive type – effect and sensitivity of the bridge (b) capacitive transducer

UNIT – IV: X Rays and Scanning System

X–rays– Production of X–rays– X–ray spectra– continues spectra and characteristic spectra– Coolidge tube– Computer Tomography (CT) principle– Block diagram of CT scanner.

UNIT – V: Recording System

Electro cardio graph (ECG) – Block diagram– ECG Leads– Unipolar and bipolar–ECG recording set up. Electro Encephalo Graph (EEG) – origin– Block diagram– Electro Myogragh (EMG) – Block diagram– EMG recorder

TEXT BOOK:

Medical Physics – John R. Cameron and James G. Skofronick, 1978, John Willy & Sons.

REFERENCE BOOK:

Bio Medical Instrumentation – Edn II, Dr. M. Arumugam, Anuradha Agencies 1997.

DIGITAL TOOL:

https://www.tutorialsduniya.com/notes/medical–physics–notes/

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	3	1	2	2
CO2	2	2	2	2	2	2
CO3	2	3	3	1	2	2
CO4	3	3	2	2	2	2
CO5	2	3	3	2	2	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSS62	NANOPHYSICS	SBS – 6	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	25	75	100

NATURE OF COURSE	Employability ☐	Skill Oriented ✓	Entrepreneurship ☐

COURSE DESCRIPTION:

This course deals with the basics, characterization and importance of nanoscience and which impart the basic physics involved in nanoscience and technology.

COURSE OBJECTIVES:

This course helps to understand the basics of nanoscience and technology. Proficiency of this knowledge will be useful in technological applications.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	get the basic knowledge in nanomaterials.	K1
CO 2	understand the scientific perspective of nanomaterials.	Upto K2
CO 3	recognize single domain magnetic nanoparticles.	Upto K2
CO 4	identify the techniques suitable for nanomaterial synthesis.	Upto K3
CO 5	know the significance of nanomaterials.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY

NANOPHYSICS

UNIT – I: Introduction

History of Nanoscience – Definition of Nanometer – Nanoscience and Nanotechnology – Classification of Nanomaterials – Examples of Nanostructured materials – Primitive vectors – Wigner–Seitz cell – Two dimensional lattice type – Primitive cells of three dimensional lattices.

UNIT – II: Synthesis of Nanomaterials

Bottom–up approach – Sol–Gel synthesis – Hydrothermal growth – Thin film growth (PVD and CVD) – Top–Down approach – Ball Milling.

UNIT – III: Quantum Dot and Carbon Nanotechnology

Super lattices – Quantum dots – Applications of Quantum dots – Carbon nanotechnology – carbon Allotropes – Graphene – Applications of carbon nanotubes.

UNIT – IV: Properties

Domains in magnetic materials – Single domain nature and the Superparamagnetism – Effect of size reduction on Bulk properties – Optoelectronic property of bulk and nanostructures.

UNIT – V: Applications of Nanotechnology

Introduction – Applications in Materials Science – Applications in Biology and Medicine – Applications in surface science – Applications in Energy and Environment.

TEXT BOOKS:

1. ***Nanoscience and Nanotechnology: Fundamentals to Frontiers*** by M.S. Ramachandra Rao, Shubra Singh, Wiley India Pvt. Ltd., New Delhi. (2013).
2. ***Text book of Nanoscience and Nanotechnology*** – B. S. Moorthy, P. Sankar, Baldev Raj, B. B. Rath and James Murdy University Press – IIM
3. ***Nanophysics,*** Sr. Geradin Jayam, Holy Cross College, Nagercoil (2010)

REFERENCE BOOKS:

1. ***Nano the Essentials*** – T. Pradeep, Tata Mc.Graw Hill company Ltd (2007)
2. ***The Chemistry of Nanomaterials :Synthesis, Properties and Applications,*** C. N. R. Rao, A. Mu¨ller, A. K. Cheetham, , Volume 1, Wiley–VCH, Verlag GmbH, Germany (2004).

DIGITAL TOOL:

https://www.researchgate.net/publication/259118068_Chapter_–_INTRODUCTION_TO_NANOMATERIALS

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	1	2	2
CO2	3	1	2	2	2	2
CO3	2	1	1	2	1	1
CO4	2	1	3	2	2	1
CO5	2	1	1	2	2	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSCP5	DIGITAL ELECTRONICS PRACTICAL	CORE PRACTICAL – 5	–	6	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	40	60	100

MAJOR CORE PRACTICALS – DIGITAL ELECTRONICS

LIST OF EXPERIMENTS

Any Fourteen

1. Dual Power Supply using IC.
2. IC 7805 Regulated Power Supply.
3. Op–Amp– Integrator and Differentiator.
4. Op–Amp – Adder and Subtractor.
5. Astable Multivibrator using Op–Amp.
6. Astable Multivibrator using IC– 555 timer.
7. Schmitt Trigger using IC–555.
8. Universality of NAND and NOR.
9. Half Adder and Full Adder.
10. Four Bit Binary Adder and Subtractor.
11. Shift Register.
12. Ring Counter.
13. D/A Converter.
14. Verification of De Morgan's theorem.
15. BCD Counter.

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
21UPSCP6	GENERAL PRACTICAL	CORE PRACTICAL – 6	–	6	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
III	VI	40	60	100

MAJOR CORE PRACTICALS – GENERAL

LIST OF EXPERIMENTS

Any Fourteen

1. Spectrometer – Small angled prism
2. Spectrometer – i–d curve
3. Spectrometer – Grating minimum deviation
4. Spectrometer – Cauchy's constants
5. Spectrometer – i–i' curve
6. Spot Galvanometer – Comparison of Mutual inductances
7. Rayleigh bridge – Self inductance
8. Maxwell's bridge – Self inductance
9. De–sauty's bridge – Comparison of capacities
10. Impedance and Power factor – LR circuit
11. Impedance and Power factor – CR circuit
12. Spot Galvanometer – comparison of emfs
13. Spot Galvanometer – Thermo emf
14. Potentiometer – Thermo emf
15. Spot Galvanometer – determination of Mutual Inductance
16. Potentiometer – Resistance of a coil
17. Potentiometer – High range voltmeter