KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE -641029

DEPARTMENT OF PHYSICS (UG)

CURRICULUM AND SCHEME OF EXAMINATIONS
(CBCS)

(2025-2026)

DEPARTMENT OF PHYSICS

Vision

The goal of the Department of Physics is to bring eminence and excellence in teaching learning process and to fetch ours as one of the Benchmark Department with "Potential for Academic excellence"

Mission

To execute the teaching profession to bring the students as an asset for a productive and fascinating career,successful in their life and to realize learning with real world experience.

PROGRAMME OUTCOME (PO)

Upon successful completion of the programme, the students will be able to

PO1:   Gain basic ideas of various branches of Physics

PO2:   Have the knowledge of theories involved in Physics

PO3:   Understand the fundamental ideas of experimental Physics and inculcate strong laboratory skills

PO4:   Understand the applications of basic concepts of Physics in Technology

PO5:   Realize the role of Physics in day-to-day life

PO6:   Be able to transfer their theoretical knowledge to experimental levels in laboratories

PO7:   Develop written and oral communication skills

PO8:   Acquire various technical skills

PROGRAMME SPECIFIC OUTCOME (PSO)

Students will

1. Understand the applications of basic concepts of Physics in Technology

2. Realize the role of Physics in day-to-day life

3. Be able to transfer their theoretical knowledge to experimental levels in laboratories

4. Develop written and oral communication skills

5. Acquire various technical skills

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), COIMBATORE - 641 029

Programme Name: B. Sc. PHYSICS

Curriculum and Scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2025-2026 and onwards)

Semester	Part	Subject code	Title of the Paper	Instruction hours / cycle	Exam. Marks			Duration of Exam. Hrs.	Credits
					CIA	ESE	Total		
I	I	25TML101@	**Language I** @	6	25	75	100	3	3
	II	25ENG101	English I	6	25	75	100	3	3
	III	25UPH101	**Core Paper 1** - Properties of Matter and Sound	6	25	75	100	3	4
		-	**Core Practical 1-** General Experiments	3	-	-	-	-	-
		25UMA1A1	**Allied Paper 1 -** Mathematics I	7	25	75	100	3	5
	IV	25EVS101	Environmental Studies**	2	-	50	50	3	2
				30	-	-	450	-	17
II	I	25TML202@	**Language II** @	6	25	75	100	3	3
	II	25ENG202	English II	6	25	75	100	3	3
	III	25UPH202	**Core Paper 2** - Heat and Thermodynamics	6	25	75	100	3	4
		25UPH2CL	**Core Practical 1-** General Experiments	3	40	60	100	3	3
		25UMA2A2	**Allied Paper 2 -** Mathematics II	7	25	75	100	3	5
	IV	25VED201	**Value Education –** Moral and Ethics**	2	-	50	50	3	2
				30	-	-	550	-	20

	I	25TML303@	**Language III** @	6	25	75	100	3	3
	II	25ENG303	English III	6	25	75	100	3	3
III	III	25UPH303	**Core Paper 3** – Mechanics	4	25	75	100	3	4
		-	**Core Practical 2** – General Experiments	3	-	-	-	-	-
		25UCH3A3	**Allied Paper 3 -** Chemistry I	4	20	55	75	3	4
		-	**Allied Practical-** Chemistry Practicals	3	-	-	-	-	-
		25UGC3S1	**Skill based Subject 1 -** Cyber Security	2	100	-	100	3	3
	IV	25TBT301/ 25TAT301/ 25UHR3N1	Basic Tamil * / Advanced Tamil** / Non-Major Elective - I **	2	-	75	75	3	2
				30	-	-	550	-	19
IV	I	25TML404@	**Language IV** @	6	25	75	100	3	3
	II	25ENG404	English IV	6	25	75	100	3	3
	III	25UPH404	**Core Paper 4 -** Electricity and Magnetism	4	25	75	100	3	4
		25UPH4CM	**Core Practical 2 –** General Experiments	3	40	60	100	3	3
		25UCH4A4	**Allied Paper 4** - Chemistry II	4	20	55	75	3	4
		25UCH4AL	**Allied Practical -** Chemistry Practical	3	20	30	50	3	2
	IV	25UPH4S2	**Skill based Subject 2 -** Scientific Computing – Python and Artificial Intelligence	2	25	75	100	3	3
		25TBT402/ 25TAT402/ 25UWR4N2	Basic Tamil * / Advanced Tamil ** / Non-Major Elective - II**	2	-	75	75	3	2
				30	-	-	700	-	24

V	III	25UPH505	**Core Paper 5** - Mathematical Physics	4	25	75	100	3	4
		25UPH506	**Core Paper 6** – Optics	4	25	75	100	3	4
		25UPH507	**Core Paper 7 -** Principles of Electronic Devices and Circuits	4	25	75	100	3	4
		25UPH508	**Core Paper 8 -** Basics of Quantum Mechanics	4	25	75	100	3	4
		25UPH5E1	**Major Elective 1**	4	25	75	100	3	5
		-	**Core Practical 3 –** General Experiments	3	-	-	-	-	-
		-	**Core Practical 4** - Electronics	3	-	-	-	-	-
		-	**Core Practical 5** - Digital Electronics, Microprocessor and Python programming	2	-	-	-	-	-
	IV	25UPH5X1	**EDC**	2	100		100	3	3
	-	25UPH5IT	Internship Training / Mini Project ***			Grade			
				30	**-**	**-**	**600**	**-**	**24**
VI	III	25UPH609	**Core Paper 9 -** Atomic and Solid State Physics	5	25	75	100	3	4
		25UPH610	**Core Paper 10 –** Fundamentals of Digital Electronics and Microprocessor	5	25	75	100	3	4
		25UPH611	**Core Paper 11 -** Nuclear Physics	5	25	75	100	3	4
		25UPH6CN	**Core Practical 3 –** General Experiments	3	40	60	100	3	4
		25UPH6CO	**Core Practical 4** - Electronics	3	40	60	100	3	3
		25UPH6CP	**Core Practical 5** - Digital Electronics, Microprocessor and Python programming	3	40	60	100	3	3
		25UPH6E2	**Major Elective 2**	4	25	75	100	3	5
		25UPH6Z1	**Project and Viva Voce ***	-	20	80	100	-	5
		25UBI6S3	**Skill Based Subject 3 -** Basics of IPR	2	25	75	100	3	3
				30	**-**	**-**	**900**	**-**	**35**
	V	25 NCC $ /NSS/ YRC/ PYE/ECC/ RRC/WEC 101#	**Co-curricular Activities ***	**-**	**50**	**-**	**50**	**-**	**1**
			Grand Total	**-**	**-**	**-**	**3800**	**-**	**140**

Note :
CBCS – Choice Based Credit system, CIA– Continuous Internal Assessment, ESE– End of Semester Examinations

$ For those students who opt NCC under Co-curricular activities will be studying the prescribed syllabi of the UGC which will include Theory, Practical & Camp components. Such students who qualify the prescribed requirements will earn an additional 24 credits.

@ Hindi/Malayalam/ French/ Sanskrit – 24HIN/MLM/FRN/SAN101 - 404

* - No End-of-Semester Examinations. Only Continuous Internal Assessment (CIA)

**- No Continuous Internal Assessment (CIA). Only End-of-Semester Examinations (ESE)

*** Project Report – 60 marks; Viva-voce – 20 marks; Internal-20 marks

**** The students shall undergo Internship training / field work for a minimum period of 14 working days at the end of the <u>fourth</u> semester during summer vacation and submit the report in the <u>fifth</u> semester which will be evaluated for 100 marks by the concerned guide and followed by an Internal Viva-voce by the respective faculty or HOD as decided by the department. According to their marks, the grades will be awarded as given below.

Marks %	Grade
85 – 100	O
70 – 84	D
60 – 69	A
50 – 59	B
40 – 49	C
< 40	U (Reappear)

<u>Major Elective Papers</u>
(2 papers are to be chosen from the following 6 papers)
1. Laser Physics and Fiber Optics
2. Principles of Communication Systems
3. Materials Science
4. Measurement Systems
5. Introduction to Biophysics
6. Object Oriented Programming in C++

<u>Non - Major Elective Papers</u>
1. Human Rights
2. Women's Rights
3. Consumer Affairs

<u>Sub. Code & Title of the Extra Departmental Course (EDC):</u>
25UPH5X1 - Physics in everyday life

<u>Certificate Courses</u>
1. Certificate course in Astrophysics
2. Certificate course in Non-Conventional Energy

3. Certificate course in Electronic Instrumentation

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Add on Courses
1. Job Oriented Course - Electrical Appliances: Maintenance and Servicing
2. Advanced Learners Course - Experimental Techniques and Data analysis

 # List of Co-curricular Activities:
1. National Cadet Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)

Note: In core/allied subjects, no. of papers both theory and practical are included wherever applicable. However, the total credits and marks for core /allied subjects remain the same as stated below.

Tally Table

S.No.	Part	Subject	Marks	Credits
1	I	Language – Tamil/Hindi/Malayalam/ French/ Sanskrit	400	12
2	II	English	400	12
3	III	Core – Theory/Practical	1600	60
	III	Allied	400	20
		Electives/Project	300	15
4	IV	Basic Tamil / Advanced Tamil (OR) Non-Major Electives	150	4
		Skill Based subject	300	9
		EDC	100	3
		Environmental Studies	50	2
		Value Education	50	2
5	V	Co-curricular Activities	50	1
Total			**3800**	**140**

➢ 25 % CIA is applicable to all subjects except JOC, COP and SWAYAM courses which are considered as extra credit courses.
➢ 100 % CIA for Cyber Security, EDC and Basics of IPR.
➢ The students should complete **Health and Wellness Programme (25UHW401)[###]** in the 4th semester and the completion marks should be submitted through the HOD to the Controller of Examinations. Extra credits will be given to the candidates who have successfully completed.
➢ The students should complete any **MOOC course available for Online learning platforms like SWAYAM, NPTEL, IIT Bombay Spoken Tutorial, e-Pathshala etc.,** with a minimum of 4 weeks in duration before the completion of the 5th semester and the course completion certificate should be submitted through the HOD to the Controller of Examinations. Extra credits will be given to the candidates who have successfully completed.
➢ An **Onsite Training** preferably relevant to the course may be undertaken as per the discretion of the HOD.

➤ Students who successfully complete **Naan Mudhalvan** courses in 3rd and 5th semester will be given 2 extra credits for each course. They are asked to submit the marks to Controller of Examinations through and undersigned by the HOD.

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Semester	Naan Mudhalvan Course Title
III	Digital skills for employability
V	Data analytics with advanced tools

Components of Continuous Internal Assessment (CIA)

Components		Marks	Total
Theory			
CIA I	75	(75+75 = 150/10)	
CIA II	75	15	25
Assignment/Seminar		5	
Attendance		5	
Practical			
CIA Practical		25	
Observation Notebook		10	40
Attendance		5	
Project			
Review		15	
Regularity		5	20
Components		Marks	
Theory (Allied) (External: 55 Marks)			
CIA I	55	(55+55)	
CIA II	55	Converted to 10	20
Assignment/Seminar		5	
Attendance		5	
Practical (Allied) (External: 30 marks)			
CIA Practical		10	
Observation Notebook		5	20
Attendance		5	

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN
K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating

Components of End Semester Examination (ESE)

1. ESE Theory Examination (Part I, II, III & Certificate Courses)
i)   **CIA I & CIA** II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	
K1 – K5 Q11 to 15	B (Either or pattern)	5 x 5 = 25	Short Answers	75
K2 – K5 Q16 to 20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

ii)   **CIA I & CIA II and ESE: 55 Marks (Allied)**

Knowledge Level	Section	Marks	Description	Total
K1 Q1 to 10	A (Answer all)	10 x 1= 10	MCQ	55

K1 – K5 Q11 to 15	B (Either or pattern)	5 x 3 = 15	Short Answers	
K2 – K5 Q16 to 20	C (Either or pattern)	5 x 6 = 30	Descriptive / Detailed	

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2. **ESE Practical Examination:**

Knowledge Level	Section	Marks	Total
K3 - K5	Experiments	50	60
	Record Work	10	
(For Allied papers)			
Knowledge Level	Section	Marks	Total
K3 - K5	Experiments	20	30
	Record Work	05	

3. **ESE Project Viva Voce: (Part III & Certificate Courses)**

Knowledge Level	Section	Marks	Total
K3 - K5	Project Report	60	80
	Viva-voce	20	

4. JOC and ALC: External only

Section A - Multiple Choice   (10× 1 = 10 marks)
Section B - Either or type   (5 × 6 = 30 marks)
Section C - Either or type   (5 ×12 = 60 marks)

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Sub. Code: 25UPH101

Programme Code: 03		B.Sc. Physics			
Title of the Paper		**Core Paper 1 - Properties of Matter and Sound**			
Batch 2025-2026	**Semester I**	**Hours/Week 6**	**Total Hours 90**	**Credits 4**	**Entrepreneurship**

Course Objectives

To enable the learners to
1. Understand the basic concepts of gravitation.
2. Get exposure to the properties of liquids & solids.
3. Understand the metallurgical advancement and properties of sound.

Course Outcomes (CO)

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

K1 - K5	CO1	Understand the action of gravitational fields and potentials on different objects
	CO2	Gain knowledge on elastic behavior of beams, rods and wires through the bending and torsional behaviors of the objects
	CO3	Gain knowledge on properties of liquids by surface tension and viscosity
	CO4	Production and application of ultrasonics and acoustics in different types of Buildings
	CO5	Understand the metallurgical advancement and acoustic resonance based on Indian Knowledge System

Syllabus

UNIT I   **(18 hrs)**
Gravitation fields and potentials
Nature of motion under central forces - Kepler's law - Newton's law of gravitation - Gravitational potential and field - Gravitational potential and field due to i) spherical shell, ii) solid sphere and hollow sphere - Boy's Method and Heyl's Method of determining 'G'. Gravitational field of Earth – equation of motion of elementary volume – escape velocity.

UNIT II   **(18 hrs)**
Elasticity
Elastic constants – Relations connecting them – Poisson's ratio - Bending of beams - uniform and non - uniform bending – Cantilever – static and dynamic methods - Torsion in a wire – Rigidity modulus -determination by static and dynamic methods.

UNIT III   **(18 hrs)**
Surface Tension and Viscosity
Surface Tension
Surface tension and Surface energy– pressure in a curved surface of a liquid–Shape of Liquid Meniscus in a Capillary tube – Angle of contact – Measurement of angle of contact – Experimental determination of Surface Tension
Viscosity
Streamline flow, Turbulent flow – Energy of a liquid – Bernoulli's theorem and its applications – Coefficient of viscosity – Poiseuille's formula to find η of low viscous liquid – Stoke's method

UNIT IV   **(18 hrs)**
Acoustics and Ultrasonics
Acoustics–Basic principle–Reverberation– Sabine's reverberation formula – Determination of absorption coefficient– Factors affecting the acoustics of buildings– Sound distribution in an auditorium–Requisites for good acoustics.
Ultrasonics – Production of ultrasonic waves: Magnetostriction oscillator and piezoelectric oscillator– Detection of ultrasonic waves – **Application of ultrasonics***.

UNITV   **(18 hrs)**
Indian Knowledge System
Wootz Steel and Ancient Indian Crucible Steel: Chemical Composition – forging techniques – comparison with modern materials. Chola Bronze Sculpyures and Los-Wax Casting: Precision casting techniques – microstructural analysis. Temple Bells and Acoustic resonance: Bell metal composition – resonant frequency studies.

* Self study
Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. D.S.Mathur, (2018), Elements of Properties of Matter-Shyamlal Charitable Trust, New Delhi.
2. Brijlal and N.Subramaniam, (1999), Properties of Matter- S.Chand & Co., New Delhi.
3. R.L.Saihgal, (1982), A Textbook of Sound- S.Chand & Co., New Delhi.
4. Srinivasan Sharadha and R.Ranganathan, Wootz steel: An advanced material of the ancient world, Academia, 1997

Reference Books:
1. Alex A.Kaufman, (2007), Principles of the Gravitational method, Elsevier
2. Brijlal and N.Subramaniam, (2018), A Textbook of Sound- S.Chand & Co. New Delhi.
3. D.S.Mathur, (2019), Mechanics - S.Chand & Co., New Delhi.
4. R.Murugesan, (2018), Properties of Matter, S.Chand & C.o, New Delhi.
5. K.K.Muhammed, Bronzes of South India, Navabharat Publishers, Kolkata, 1978
6. T.R.Anadharaman, Metallurgy in India, South Asia Books, 1995

e-Resources:
1. http://orca.phys.uvic.ca/~tatum/celmechs/celm5.pdf
2. https://en.wikipedia.org/wiki/Elasticity_(physics)
3. https://youtu.be/HALbtyDUjp0
4. https://byjus.com/physics/viscosity/
5. https://www.youtube.com/watch?v=P2DOx0WGsOc

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	H	H
CO 2	H	S	H	S	S
CO 3	S	S	H	H	S

CO 4	H	H	S	S	S
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L – Low

Programme Code: 03		B.Sc. Physics			
Title of the Paper		**Core Paper 2 - Heat and Thermodynamics**			
Batch 2025-2026	Semester II	Hours/Week 6	Total Hours 90	Credits 4	Entrepreneurship

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Course Objectives

To enable the learners to understand

1. The concept of heat and temperature and specific heat
2. Mechanism of petrol and diesel engine
3. Quantum theory of radiation and three types of thermodynamical statistics.

Course Outcomes (CO)

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

K1 To K5	CO1	Understand the concept of Zero and First law of thermodynamics
	CO2	Gain knowledge on second law of thermodynamics and engines
	CO3	Understand gas laws and its behavior, Einstein's and Debye's theory of specific heat
	CO4	Understand radiative heat transfer and radiation laws
	CO5	Analyze the concepts of microstate, macrostate of a model system, classical and quantum statistics.

Syllabus

UNIT I
Concept of Temperature   **(18 hrs)**
Zeroth law of thermodynamics-Concept of heat-Comparison of heat and work-First law of thermodynamics-Isothermal Process- Adiabatic Process-Isochoric Process- Isobaric Process-Gas equation during a Process -Slopes of adiabatic and isothermals process-Work done during Adiabatic andIsothermal Process-Relation between isothermal and adiabatic elasticities.

UNIT II   **(18 hrs)**
Second Law of Thermodynamics
Irreversible Process- Reversible Process-Second law of thermodynamics- Carnot reversible engine - Carnot Cycle-efficiency-Otto Cycle-Petrol engine -Diesel engine- Clausius-Clapeyron's latent heat equation-Applications-Thermodynamic potentials-Maxwell's thermodynamic relation.

UNIT III   **(18 hrs)**
Gas equations
Van der waals equation of a state – Estimation of Critical constants – Constants of Van der waalsequation – Critical co-efficient of a gas – Limitations of Van der waals equation.
Quantum theory of specific heat
Dulong and Petit's law and the deduction; failure of Dulong and Petit's law – Einstein's theory and itslimitation – Debye's theory – **Specific heat of diatomic gases***.

UNIT IV   **(18 hrs)**
Thermal radiation
Quantum theory of radiation; Planck's hypothesis – average energy of Planck's oscillator–Planck's radiation law and its experimental verification – Wien's law and Rayleigh – Jean's law

in relation to Planck's law– Stefan's constant and Wien's constant from Planck's law

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UNIT V **(18 hrs)**
Thermodynamics
Statistical equilibrium– probability theorem in statistical thermodynamics; Maxwell - Boltzmann distribution law; Maxwell – Boltzmann distribution in terms of temperature – Maxwell's quantum statistics – phase space – Fermi- Dirac distribution law – Bose-Einstein distribution law (Qualitative study only) – **comparison of three statistics***

*Self-study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. Brijlal and N.Subrahmaniam, P.S.Hemne (2018), Heat, Thermodynamics and Statistical Physics - S.Chand & Co., New Delhi

Reference Book:
1. R.Murugeshan, Sivaprasath, (2004), Thermal Physics- S.Chand & Co., New Delhi.
2. Zemansky and R.H. Dcltanann, (2017), Heat and Thermodynamics, McGraw Hill Education

E- Resources:
1. https://www.askiitians.com/revision-notes/physics/heat-transfer/
2. https://www.askiitians.com/revision-notes/physics/kinetic-theory-of-gases/
3. https://www.youtube.com/watch?v=TnDCxw0y6YM
4. https://www.youtube.com/watch?v=n1go03oIyos
5. https://www.youtube.com/watch?v=Fi9Z5DxVsu0

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	H	S	H
CO 2	H	H	S	S	S
CO 3	S	S	H	H	H
CO 4	H	S	S	H	S
CO 5	H	S	H	S	S

S- Strong   H-High   M-Medium   L – Low

Programme Code: 03			B.Sc. Physics			
Title of the Paper			**Core Paper 3 - Mechanics**			
Batch 2025-2026	**Semester 3**	**Hours/Week 4**	**Total Hours 60**	**Credits 4**	**Employability**	

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Course Objectives

To enable the learners to
1. Understand the principles of rigid body dynamics
2. Acquire the fundamental ideas of projectile motions
3. Attain the idea about statics, hydrostatics and hydrodynamics

Course Outcomes (CO)

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

K1 - K5	CO1	Understanding the behavior of various bodies due to kinematic and dynamic forces acting on the body
	CO2	Apply the knowledge of mathematics, fundamental sciences to obtain solution of complex mechanical problems
	CO3	Study of statics which promotes analysis and interpretation of numerical problems
	CO4	Gain knowledge on hydrostatics
	CO5	Understand the theory of relativity

Syllabus

UNIT I (12 hrs)
Rigid body dynamics
Rigid body – rotational and vibrational motion –Torque – moment of inertia – radius of gyration – kineticenergy of rotation – M.I. of a fly wheel – experimental determination – precession – **gyrostat – gyrostaticapplication *** – M.I. of a diatomic molecule and its rotational energy states.

UNIT II (12 hrs)
Projectiles
Projectiles – Range – Expression for the range of projectile on an inclined plane – path of a projectile – Impulse – direct and oblique impact – expression for velocity after direct impact – loss of energyduring direct and oblique impact.

UNIT III (12 hrs)
Statics
Centre of gravity – Position of G for simple rigid bodies – rigid solid cone – thin hollow hemisphere – solid hemisphere – Centre of gravity of a body composed of two parts – Equilibrium of bodies – suspended and supported – types of equilibrium.Force of friction –Limiting friction – Laws of friction –Angle of friction and resultant reaction – Cone of friction.

UNIT IV (12 hrs)
Hydrostatics Fluid thrust

Thrust on a plane surface – the center of pressure – position of the center of pressure – Rectangular lamina – Triangular lamina – Thrust on curved surfaces.

Flotation: Laws of flotation – Metacenter – Metacentric height – Metacentric height of a ship.

Sub Code: 25UPH303

UNIT V **(12 hrs)**
Relativity
Frames of reference – inertial frames of reference – Galilean transformation – Michelson Morley experiment and explanation of negative results - Postulates of special theory of relativity – Lorentz's transformation equation – length contraction – time dilation – Meson decay – relativity of simultaneity –addition of velocities – variation of mass with velocity – **mass energy equivalence*** – General theory ofrelativity.

* Self study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz / Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. D.S.Mathur and P.S.Hemme (2021), Mechanics, S.Chand & Co., New Delhi.

Reference Books:
1. M.Narayanamurthy, N.Nagarathianam, (2005), Statics, Hydrostatics and Hydrodynamics- The National Publishing Company, Chennai.
2. D.Halliday, R.Resnick and J.Walker (2018), Fundamentals of Physics - 11th Edition, John Wiley &Sons, India

e-Resources:
1. https://nucleoniitjeekota.com/topic-notes.php?topic=RIGID%20BODY%20DYNAMICS
2. https://byjus.com/physics/projectile-motion/
3. https://engineeringstatics.org/Chapter_07-center-of-gravity.html
4. https://byjus.com/physics/buoyant-force/
5. https://byjus.com/physics/fluid-dynamics/

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	H	H
CO 2	H	S	H	S	S
CO 3	S	S	H	H	S
CO 4	H	H	S	S	S
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L – Low

Programme Code: 03			B.Sc. Physics		
Title of the Paper			**Core Paper 4 - Electricity and Magnetism**		
Batch 2025-2026	**Semester 3**	**Hours/Week 4**	**Total Hours 60**	**Credits 4**	**Employability**

Course Objectives

To enable the learners to
1. Acquire basic knowledge of electrostatics and thermoelectricity
2. Study about magnetic properties of materials
3. Learn motion of charges and alternating current and its circuits

Course Outcomes (CO)

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

	CO1	Acquire knowledge about electrostatics
	CO2	Understand the magnetic properties of materials and magnetic effect of electric current
	CO3	Gain knowledge on thermoelectricity
K1 - K5	CO4	Apply knowledge on fabrication of different types of capacitors, transformer, choke coil and thermoelectric power generators.
	CO5	Analyze the trouble shooting of ac circuits (LCR series and LCR parallel mode) and also analyze the thermoelectric diagrams

Syllabus

UNIT I   **(12 hrs)**
Electrostatics
Gauss theorem and its applications: Gauss theorem, application of Gauss theorem – Electric intensity at a point immediately adjacent to a charged conductor –energy stored in unit volume of an electric field. **Capacitance and capacitors:** Spherical capacitor – cylindrical capacitor – force of attraction between charged plates of a capacitor – change in the energy of a parallel plate capacitor when the distance between the plates is altered and when a dielectric slab is introduced between the plates – types of capacitors – Guard ring capacitor – electrolytic capacitor – variable capacitor.
Dielectrics: Polarization in dielectric material – parallel plate capacitor and dielectric slab – boundary condition – depolarization factor.

UNIT II   **(12 hrs)**
Magnetic properties of materials
Magnetic vector potential – electron theory of magnetism – Dia, Para and Ferromagnetism– magnetic field (B) – magnetization (M) – magnetic field intensity (H) – magnetic susceptibility and magnetic permeability – magnetic materials and magnetization – magnetic hysteresis – area of the hysteresis loop – Ferro magnets, determination of susceptibility – curie balance method – **Guoy's method* Magnetic effect of electric current -** Moving coil Ballistic Galvanometer – Figure of merit of B.G. – Absolute capacitance of a capacitor.

UNIT III   **(12 hrs)**
Thermoelectricity:
Seebeck effect – laws of thermo e.m.f – Measurement of thermo e.m.f - Peltier effect – Peltier Co-efficient, determination of Peltier co- efficient at a junction – thermo dynamical consideration of

Peltier effect – Thomson effect – Thomson co – efficient – e.m.f. generated in a thermocouple taking both Peltier effect at the junctions and Thomson effect in the metals –application of thermodynamics tothermocouple – thermoelectric power diagrams and their uses.

Sub. Code: 25UPH404

UNIT IV (12 hrs)
Alternating Current
Mutual and Self Inductance-EMF induced in a coil rotating in a magnetic field – AC circuits containing resistance, inductance andcapacitance in series – series resonant circuit – acceptor circuit – voltage magnification – the Q-factor – Parallel resonant circuit – Power in AC circuit containing resistance, capacitance and inductance –wattless current – choke coil – transformer.

UNIT V (12 hrs)
Transient currents
Growth and decay of current in an inductance – resistance circuit – charging and discharging of a capacitance through a resistance – Measurement of resistance by leakage – charging and discharging of a capacitance through an inductance and a resistor.
Motion of charged particles
Motion of charged particles in uniform longitudinal and transverse Electric field – **Motion of charged particles in a uniform constant magnetic field*** - e/m by Magnetron method - e/m by Thomson method.

* Self study
 Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz / Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
   1. R.Murugesan, (2019), Electricity and Magnetism - S.Chand & Co., New Delhi.
   2. Brijlal and Subramaniam, (2000), Electricity and Magnetism- Ratan Prakashan Mandir.

Reference Books:
   1. K.K. Tewari, (2007), Electricity and Magnetism with Electronics- S.Chand & Co., New Delhi.
   2. D.N.Vasudeva, (2007), Fundamentals of Electricity and Magnetism - McGraw Hill, India

e-Resources:
   1. https://www.youtube.com/watch?v=MLvCPath35I
   2. https://www.youtube.com/watch?v=VC1OTpL8qVI
   3. https://www.youtube.com/watch?v=9EsOFiP1J2E
   4. https://www.youtube.com/watch?v=bfR0k0BJeBE
   5. https://www.youtube.com/watch?v=psdWQddVXd4

Mapping

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	H	H
CO 2	H	S	H	S	S
CO 3	S	S	H	H	S
CO 4	H	H	S	S	S
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L - Low

Programme code: 03		B.Sc. Physics			
Title of the Paper		**Core Paper 5 - Mathematical Physics**			
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**	**Skill Development**
2025-2026	5	4	60	4	

Course Objectives

To enable the learners to
1. Apply Fourier series, transformation and vector analysis to physical problems
2. Know about the basic concepts of complex variables
3. Apply vectors to physical systems.

Course Outcomes (CO)

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

	CO1	Understand differential operators in vectors
	CO2	Apply vectors for physical examples
K1 - K5	CO3	Understand physical examples of Fourier series
	CO4	Apply Fourier's transformation
	CO5	Analyze complex variables

Syllabus

UNIT I
Differential Operators in Vectors (12 hrs)
Orthogonal curvilinear coordinates - Differential operators: Gradient – divergence – Laplacian - curl- Spherical polar coordinates: Differential operators – Gradient – divergence – Laplacian – curl - Cylindrical Co-ordinates: Differential operators – Gradient - divergence.

UNIT II
Application of Vectors (12 hrs)
Hydrodynamics - Equation of continuity - Cartesian form - Incompressible fluid - Euler's equation of motion - Bernoulli's equation - Fourier's Heat flow equation (One dimension)- Gravitational Potential and Intensity - Poisson's equation - Gauss' law of gravitation

UNIT III
Fourier series (12 hrs)
Even and odd functions - Dirichlet's theorem and conditions - Fourier series for function such as x sinx, $x+x^2$, e^x, x^2 - Physical examples of Fourier series - Half wave rectifier - Full wave rectifier - Square wave - Saw tooth wave - Triangular wave.

UNIT IV
Fourier's Transformation (12 hrs)
Fourier Transform - Sine and Cosine Transforms - Properties of Fourier's Transform: Addition theorem - Similarity theorem - Complex Conjugate - Shifting property - Modulation theorem - Convolution theorem - Parseval's theorem - Self convolution Integral - Derivative of Fourier Transform - Fourier Transform of a derivative - Fourier sine and cosine transform of derivatives - Fourier transform of $1/\varepsilon$ and $Ne^{-\alpha x2}$

UNIT V
Complex Variables **12 hrs**
Complex numbers - Review of Algebraic Operations of Complex Numbers - Complex Conjugates - Modulus and Argument of a complex number - Properties of Modulii and Arguments - Graphical representation on Argand diagram and Trignometric form - Vector representation of Complex numbers - Some definitions underlying complex analysis - **Functions of a Complex variable - Limit, Continuity and Differentiability***.

* Self study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz / Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. Satya Prakash, (2021), Mathematical Physics- S.Chand & Co., New Delhi.
2. HK Dass and Rama Verma (2010), Mathematical Physics- S.Chand & Co., New Delhi.

Reference Books:
1. P.K.Chattopadhyay, (2022), Mathematical Physics-New Age International, New Delhi.
2. B.D. Gupta, (2022), Mathematical Physics-Vikas publishing house, New Delhi.
3. P. Kandasamy, K. Thilagavathy, K.Gunavathy, (2010), Engineering Mathematics –S.Chand & Co., New Delhi.

e-Resources:
1. https://www.youtube.com/watch?v=hsGhvle5Krw
2. https://www.youtube.com/watch?v=qbTTLNzW-
3. JI&list=RDCMUCVtCdIa5rA8PwQbz4hixtpQ&index=3
4. https://www.youtube.com/watch?v=_87AM0wyMp0&list=RDCMUCVtCdIa5rA8PwQbz4hixtpQ&index=1
5. https://www.youtube.com/watch?v=-QVENB3aEvY

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	S	S	H	H
CO 2	S	H	H	H	S
CO 3	H	S	H	S	H
CO 4	S	H	H	S	H
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L – Low

Programme code: 03		B.Sc. Physics			
Title of the Paper		**Core Paper 6 - Optics**			
Batch 2025-2026	**Semester 5**	**Hours/Week 4**	**Total Hours 60**	**Credits 4**	**Employability**

Course Objectives

To enable the learners to

1. Acquire knowledge in ray optics
2. Understand mechanism of energy transfer in the form of waves
3. Understand the basic principles of optical instruments

Course Outcomes (CO)

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

K1 - K5	CO1	Understand the aberrations with an emphasis on image forming systems	
	CO2	Understand wave optics and interference	
	CO3	Be acquainted with Fresnel and Fraunhofer diffraction	
	CO4	Gain knowledge on polarization	
	CO5	Understand principle, construction and working of optical instruments	

Syllabus

UNIT I (12 hrs)

Geometrical optics: Aberrations and dispersion

Aberrations : Spherical aberrations in a lens – coma – aplanatic lens – astigmatism – curvature of the field – distortions – chromatic aberration– dispersion by a prism – irrational dispersion– angular and chromatic dispersions – Cauchy's dispersion formula – dispersive power, achromatism in prisms – dispersion without deviation – deviation without dispersion - chromatic aberration in a lens– **circle of least confusion***, achromatic lenses – condition for achromatism of two thin lenses separated by a finitedistance.

UNIT II (12 hrs)

Interference

Fresnel's bi prism – interference in thin films due to reflected and transmitted light – fringes due to wedgeshaped thin film – Newton's rings – refractive index of a liquid – Michelson's interferometer – determination of wavelength of monochromatic light – difference in wave length between two neighboring spectral lines – Fabry perot interferometer - visibility of fringes – sharpness of fringes– resolving power – Airy's formula.

UNIT III (12 hrs)

Diffraction

Fresnel's assumptions – rectilinear propagation of light – half period zone – zone plate – action and construction – comparison with the convex lens – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction at a single slit – diffraction grating – resolving power and dispersive power of a grating.

UNIT IV (12 hrs)

Polarization

Double refraction – Huygen's explanation in uniaxial crystals – Quarter wave plate – Half wave plate Babinet's compensator - production and detection of plane, circularly and elliptically polarized light optical activity – Fresnel's explanation – specific rotation – Laurentz's half shade Polarimeter.

UNIT V (12 hrs)
Optical instruments
Objective lens and eye piece: Huygen's eyepiece – Ramsden eyepiece – compound microscope – astronomical telescope (refracting) – Constant deviation spectrometer - Kerr cell method - Anderson's method.

* Self study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz / Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. Brijlal, M.N.Avadhanulu, N. Subrahmanyam, (2019), A Text Book of Optics- S.Chand & Co., New Delhi

Reference Books:
1.R. Murugesan, (2013), Optics and Spectroscopy- S.Chand & Co., New Delhi.
2.Sathyapraksh, (2016), Optics- Ratan Prakashan, Mandir.

e-Resources:
1. https://www.youtube.com/watch?v=ML7HcZo6IaE
2. https://www.youtube.com/watch?v=jB7suji-fCY
3. https://www.youtube.com/watch?v=ueurJnTGwx4
4. https://www.youtube.com/watch?v=HH58VmUbOKM
5. https://www.youtube.com/watch?v=8nxsx6AKDN8

Mapping

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	H	H	S
CO 2	S	H	S	S	S
CO 3	S	S	H	S	H
CO 4	S	S	H	H	S
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L – Low

Programme code: 03		B.Sc. Physics			
Title of the Paper		Core Paper 7 - Principles of Electronic Devices and Circuits			
Batch 2025-2026	Semester 5	Hours/Week 4	Total Hours 60	Credits 4	Employability

Course Objectives

To enable the learners to

1. Understand the principles of semiconductor devices and their applications.
2. Know the principle and working of oscillators.
3. Know the working of FET, MOSFET and UJT

Course Outcomes (CO)

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

	CO1	Understand the fundamentals of semiconductor devices
	CO2	Understand transistor biasing and stabilization
K1 to K5	CO3	Learn about the functioning of FET, MOSFET, UJT and SCR
	CO4	Understand the basic principles of amplifiers and Operational amplifiers
	CO5	Acquire knowledge on oscillators

Syllabus

UNIT I (12 hrs)

Semiconductors : Commonly used semiconductors – energy band description of semiconductors – effect of temperature on semiconductors – n type and p type semiconductors – majority and minoritycarriers - pn junction – volt ampere characteristics.

Semiconductors Diodes : Characteristics, equivalent circuits, applications of pn junction and zenerdiode – tunnel diode – photodiode –thermistor.

Rectifiers and Filters : Half wave and full wave bridge rectifiers – Ripple factor - **Inductive andcapacitive filters*.**

UNIT II (12 hrs)

Transistor biasing and stabilization : Leakage current and total output current in a CE and CC circuits – advantages of common emitter circuits - Load line – Q point and maximum undistorted output – factors affecting stability of Q point stability factor.

Transistor equivalent circuits and h parameter : AC load resistance – current gain – voltage gain –h parameters – h parameters of an ideal transistor.

UNIT III (12 hrs)

Field Effect Transistor

Junction Field Effect Transistor (JFET) – construction, operation, parameters and characteristics of JFET – expression for transconductance – comparison between FET and bipolar junction transistor.

Metal Oxide Semiconductor FET (MOSFET)

Construction, working of drain and transfer characteristics of depletion type and enhancement type MOSFETs – advantages of MOSFETs over JFETs – advantages of n over p channel MOSFETs.

Uni Junction Transistor (UJT): Construction, equivalent circuit, operation, characteristics and application

Silicon Controlled Rectifier : SCR - Working of SCR - VI characteristics – SCR as a switch

UNIT IV   **(12 hrs)**
Amplifiers – Single stage & multistage
Design of single stage transistor amplifier: RC coupled amplifier – multistage amplifier:
transformer coupled amplifier
Operational Amplifiers: Characteristics of an ideal operational amplifier – operational amplifier as
inverting and non- inverting amplifier – operational amplifier as an adder, subtractor, differentiator
and integrator.

UNIT V   **(12 hrs)**
Sinusoidal Oscillators
Principle of an oscillator - Crystal oscillators - Hartley and Colpitts oscillators with theory -
Waveforms of astable, monostable and bistable multivibrator circuits – clipping and clamping
circuits and applications.

* Self study
Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz / Discussion /
Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. V.K.Metha, (2020), Principles of Electronics - (12th Edition) S.Chand & Co., New Delhi.
2. R.S.Sedha, (2019), A Text Book of Applied Electronics- S.Chand & Co., New Delhi.

Reference Book:
1. B.L.Theraja (2007), Basic Electronics (Solid State) - S.Chand & Co., New Delhi.
2. Bernod Grob, (2010), Basic Electronics - McGraw Hill, New Delhi.

e-Resources:
1. https://byjus.com/jee/semiconductors/#properties-of-semiconductors
2. https://www.shobhituniversity.ac.in/pdf/econtent/4TransistorBiasing&Stabilization-Dr-Aniket-Kumar.pdf
3. https://byjus.com/physics/fet-transistor/
4. https://amiestudycircle.com/
5. https://www.tutorialspoint.com/sinusoidal_oscillators/sinusoidal_oscillators_introduction.htm

Mapping

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	H	H	S
CO 2	S	H	S	S	S
CO 3	S	S	H	S	H
CO 4	S	S	H	H	S
CO 5	H	S	H	S	H

S- Strong   **H-High**   **M-Medium**   **L - Low**

Sub Code: 25UPH508

Programme code: 03		B.Sc. Physics			
Title of the Paper		**Core Paper 8 – Basics of Quantum Mechanics**			
Batch 2025-2026	**Semester 5**	**Hours/Week 4**	**Total Hours 60**	**Credits 4**	**Employability**

Course Objectives

To enable the learners to
1. Know about De-Broglie concept
2. Understand operators and uncertainty relation
3. Know about applications of Schrodinger's equation

Course Outcomes (CO)

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

	CO1	Understand the wave aspects of matter
	CO2	Know the relation between group velocity and phase velocity of waves
	CO3	Understand uncertainty principle and its applications
K1 to K5	CO4	Understand the concept of operators and to solve Schrodinger's equation for simple systems in one dimension.
	CO5	Understand Schrodinger's equation, wave function and to solve Schrodinger's equation for systems in three dimensions.

Syllabus

UNIT I
Origin of Quantum Mechanics (12 hrs)

Inadequacy of classical mechanics - shortcomings of old quantum theory - Foundations of wave mechanics - dual nature of light and matter - experimental evidence for matter waves - Davisson and Germer's electron diffraction experiment - G.P.Thomson's experiment – De'Broglie concept of stationary orbits – De'Broglie wavelength associated with electron accelerated through a potential difference – Non relativistic expression – Relativistic expression.

UNIT II
Wave and Group velocity (12 hrs)

Wave (or Phase) velocity and group velocity – velocity of De'Broglie waves – relation between phase velocity and group velocity for a non relativistic free particle - Equation of motion of matter waves – Physical interpretation of the wave function – Normalized and orthogonal wave function – conditions satisfied by wave function – solution of the Schrodinger's equation – Stationary state solution.

UNIT III
Uncertainty principle and its applications (12 hrs)

Uncertainty Principle - Heisenberg's gamma ray microscope – Diffraction of a beam of electrons by a slit – application of uncertainty principle – Nonexistence of electrons in a nucleus – radius of the first orbit – Light Quanta – Minimum energy of a harmonic oscillator – Bohr's atomic energy levels and Uncertainty principle – Energy of particle in one-dimensional box.

UNIT IV
Operators and Schrodinger Equation (12 hrs)

Operators associated with different observables – Expectation values of dynamical quantities – probability current density – Ehrenfest theorem – related problems - Free particle - Particle in a box - Potential step – Reflectance and Transmittance for E>V0 and E<V0.

UNIT V
Physical applications of Schrödinger's Equation   **12 hrs**
Particle in one dimensional infinitely deep potential well - One dimensional linear harmonic oscillator - Eigen values of harmonic oscillator- Significance of zero point energy - Particle in three dimensional infinitely deep potential well – **The square well potential – Bound states: Discrete energy levels. ***

* Self study
Teaching Methods: Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/Flipped Class

Text Books:
1. Satya Prakash and Swati Saluja, (2021), Quantum Mechanics - Kedar Nath Ram Nath & Co., Meerut.
2. R.Murugeshan and Kiruthiga Sivaprasath, (2018), Modern Physics - S.Chand & Co., New Delhi.

Reference Books:
1. S.P.Singh and M.K.Bagde, Kamal Singh, (2004), Quantum Mechanics - S.Chand & Co.,New Delhi.
2. V.Devanathan, (2005), Quantum Mechanics - Narosa Publishing House, New Delhi.

e-Resources:
1. https://www.youtube.com/playlist?list=PLbMVogVj5nJTDMhThY9xu2Tvg0u1RPuxO
2. https://www.askiitians.com/revision-notes/physics/special-theory-of-relativity/
3. https://www.youtube.com/watch?v=zZ2975Ui26w&list=RDLV-yKwHvAWMT8&index=7
4. https://youtu.be/iRVfaR3N5K4?list=PLUl4u3cNGP629n_3fX7HmKKgin_rqGzbx
5. https://www.youtube.com/watch?v=wBAfNRnYYEE

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	H	H	H
CO 2	H	H	S	H	S
CO 3	H	H	S	S	H
CO 4	S	H	H	H	H
CO 5	H	S	H	S	H

S- Strong   **H-High**   **M-Medium**   **L – Low**

Sub Code: 25UPH609

Programme code: 03		B.Sc. Physics			
Title of the Paper		Core Paper 9 - Atomic and Solid State Physics			
Batch 2025-2026	Semester 6	Hours/Week 5	Total Hours 75	Credits 4	Employability

Course Objectives

To enable the learners to
1. Know about x - rays, Photoelectric effect and their applications
2. Know about different coupling schemes and the effect of magnetic and electric fields on the spectrum of an atom and molecule
3. Understand the different crystal structure and their bonds

Course Outcomes (CO)

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

	CO1	Acquire knowledge about atomic and molecular spectroscopy.
	CO2	Understand bonding in solids
K1 - K5	CO3	Understand crystal structure
	CO4	Gain knowledge about x-rays and photoelectric effect
	CO5	Understand the concept of Superconductors

Syllabus

UNIT I (15 hrs)
Atomic and Molecular Spectroscopy
Vector atom model – Quantum number associated with the Vector atom model – Coupling schemes – Pauli's exclusion principle – Electronic configuration of light elements – Normal and anomalous Zeeman effects - Expression for the Zeeman shift – Anomalous Zeeman effect – Paschen Back effect – Stark effect – Basic concepts of NMR, NQR, ESR – Raman Effect – Raman shift – Stokes and Antistokes lines.

UNIT II (15 hrs)
Bonding in solids
Interatomic forces and types of bonding – Ionic bonds – Metallic bonds – Vander Waal's bonds – Hydrogen bonds – Binding energy of ionic crystals – Evaluation of Madelung constant – Determination of range – Binding energy of crystals of inert gases – Vander Waals' Interaction – Repulsive interaction.

UNIT III (15 hrs)
Crystal structure
Crystal lattice – Unit cell – Lattice parameter – Primitive cell – Types of crystal system – Bravais lattices – BCC – FCC – HCP – Miller indices – Procedure for finding miller indices of crystal planes - Representation of crystal planes in a cubic unit cell – Atomic radius, number of atoms and atomic packing factor of SC, BCC and FCC structures - Crystal growth by slow evaporation method - Czochralski method.

UNIT IV 15 hrs
X-Rays : Productions of x-rays : Coolidge tube method - Spacing between three dimensional lattice planes –absorptions of x-rays - Bragg's Law - Bragg's x-ray Spectrometer - powder crystal

diffraction Compton Scattering.

Photoelectric effect: Einstein's photoelectric equation - Experimental verification - Applications of photoelectric effect - Millikan's experiment – Determination of Planck's constant

UNIT V   **(15 hrs)**
Superconductivity
Experimental facts of Superconductivity – Persistent currents – Effect of magnetic fields – Meissner effect **– Type I and Type II superconductors *** – BCS theory of superconductivity.

* Self study

Teaching Methods: Smart Class Room / Power point Presentation / Seminar / Quiz / Discussion / FlippedClass

Text Books :
1. R.S.Khurmi, R.S.Sedha, (2014), Material Science- S.Chand & Co., New Delhi.
2. R.K.Puri, V.K.Babbar, (2010), Solid State Physics - S.Chand & Co., New Delhi.

Reference Books:
1. Saxena, Gupta and Saxena, (2019), Fundamentals of Solid State Physics, Pragati Prakashan, NewDelhi.
2. S.O.Pillai, (2018), Solid State Physics - New Age International Pvt. Ltd, New Delhi.
3. V. Raghavan, (2010), Materials Science and Engineering, Prentice Hall India Pvt. Ltd, New Delhi.

e- Resources:
1. https://www.youtube.com/watch?v=-3aqWCcfKzQ
2. https://www.youtube.com/watch?v=ik51zFSWN4g
3. https://www.youtube.com/watch?v=eMmNPGdx1Ec

Mapping

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CO 1	S	H	H	H	S
CO 2	H	S	H	H	S
CO 3	S	H	H	S	H
CO 4	H	S	H	S	H
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L – Low

Programme code: 03	B.Sc. Physics				
Title of the Paper	Core Paper 10 – Fundamentals of Digital Electronics and Microprocessor				
Batch 2025-2026	**Semester 6**	**Hours/Week 5**	**Total Hours 75**	**Credits 4**	**Employability**

Course Objectives

To enable the learners to acquire knowledge about
1. Logic gates, Boolean algebra and Karnaugh map
2. Flip- flops, counters, arithmetic circuits, data processing circuits, shift registers
3. Microprocessors architecture and instruction sets

Course Outcomes (CO)

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

K1 - K5	CO1	Acquire knowledge on number systems, binary arithmetic operations and binary codes
	CO2	Have an understanding of logic gates, Demorgan's theorems, Karnaugh maps and simplification of Boolean expressions
	CO3	Apply the knowledge of logic gates to design flip-flops and counters
	CO4	Understand architecture of a Microprocessor
	CO5	Get exposure on Microprocessor programmes

Syllabus

UNIT I (15 hrs)

Logic gates, Boolean algebra and Karnaugh map

Logic gates (OR, AND, NOT,NOR, NAND, XOR, XNOR) – NAND and NOR gates as Universal building blocks – Construction of OR, AND, NOT gates using discrete components – Laws of Boolean algebra – DeMorgan's theorems – Construction of Karnaugh maps – Simplification of Boolean expressions using Boolean algebra.

UNIT II (15 hrs)

Flip-flops and Counters

R-S flip flop – D flip flop- JK flip flop – Master slave J-K flip flop – Edge triggered flip flops
Asynchronous counters: Ripple counter – Mod 3, Mod 5 counters and Decade counters, Ring counters-synchronous counters.

UNIT III (15 hrs)

Arithmetic, Data processing circuits and Shift Register

Half and full adder – Half and full subtractor – Parallel binary adder and subtractor – Multiplexer-Demultiplexer – Encoder – Decoder – Serial in serial out shift register – Parallel in parallel out shift registers- **Bidirectional shift register*.**

Unit IV

Microprocessor (15 hrs)

Origin and development of microprocessor - Internal Architecture of 8085 – PIN diagram - Addressing modes – timing diagram – Addressing modes

UNIT V   **(15 hrs)**
Microprocessor Programming
Instruction Set: Data Transfer instructions – Arithmetic instructions – Logical instructions – Branching and looping Instructions - Addition – Subtraction – Multiplication – Division – Finding Smallest and Biggest number in a array - Sorting of an array in ascending order and descending order **(Experienced learning - Demonstration of above programs*)**

* Self study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. Thomos L. Floyd, (2017), Digital fundamentals -Tata McGraw Hill, India
2. M. Morris Mano, (2016), Digital logic and computer Design - Prentice-Hall of India, New Delhi.
3. B.Ram, (2005), Fundamentals of Microprocessor and Microcomputers - Dhanpat Rai Publications, New Delhi.

Reference Books:
1. V.Vijayendaran, S.Vishwanathan, (2011), Introduction to Integrated Electronics: Digital and Analog Printers and Publishers Pvt. Ltd.
2. Albert Paul Malvino & Donald P Leach, (2015), Digital principles and applications -Tata McGraw Hill, New Delhi.
3. Ramesh, (2013), Microprocessor Architecture & Applications with 8085- InternationalPublishing India.

e-Resources:
1. https://www.youtube.com/watch?v=RKAQsyPRk_w
2. https://www.youtube.com/watch?v=wjM2RDG5yTI
3. https://www.youtube.com/watch?v=tSti91b6qec
4. https://www.tutorialspoint.com/microprocessor/microprocessor_overview.htm
5. https://www.tutorialspoint.com/microprocessor/microprocessor_8085_architecture.htm

Mapping

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CO 2	S	S	S	H	S
CO 3	S	H	S	S	S
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CO 5	H	S	H	S	H

S- Strong   **H-High**   **M-Medium**   **L – Low**

Programme code: 03		B.Sc. Physics			
Title of the Paper		Core Paper - 11: Nuclear Physics			
Batch 2025-2026	Semester 6	Hours/Week 5	Total Hours 75	Credits 4	Employability

Course Objectives

To enable the learner to know about
1. General properties of atomic nuclei, particle accelerators and radioactivity
2. Artificial transmutation of elements and nuclear transmutation
3. Nuclear fission, fusion and elementary particles

Course Outcomes (CO)

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

	CO1	Know about basic nuclear properties and particle accelerators.
	CO2	Gain knowledge on radioactivity
K1 - K5	CO3	Understand artificial and nuclear transmutations
	CO4	Understand nuclear fission, fusion and detection of nuclear radiations.
	CO5	Acquire knowledge on elementary particles

Syllabus

UNIT I (15 hrs)

General properties of atomic nuclei

Classification of nuclei- nuclear spin angular momentum – nuclear magnetic dipole moment – electric quadruple moment – nuclear size – nuclear stability – nuclear forces – Meson theory of nuclear forces- theories of nuclear composition – proton electron hypothesis – Models of nuclear structure : liquid dropmodel – shell model.

Particle accelerators: Synchrocyclotron – betatron – electron synchrotron and **proton synchrotron***.

UNIT II (15 hrs)

Radioactivity

Determination of e/m of alpha particles – determination of charge of alpha particles – experimental measure of range of alpha particles – Geiger and Nuttal experiment – Geiger Nuttal law – alpha particledisintegration energy – determination of e/m of beta particles – origin of line and continuous spectrum- neutrino theory of beta decay- k electron capture – origin of gamma rays – absorption of gamma rays – natural radioactive series – law of successive disintegration – radioactive equilibrium and radioactive dating.

UNIT III (15 hrs)

Artificial transmutation of elements

Discovery of artificial transmutation – Rutherford experiment – Bohr's theory of nuclear disintegration - nuclear reaction – energy balance in nuclear reaction and Q value

Nuclear transmutation

Transmutation by alpha particles, protons, deuterons and neutrons - scattering cross section and its determination - production of radioisotopes and their uses.

UNIT IV **(15 hrs)**

Nuclear fission and fusion

Nuclear fission – energy released in fission – Bohr and Wheeler's theory of nuclear fission – chain reaction - multiplication factor - natural uranium and chain reaction - design of nuclear reactor - breeder reactor - nuclear fusion-source of stellar energy - thermonuclear reactions - transuranic elements.

Detectors of nuclear radiations: Ionization chamber – Geiger Muller counter - Proportional counter - Wilson's cloud chamber - bubble chamber.

UNIT V **(15 hrs)**

Elementary particles

Baryons – Leptons – Mesons – particles and antiparticles – concept of antimatter – strong interaction – electromagnetic interaction – weak interaction – gravitational interaction – elementary particle quantum numbers – conservation laws and symmetry – charge conjugation, parity and time reversal – CPT Quarkmodel .

* Self study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. R.Murugesan, Kiruthiga Sivaprasath, (2019), Modern Physics - 18th edition, S.Chand & Co., New Delhi.
2. Brijlal, N.Subramaniam and Jivan Seshan, (2013), Atomic and Nuclear Physics - S.Chand & Co., New Delhi.

Reference Books:
1. D.C.Tayal, (2021), Nuclear Physics (5th edition) Himalaya Publishing House, Bombay.
2. M.L.Pandya, R.P.S.Yadav and Amiya Dash (2020), Elements of Nuclear Physics- Kedar Nath RamNath, Meerut.
3. B.C.Theraja, (2008), Modern Physics- (16th edition), S.Chand & Co., New Delhi.

e-Resources:
1. https://byjus.com/physics/nuclear-physics/
2. https://chem.libretexts.org/Bookshelves/General_Chemistry/Chemistry_(OpenSTAX)/21%3A_Nucle ar_Chemistry/21.3%3A_Radioactive_Decay
3. https://chem.libretexts.org/Courses/Modesto_Junior_College/Chemistry_150_-Bunag/Textbook_for_Chemistry_150/06%3A_Nuclear_Weapons-_Fission_and_Fusion/6.01%3A__The_History_and_Basics_of_Fission
4. https://www.diffen.com/difference/Nuclear_Fission_vs_Nuclear_Fusion
5. https://theconversation.com/explainer-what-are-fundamental-particles-38339

Mapping

CO PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	H	S	S	H
CO 2	S	S	H	H	S
CO 3	S	S	H	S	H
CO 4	S	H	S	H	S
CO 5	H	S	H	S	H

S- Strong **H-High** **M-Medium** **L – Low**

Programme code: 03		B.Sc. Physics			
Title of the Paper		**Core Practical I – General Experiments**			
Batch 2025-2026	**Semester 1 & 2**	**Hours/Week 3**	**Total Hours 90**	**Credits 3**	**Skill Development**

Course Objectives

To enable the learners to:

1. Understand the physical phenomena and fundamentals of General Physics.
2. Perform experiments in the field of General Physics.
3. Interpret the practical result to corroborate the theory.

Course Outcomes (CO)

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

	CO1	Provide hands on experiences in conducting scientific investigations and laboratory experiments.
	CO2	Develop the ability to analyze basic experiments
K3 - K5	CO3	To analyze the relationship between theory and experimental results.
	CO4	To conduct experimental investigations on mechanical, electrical, heat and optical physics.
	CO5	Practice recording of experimental work and data graphing

List of experiments (Any Fifteen)

1. Determination of Young's Modulus - Non-uniform bending - Optic lever

2. Determination of Young's Modulus - Cantilever - Static method

3. Determination of Rigidity Modulus - Static Torsion

4. Determination of rigidity modulus and moment of inertia - Torsional Pendulum

5. Determination of Young's modulus by uniform bending - optic lever method

6. Determination of co-efficient of viscosity - Stokes's method

7. Determination of A.C. frequency - Sonometer

8. Determination of acceleration due to gravity - Compound pendulum

9. Determination of co-efficient of thermal conductivity - Lee's disc method

10. Determination of specific heat capacity of a liquid - Newton's cooling method

11. Determination of refractive index of a solid prism - Spectrometer

12. Determination of refractive index of a liquid prism – Spectrometer

13. Determination of refractive index of a solid prism (i-d) curve – Spectrometer

14. Determination of wavelength of spectral lines - Normal incidence - Grating - Spectrometer

15. Calibration of low range voltmeter – Potentiometer

16. Calibration of low range ammeter – Potentiometer

17. Determination of specific resistance of a wire – Meter bridge

18. Determination of unknown resistance using Post office Box

19. Determination of pole strength – Tan C position

20. Determination of surface tension by Capillary rise method

21. Determination of wavelength of laser - Diffraction method

22. Determination of angle of deviation of laser

23. Determination of viscosity of a liquid by Poiseullie's flow method.

24. Determination of surface tension & interfacial surface tension by drop weight method.

25. Determination of frequency of tuning fork- Sonometer

e-Resources:
1. https://www.youtube.com/watch?v=Ia_GINOcaTs
2. https://www.youtube.com/watch?v=VC_TT8S65ac
3. https://www.youtube.com/watch?v=B-W0eVv6fLI
4. https://www.youtube.com/watch?v=oRch7irmLvo
5. https://www.youtube.com/watch?v=Iv08qZqJnGk

Mapping

CO PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	H	S	S	H
CO 2	S	S	H	H	S
CO 3	S	S	H	S	H
CO 4	S	H	S	H	S
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L – Low

Practical beyond the syllabus
1. Measurement of error on simple pendulum

Programme code: 03		B.Sc. Physics			
Title of the Paper		**Core Practical II – General Experiments**			
Batch 2025-2026	**Semester 3 & 4**	**Hours/Week 3**	**Total Hours 90**	**Credits 3**	**Skill Development**

Course Objectives

To enable the learners to:
1. Understand the physical phenomena and fundamentals of general physics
2. Perform experiments in the field of general physics.
3. Interpret the practical result to corroborate the theory.

Course Outcomes (CO)

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

	CO1	Provide hands-on experiences in conducting scientific investigations and laboratory experiments.
	CO2	Develop the ability to analyze basic experiments
K3-K5	CO3	Analyze the relationship between theory and experimental results.
	CO4	To conduct experimental investigations on mechanical, electrical, heat and optical physics.
	CO5	Practice recording of experimental work and data graphing

List of experiments (Any Fifteen)

1. Determination of Young's modulus – Uniform bending – pin and microscope

2. Determination of Young's modulus – Cantilever – Dynamic method

3. Determination of spring constant of different metals

4. Determination of specific gravity of liquid – Joule's Calorimeter

5. Determination of wavelength of mercury spectral lines – Grating – minimum deviation – Spectrometer

6. Determination of refractive index of a prism (i-i') – Spectrometer

7. Determination of thickness of a thin wire – Air wedge method

8. Study of solar spectrum – Spectrometer

9. Calibration of high range voltmeter – Potentiometer

10. Determination of emf. of a thermocouple – Potentiometer

11. Determination of specific resistance of a wire – Potentiometer

12. Determination of temperature co-efficient of resistance of a wire - Carey Foster's Bridge

13. Conversion of Galvanometer into ammeter and its calibration

14. Conversion of Galvanometer into voltmeter and its calibration

15. Determination of A.C. frequency - Melde's method

16. Determination of self-inductance of a coil - Maxwell's bridge

17. Study of series resonance circuit

18. Study of parallel resonance circuit

19. Determination of figure of merit - B.G.

20. Determination of absolute capacitance of a condenser – B.G.

21. Determination of moment of a magnet - circular coil – Deflection magnetometer

22. Determination of field intensity of a circular coil - Vibrational magnetometer

23. Study of Multimeter as Ammeter, Voltmeter and Ohm meter

24. Determination of temperature co-efficient of resistance of a wire –Post office Box

e-Resources:
1. https://youtu.be/FRwHt4DAfhE
2. https://youtu.be/_m2toS3HGG8
3. https://youtu.be/AXTsOpyYl_0
4. https://youtu.be/SnxrvXQX8os
5. https://youtu.be/XuXUtGN928U

Mapping

CO PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	H	H	S	S
CO 2	H	H	S	S	H
CO 3	S	S	S	H	H
CO 4	H	H	S	H	H
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L – Low

Practical beyond the syllabus

1. Determination of Retentivity and Coercivity of a magnetic material - Hysteresis

2. Determination of e/m - Thomson method

3. Determination of e/m – Magnetron method

Programme code: 03		B.Sc. Physics			
Title of the Paper		**Core Practical III – General Experiments**			
Batch 2025-2026	**Semester 5 & 6**	**Hours/Week 3**	**Total Hours 90**	**Credits 4**	**Skill Development**

Course Objectives

To enable the learners to:

1. Have a good foundation in the fundamentals and applications of general Physics
2. Acquire the skill of finding and developing practical scientific facts
3. Employ the practical result to support the theory

Course Outcomes (CO)

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

	CO1	Develop the ability to analyze basic experiments.
	CO2	Take measurements to compare experimental results in the laboratory with the theoretical analysis.
K3 - K5	CO3	Conduct experimental investigations on mechanical, heat and optical phenomena.
	CO4	Conduct experimental investigations on electrical and magnetic phenomena.
	CO5	Practice record keeping of experimental work and data graphing

List of Experiments (Any Fifteen)

1. Determination of Young's modulus – uniform bending – Koenig's method

2. Determination of Young's modulus – non-uniform bending – Koenig's method

3. Determination of Rydberg's constant – scale and telescope

4. Determination of dispersive and resolving power of a Grating - spectrometer

5. Determination of Cauchy's constant and dispersive power of a prism - spectrometer

6. Determination of refractive index of a prism- Stoke's formula- spectrometer

7. Determination of the wavelength of the arc spectrum - Hartmann's interpolation formula

8. Determination of the wavelength of a monochromatic source - Fresnel's Biprism - Optic bench

9. Determination of refractive index of a convex lens - Newton's rings

10. Determination of specific rotation of light and concentration of the solution - Polarimeter experiment

11. Comparison of Mutual Inductance - Ballistic Galvanometer

12. Determination of high resistance by charging - Ballistic Galvanometer

13. Determination of high resistance by leakage - Ballistic Galvanometer

14. Determination of temperature co-efficient of resistance of a coil – Post office box.

15. Determination of band gap energy of a semiconducting material

16. Determination of melting point of wax - Thermistor

17. Determination of impedance and power factor of an LR circuit

18. Determination of self-inductance of a coil- Anderson bridge

19. Determination of capacitance - Scherring bridge

20. Determination of capacitance - DeSauty bridge

21. Determination of inductance - Owen's bridge

22. Determination of particle size - Laser diffraction method

23. Determination of Planck's constant using photoelectric effect.

24. Magnetic properties of Iron rod-I-H Curve apparatus

e-Resources:
1. https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	H	H	H
CO 2	H	H	S	H	S
CO 3	H	H	S	S	H
CO 4	S	H	H	H	H
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L – Low

Practical beyond the syllabus

1. Determination of Boltzmann constant

2. Zener diode as a voltage regulator

3. Determination of Youngs modulus-elliptical fringes (Cornus method)

4. Determination of Youngs modulus-hyperbolic fringes (Cornus method)

Programme code: 03		B.Sc. Physics			
Title of the Paper		Core Practical IV – Electronics			
Batch 2025-2026	Semester 5 & 6	Hours/Week 3	Total Hours 90	Credits 3	Employability

Course Objectives

To enable the learners

1. To design and construct electronic circuits
2. To develop experimental skills and understand relation between experimental data and theoretical analysis.
3. Have a foundation of constructing electronic devices

Course Outcomes (CO)

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

	CO1	Acquire basic knowledge in solid state electronics.
	CO2	Analyze and design analog electronic circuits using discrete components.
K3 - K5	CO3	Acquire knowledge in basic electronics by constructing electronic circuits and devices.
	CO4	Take measurements to compare experimental results with the theoretical data
	CO5	Practice record keeping of experimental work and data graphing

LIST OF EXPERIMENTS (Any Fifteen)

1. Construction and study of IC regulated power supply

2. Construction and study of bridge rectifier

3. Characteristics of PN junction diode and zener diode

4. Construction and study of voltage doubler

5. Study of transistor characteristics – CE configuration

6. Construction and study of single stage RC coupled amplifier

7. Construction and study of Feedback amplifier

8. Construction and study of Hartley oscillator

9. Construction and study of Colpitt's oscillator

10. Construction and study of monostable multivibrator using transistor

11. Study of characteristics of tunnel diode

12. Study of characteristics of SCR

13.   Study of characteristics of FET

14.   Study of characteristics of MOSFET

15.   Study of characteristics of UJT

16.   Construction of inverting amplifier using op-amp.

17.   Construction of non-inverting amplifier using op-amp.

18.   Construction of adder and subtractor using op-amp.

19.   Construction of scalar using op-amp

20.   Construction of integrator and differentiator using op-amp.

21.   Current and voltage characteristics of LED.

22.   Study of characteristics of photodiode.

e-Resources:

1. https://youtu.be/HG22Y0KrvI0
2. https://youtu.be/okGdxX36pt0
3. https://youtu.be/dICmcSNo4eI
4. https://youtu.be/1G8Sx6vE7kM
5. https://youtu.be/NZAg4Li1mvs

Mapping

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	H	H	H
CO 2	H	S	S	S	S
CO 3	H	H	S	S	H
CO 4	S	H	H	H	S
CO 5	H	S	H	S	H

S- Strong   **H-High**   **M-Medium**   **L – Low**

Programme code: 03	B.Sc. Physics		
Title of the Paper	**Core Practical V - Digital Electronics, Microprocessor and Python programming**		
Batch 2025-2026	**Semester 5 & 6**	**Hours/Week 3**	**Total Hours 90**

Batch 2025-2026	**Semester 5 & 6**	**Hours/Week 3**	**Total Hours 90**	**Credits 3**	**Employability**

Course objectives

To enable the learners to
1. Have foundations in the fundamentals of digital electronics.
2. Visualize the applications of digital electronics and microprocessor
3. Simulation using Python programme

Course Outcomes (CO)

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

	CO1	Construct basic logic gates.
	CO2	Gain expertise to construct digital electronic circuits.
K3 to K5	CO3	Get familiarized in Microprocessor and Python programming
	CO4	Accomplish Physics concepts through python programme based tasks.
	CO5	Practice record keeping of experimental work and data graphing

List of Experiments (Any fifteen)

1. Verification of truth tables of logic gates using IC's

2. Construction of logic gates using discrete components

3. Verification of NOR gate as universal building blocks

4. Verification of NAND gate as universal building blocks

5. Verifications of Demorgan's theorems

6. Construction and study of Half adder and Full adder

7. Construction and study of Half subtractor and Full subtractor

8. Construction and study of 4 bit parallel adder

9. Construction and study of 4 bit parallel subtractor

10. Construction and study of T flip flop

11. Construction of Timer circuit using IC 555

12. Construction of sine wave generator using IC 555

13. Construction of DC voltage doubler using IC 555

14. Construction of darkness detector using LDR and IC 555

15. Construction of Seven segment display counter using IC 555 and IC 4026

16. Microprocessor **-** Addition and Subtraction

17. Microprocessor **-** Multiplication and Division

18. Microprocessor **-** Finding Smallest and Biggest number in a array

19. Microprocessor **-** Sorting of an array in ascending order and descending order

20. Python - Simulation of the electric field of a capacitor

21. Python - Simulation of Half wave and Full wave rectifier

22. Python - Simulate and plot the characteristics of a zener diode

23. Python - Simulation of Op-amp inverting and non-inverting amplifier

24. Python - Simulation of a ac coupled amplifier using NPN bipolar transistor

e-Resources:
1. https://www.youtube.com/watch?v=ldeQU8lvnts
2. https://www.youtube.com/watch?v=rM2FTNQbDCY
3. https://www.youtube.com/watch?v=4Po3-QHPGWo
4. https://pyspice.fabrice-salvaire.fr/releases/v1.6/examples/diode/rectification.html
5. https://scipython.com/blog/the-electric-field-of-a-capacitor/

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	**S**	**H**	**H**	**H**	**H**
CO 2	**H**	**S**	**S**	**S**	**S**
CO 3	**H**	**H**	**S**	**S**	**H**
CO 4	**S**	**H**	**H**	**H**	**S**
CO 5	**H**	**S**	**H**	**S**	**H**

S- Strong   H-High   M-Medium   L – Low

Practical beyond the syllabus
1. Square wave generator using IC 555
2. Music tone generator using IC 555

Sub Code: 25UPH6Z1

Programme code: 03		B.Sc. Physics			
Title of the Paper		**Project and Viva Voce**			
Batch 2025-2026	**Semester 6**	**Hours/Week -**	**Total Hours -**	**Credits 5**	**Skill Development**

Course objectives

To enable the learners to

1. Have foundations in the fundamentals of Physics and related area.
2. Acquire skills to develop a working model
3. Visualize the applications of theoretical concepts

Course Outcomes (CO)

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

	CO1	Construct working models
	CO2	Gain expertise to present their ideas systematically through PPT
K3 - K5	CO3	Get familiarized to develop a report on the project work
	CO4	Accomplish the result accumulation and data graphing
	CO5	Gain expertise to apply knowledge on multidisciplinary field

Marks Distribution

CIA/ESE	Particulars	Marks
CIA	Project Review	15
	Regularity	5
	Total Internal Marks	20
*ESE	Project Report Presentation	60
	Viva Voce	20
	Total External Marks	80
Total Marks (CIA + ESE)		100

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	H	H	H
CO 2	H	S	S	S	S
CO 3	H	H	S	S	H
CO 4	S	H	H	H	S
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L – Low

* Projects report and Viva voce will be evaluated jointly by Project Supervisor and an External Examiner.

Allied Physics

Allied Subject II - Physics I (25UPH3A1)

Allied Subject II - Physics II (25UPH4A2)

Sub. Code: 25UPH3A1

ALLIED PHYSICS PAPER FOR B.Sc. MATHEMATICS / CHEMISTRY

Programme code: 03		For B.Sc. Mathematics and B.Sc. Chemistry			
Title of the Paper		Allied Subject II – Physics I			
Batch 2025-2026	Semester 3	Hours/Week 4	Total Hours 60	Credits 4	Skill Development

Course Objectives

To enable the learners
1. To know about mechanics, properties of matter and sound
2. To understand thermal physics
3. To know about light, electricity and electromagnetism

Course Outcomes (CO)

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

	CO1	Know about simple harmonic motion and projectile motion
	CO2	Understand moduli of elasticity and propagation of sound
K1 - K5	CO3	Acquire knowledge about thermal Physics
	CO4	Gain knowledge on optics
	CO5	Gain knowledge on current electricity and electromagnetism.

Syllabus

UNIT I (12 hrs)
Mechanics
Composition of two simple harmonic motions along a line and at right angles – Lissajou's figures, uniform circular motion - Acceleration of a particle in a circle - Centripetal and centrifugal forces - Banking on curved tracks. Projectile - Motion in a horizontal plane - Maximum height – Time of flight – Range – Path of a Projectile – Range and time of flight in a horizontal plane.

UNIT II (12 hrs)
Properties of Matter and Sound
Elasticity: Elastic constants – Bending of beams – Young's modulus by uniform and non-uniform bending – Energy stored in a stretched wire – Torsion in a wire – Determination of rigidify modulus –Torsional oscillation – Static torsion.
Sound: Interference of sound waves – Beats – Doppler Effect – Applications – Production of ultrasonics:Piezoelectric method – Applications.

UNIT III (12 hrs)
Thermal Physics
Specific heat of solids and liquids – Dulong and Petit law – Newton's law of cooling – Thermal conductivity – Lee's disc method – Variation of specific heat with temperature – Vander waal's equationof state – derivation of critical constants – Black body radiation – Stefan's law – Laws of thermodynamics – Change of entropy in reversible and irreversible processes.

UNIT IV (12 hrs)
Optics
Condition for interference – Young's double slit experiment – Interference due to transmitted light – Air wedge – Newton's rings – Determination of refractive index of a liquid – Diffraction - Diffraction at a single slit – Transmission grating – Polarization – Production and analysis of circularly and elliptically polarized light – Optical activity – Specific rotation – **Half shade Polarimeter*.**

UNIT V (12 hrs)
Current electricity and Electromagnetism
Kirchhoff's laws – Wheatstone's network – Condition for balance – Carey Foster's bridge – measurement of resistance – Capacitor – Energy of a charged capacitor – Loss of energy due to sharingof charges - Electromagnetic induction - Faraday's laws – AC circuits : Mean – rms – Peak values – LCR in series and in parallel – Sharpness of resonance – Ballistic Galvanometer – Theory – Measurement of capacitance – Transformer and its applications.

*Self study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1.R. Murugeshan, (2018), Allied Physics - S.Chand & Co., New Delhi.
2.R. Murugeshan, (2018), Modern Physics - S.Chand & Co., New Delhi.

Reference Books:
1.D.S.Mathur, (2018), Properties of Matter - Shyamlal Charitable Trust, New Delhi.
2.Brijlal and Subramaniam, (2004), Heat and thermodynamics - S. Chand & Co., New Delhi.
3.Brijlal and Subramaniam, (1997), Electricity and Magnetism - Rathan Prakasam, Mandir, India.

e-Resources:
1. https://www.youtube.com/watch?v=_psIWtPBHzA
2. https://www.youtube.com/watch?v=cQtFR0Qwm_E
3. https://www.youtube.com/watch?v=2vm1WkXg4EY
4. https://www.youtube.com/watch?v=e2MArppYcM4&list=PLCvpYrhOPdiWKu734tjeevs2-O0B7MJ1g
5. https://www.youtube.com/watch?v=rtlJoXxlSFE&list=PLyQSN7X0ro2314mKyUiOILaOC2hk6Pc 3j

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	S	H
CO 2	H	S	H	H	S
CO 3	H	S	H	H	S
CO 4	S	S	H	S	H
CO 5	H	S	H	S	S

S- Strong   H-High   M-Medium   L – Low

ALLIED PHYSICS PAPER FOR B.Sc. MATHEMATICS / CHEMISTRY

Programme code: 03		For B.Sc. Mathematics and B.Sc. Chemistry			
Title of the Paper		**Allied Subject II – Physics II**			
Batch 2025-2026	**Semester 4**	**Hours/Week 4**	**Total Hours 60**	**Credits 4**	**Skill Development**

Course Objectives
To enable the learners
1. To know about atomic physics and concepts of relativity
2. To understand nuclear and quantum Physics
3. To know the basics of lasers, electronics and communication Physics

Course Outcomes (CO)
On successful completion of the course, the students will be able to

	CO1	Understand atomic Physics and concepts of relativity
	CO2	Know about nuclear Physics
K1- K5	CO3	Know about quantum Physics
	CO4	Acquire knowledge on laser Physics
	CO5	Understand electronics and communication Physics

Syllabus
UNIT I (12 hrs)
Atomic Physics and Elements of Relativity
Atom models: Sommerfeld atom model – Vector atom model – Periodic table – Pauli's exclusion principle – excitation and ionization potentials – Frank and Hertz method – Postulates of theory of relativity – Lorentz transformation equations – derivations – Length contraction – Time dilation – Mass- energy equivalence.

UNIT II (12 hrs)
Nuclear Physics
Classification of nuclei – General properties of nuclei – Characteristics of nuclear forces – Nuclearstructure – Liquid drop model – Shell model – Particle accelerators – Betatron – Electron synchrotron –Artificial transmutations by α particles – Photon particles - Nuclear fission and fusion (Quantitative) Elementary particles – Mesons – Baryons – Leptons.

UNIT III (12 hrs)
Quantum Physics
Photoelectric effect - Laws of photoelectric effect – Millikan's experiment – Photoconductive andphotovoltaic cells – **Photomultiplier *–** Applications of photocells – Production and properties of x rays x ray spectrum – Mosley's law – Compton effect – Relation for change in wavelength - x ray diffraction Bragg's law – Miller indices – Determination of h,k,l values of cubic crystals.

UNIT IV (12 hrs)
Laser Physics
Purity of spectral lines – Coherence length and time – Spontaneous and induced emissions – population inversion – Meta stable state – Conditions for laser action – Ruby laser – He-Ne lasers – Applications of lasers – Raman effect – Raman shift – Stokes and antistokes lines – Laser Raman

Spectrometer.

UNIT V   **12 hrs**
Electronics and Communication Physics
Characteristics of pn junction diode – Zener diode – Uses of Zenar diode – Characteristics of FET – UJT-Principles of LED and LCD - Number systems : Conversion of Binary into Decimal – Decimal into Binary – Binary addition – Subtraction – Basic logic gates – Boolean algebra – Demorgan's theorems –Modulation : AM and FM – Basic principles of antenna and RADAR.

* Self study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1.R. Murugeshan, (2018), Allied Physics - S.Chand & Co., New Delhi.
2.R. Murugeshan, (2018), Modern Physics - S.Chand & Co., New Delhi.

Reference Books:
1.B.L.Theraja, (2006), Basic Electronics - S.Chand & Co., New Delhi.
2.V.K.Mehta, (2014), Principles of Electronics - S.Chand & Co., New Delhi.

e-Resources:
1. https://www.bhattadevuniversity.ac.in/docs/studyMaterial/UpakulMahanta_Physics_6thSem _Nuc learPhysics.pdf
2. https://physics.info/photoelectric/
3. https://slideplayer.com/slide/5789401/
4. https://www.slideshare.net/HebaRageh/laser-physics-lect1-1
5. https://nith.ac.in/upload/phyece.pdf

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	S	H
CO 2	H	S	H	H	S
CO 3	H	S	H	H	S
CO 4	S	S	H	S	H
CO 5	H	S	H	S	S

        S- Strong   **H-High**   **M-Medium**   **L – Low**

ALLIED PHYSICS PRACTICALS FOR B.Sc. MATHEMATICS / CHEMISTRY

Programme code: 03	For B.Sc. Mathematics and B.Sc. Chemistry				
Title of the Paper	Allied Physics Practical				
Batch 2025-2026	Semester 3 & 4	Hours/Week 3	Total Hours 90	Credits 2	Skill Development

Course Objectives

To enable the learners to:
1. Understand Physical phenomena and fundamentals of general Physics.
2. Perform experiments in Physics and understanding the results.
3. Interpret the experimental results to support the theory

Course Outcomes (CO)

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

	CO1	Provide hands-on experiences in conducting laboratory experiments.
	CO2	Analyze relationship between theory and experimental results.
K3 - K5	CO3	Conduct experimental investigations on mechanical and heat and optical Physics.
	CO4	Conduct experimental investigations on optics, electricity and electronics
	CO5	Practice record keeping of experimental work

List of Experiments (Any fifteen)

1. Determination of Young's Modulus – Uniform bending – Optic lever

2. Determination of Young's modulus – Cantilever – Static method

3. Determination of Rigidity Modulus – Static torsion

4. Determination of moment of inertia and rigidity modulus - Torsional pendulum

5. Determination of acceleration due to gravity – Compound pendulum

6. Measurement of terminal velocity of falling balls - Stokes method

7. Determination of thermal conductivity – Lee's disc

8. Determination of refractive index of a solid prism - Spectrometer

9. Determination of wavelength - Minimum deviation method – Grating - Spectrometer

10. Determination of radius of curvature of lens - Newton's ring

11. Calibration of low range voltmeter - Potentiometer

12. Calibration of low range ammeter – Potentiometer

13. Determination of specific resistance - Potentiometer

14. Determination of Moment of a magnet – Tan C position

15. Determination of AC frequency - Sonometer

16. Determination of frequency of a tuning fork– Melde's method

17. Characteristics of PN Junction diode

18. Characteristics of Zener diode

19. Verification of the truth tables of OR, AND, NOR, NOT, NAND gates using IC'S

20. Verification of De-Morgan's theorems.

e-Resources:
1. https://www.learncbse.in/to-find-the-frequency-of-the-ac-mains-with-a-sonometer/
2. https://www.youtube.com/watch?v=oRch7irmLvo
3. https://www.youtube.com/watch?v=DD5woC4ZYAQ

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	H	H	S
CO 2	H	S	H	H	S
CO 3	S	H	H	S	H
CO 4	H	S	H	S	H
CO 5	H	S	H	S	S

S- Strong   H-High   M-Medium   L – Low

ALL UG COURSES		
Title of the paper : **HEALTH AND WELLNESS**		
Batch 2025 – 2026	Semester IV	Credits 2

Skill Areas:

Physical Fitness, Nutrition, Mental Health, Awareness on Drug addiction and its effects

Purpose:

The Health & Wellness course focuses on teaching the elements of physical, mental, emotional, social, intellectual, environmental well-being which are essential for overall development of an individual. The course also addresses the dangers of substance abuse and online risks to promote emotional and mental health.

Learning Outcomes:

Upon completion of the Health & Wellness course, students will be able to:

1. Demonstrate proficiency in sports training and physical fitness practices.
2. Improve their mental and emotional well-being, fostering a positive outlook on health and life.
3. Develop competence and commitment as professionals in the field of health and wellness.
4. Awareness on drug addiction and its ill effects

Focus:

During the conduct of the Health & Wellness course, the students will benefit from the following focus areas:

1. Stress Management.
2. Breaking Bad Habits.
3. Improving Interpersonal Relationships.
4. Building Physical Strength & Inner Strength.

Role of the Facilitator:

The faculty plays a crucial role in effectively engaging with students and guiding them towards achieving learning outcomes. Faculty participation involves the following areas:

1. **Mentorship & Motivation:** The Facilitator mentors students in wellness and self-discipline while inspiring a positive outlook on health. Faculty teach stress management, fitness, and daily well-being.
2. **Promoting a Safe and Inclusive Environment:** The facilitator ensures a safe, inclusive, and respectful learning environment for active student participation and benefit.
3. **Individualised Support and Monitoring Progress:** The facilitator plays a crucial role in providing personalized support, monitoring and guidance to students.

Guided Activities:

In this course, several general guided activities have been suggested to facilitate the achievement of desired learning outcomes. They are as follows:

1. Introduction to Holistic Well-being.
2. Holistic Wellness Program- Nurturing Body and Mind
3. Breaking Bad Habits Workshop.
4. Improving the elements of physical, emotional, social, intellectual, environmental and mental well-being.
5. Creating situational awareness, digital awareness.
6. Understanding substance abuse, consequences and the way out.

Period Distribution

The following are the guided activities suggested for this Audit course.

The Physical Director should plan the activities by the students.

Arrange the suitable Mentor / Guide for the wellness activities.

Additional activities and programs can be planned for Health and Wellness.

S.No	Guided Activities	Period
1	**Introduction to Holistic Well-being** 1. Introduce the core components of Health & Well-being namely Physical, mental and emotional well-being 2. Provide worksheets on all the four components individually and explain the interconnectedness to give an overall understanding.	
2	**Wellness Wheel Exercise (Overall Analysis)**	

	• Guide students to assess their well-being in various life dimensions through exercises on various aspects of well – being, and explain the benefits of applying wellness wheel. • Introduce Tech Tools: • Explore the use of technology to support well-being. • Introduce students to apps for meditation, sleep tracking, or healthy recipe inspiration.	
3	**Breaking Bad Habits (Overall Analysis)** • Open a discussion on bad habits and their harmful effects. • Provide a worksheet to the students to identify their personal bad habits. • Discuss the trigger, cause, consequence and solution with examples. • Guide them to replace the bad habits with good ones through worksheets.	
4	**Physical Well-being** **1. Fitness** Introduce the different types of fitness activities such as basic exercises, cardiovascular exercises, strength training exercises, flexibility exercises, so on and so forth. (Include theoretical explanations and outdoor activity). **2. Nutrition** Facilitate students to reflect on their eating habits, their body type, and to test their knowledge on nutrition, its sources and the benefits. **3. Yoga & Meditation** Discuss the benefits of Yoga and Meditation for one's overall health. Demonstrate different yoga postures and their benefits on the body through visuals (pictures or videos)	

	4. Brain Health Discuss the importance of brain health for daily life. Habits that affect brain health (irregular sleep, eating, screen time). Habits that help for healthy brains (reading, proper sleep, exercises). Benefits of breathing exercises and meditation for healthy lungs. **5. Healthy Lungs** Discuss the importance of lung health for daily life. Habits that affect lung health (smoking, lack of exercises). Benefits of breathing exercises for healthy lungs. **6. Hygiene and Grooming** Discuss the importance of hygienic habits for good oral, vision, hearing and skin health. Discuss the positive effects of grooming on one's confidence level and professional growth. Suggested Activities (sample): Nutrition: Invite a nutritionist to talk among the students on the importance of nutrition to the body or show similar videos shared by experts on social media. Organize a 'Stove less/fireless cooking competition' for students where they are expected to prepare a nutritious dish and explain the nutritive values in parallel.	
5	**Emotional Well-being** **1. Stress Management** Trigger a conversation or provide self-reflective worksheets to identify the stress factors in daily life and their impact on students' performance. Introduce different relaxation techniques like deep breathing, progressive muscle relaxation, or guided imagery. (use audio recordings or visuals to guide them through these techniques). After practicing the techniques, have them reflect on how these methods can help manage stress in daily life. **2. Importance of saying 'NO'.**	

	Explain the students that saying 'NO' is important for their Physical and mental well-being, Academic Performance, Growth and Future, Confidence, Self-respect, Strong and Healthy Relationships, building reputation for self and their family (avoid earning a bad name). Factors that prevent them from saying 'NO'. How to practice saying 'NO". **3. Body Positivity and self-acceptance** Discuss the following with the students. • What is body positivity and self-acceptance? • Why is it important? • Be kind to yourself. • Understand that everyone's unique. <u>Suggested Activities(Sample):</u> (Importance of saying 'NO') Provide worksheets to self-reflect on… …how they feel when others say 'no' to them …the situations where they should say 'no' Challenge students to write a song or rap about the importance of saying no and how to do it effectively. Students can perform their creations for the class.	
6	**Social Well-Being** **1. Practicing Gratitude** Discuss the importance of practicing gratitude for building relationships with family, friends, relatives, mentors and colleagues. Discuss how one can show gratitude through words and deeds. Explain how practicing gratitude can create 'ripple effect'. **2. Cultivating Kindness and Compassion** Define and differentiate between kindness and compassion. Explore practices that cultivate these positive emotions. Self-Compassion as the Foundation.	

	The power of small gestures.	
	Understanding another's perspective.	
	The fruits of compassion.	
	3. Practising Forgiveness	
	Discuss the concept of forgiveness and its benefits.	
	Forgiveness: What is it? and What it isn't?	
	Benefits of forgiveness.	
	Finding forgiveness practices.	
	4. Celebrating Differences	
	Appreciate the value of individual differences and foster inclusivity.	
	The World: A Tapestry of Differences (cultures, backgrounds, beliefs, abilities, and appearances).	
	Finding strength in differences (diverse perspectives and experiences lead to better problem-solving and innovation).	
	Celebrating differences, not ignoring them (respecting and appreciating the unique qualities).	
	Activities for celebrating differences (share culture, learn about others, embrace new experiences).	
	5. Digital Detox	
	Introduce the students to:	
	The concept of a digital detox and its benefits for social well-being.	
	How to disconnect from devices more often to strengthen real-world connections.	
	<u>Suggested Activities (sample)</u>:	
	(Practicing Gratitude)	
	Provide worksheets to choose the right ways to express gratitude.	
	Celebrate 'gratitude day' in the college and encourage the students to honour the house keeping staff in some way to express gratitude for their service.	
7.	**Intellectual Well-being**	
	1. Being a lifelong Learner	
	Give students an understanding on:	
	The relevance of intellectual well-being in this 21st century to meet	

	the expectations in personal and professional well-being
	The Importance of enhancing problem-solving skills
	Cultivating habits to enhance the intellectual well-being (using the library extensively, participating in extra-curricular activities, reading newspaper etc.)
	2. Digital Literacy
	Discuss:
	The key aspects of digital literacy and its importance in today's world.
	It is more than just liking and sharing on social media.
	The four major components of digital literacy (critical thinking, communication, problem-solving, digital citizenship).
	Why is digital literacy important?
	Boosting one's digital skills.
	3. Transfer of Learning
	Connections between different subjects – How knowledge gained in one area can be applied to others.
	<u>**Suggested Activities(sample):**</u>
	Intellectual Well-being.
	Provide worksheets to students for teaching them how to boost intellectual well-being.
	Ask the students to identify a long-standing problem in their locality, and come up with a solution and present it in the classroom. Also organize an event like 'Idea Expo' to display the designs, ideas, and suggestions, to motivate the students to improve their intellectual well-being.
8	**Environmental Well-being**
	1.The Importance of initiating a change in the environment.
	The session could be around:
	Defining Environmental well-being (physical, chemical, biological, social, and psychosocial factors) – People's behaviour, crime, pollution, political activities, infra-structure, family situation etc.
	Suggesting different ways of initiating changes in the environment (taking responsibility, creating awareness, volunteering,

	approaching administration). <u>**Suggested Activities (sample)**</u>: Providing worksheets to self-reflect on how the environment affects their life, and the ways to initiate a change. Dedicate a bulletin board or wall space (or chart work) in the classroom for students to share their ideas for improving environmental well-being. Creating a volunteers' club in the college and carrying out monthly activities like campus cleaning, awareness campaigns against noise pollution, (loud speakers in public places), addressing anti-social behaviour on the campus or in their locality.	

9	**Mental Well-being**
	
	 1. Importance of self-reflection
	
	 Discuss:
	
	 Steps involved in achieving mental well-being (self-reflection, self-awareness, applying actions, achieving mental well-being).
	
	 Different ways to achieve mental well-being (finding purpose, coping with stress, moral compass, connecting for a common cause).
	
	 The role of journaling in mental well-being.
	
	 2. Mindfulness and Meditation Practices
	
	 Benefits of practicing mindful habits and meditation for overall well-being.
	
	     1. Connecting with nature
	
	 Practising to be in the present moment – Nature walk, feeling the sun, listening to the natural sounds.
	
	 Exploring with intention – Hiking, gardening to observe the nature.
	
	 Reflecting on the emotions, and feeling kindled by nature.
	
	     2. Serving people
	
	 Identifying the needs of others.
	
	 Helping others.
	
	 Volunteering your time, skills and listening ear.
	
	 Finding joy in giving.
	
	     3. Creative Expressions	

	Indulging in writing poems, stories, music making/listening, creating visual arts to connect with inner selves. <u>Suggested Activities(Sample):</u> (Mindfulness and Meditation) – Conducting guided meditation every day for 10 minutes and directing the students to record the changes they observe.	
10	**Situational Awareness (Developing Life skills)** **1. Being street smart** **Discuss:** Who are street smarts? Why is it important to be street smart? Characteristics of a street smart person: Importance of acquiring life skills to become street smart – (General First-aid procedure, CPR Procedure, Handling emergency situations like fire, flood etc). **2. Digital Awareness** **Discuss:** Cyber Security Information Literacy Digital Privacy Fraud Detection <u>Suggested Activities</u> (sample): (Street Smart) Inviting professionals to demonstrate the CPR Procedure Conducting a quiz on Emergency Numbers	
11	**Understanding Addiction** **Plan this session around:** Identifying the environmental cues, triggers that lead to picking up this habit. Knowing the impact of substance abuse – Adverse health conditions, social isolation, ruined future, hidden financial loss and damaging the family reputation. Seeking help to get out of this addiction. <u>Suggested Activities:</u>	

| | Provide Worksheets to check the students' level of understanding about substance addiction and their impacts.
Share case studies with students from real-life.
Play/share awareness videos on addiction/de-addiction, experts talk.
*Conduct awareness programmes on Drugs and its ill effects. (Arrange Experts from the concerned government departments and NGOs working in drug addiction issues) and maintain the documents of the program. | |

Closure:

Each student should submit a Handwritten Summary of their Learnings & Action Plan for the future.

Assessments:

- Use Self-reflective worksheets to assess their understanding.
- Submit the worksheets to internal audit/external audit.
- Every student's activities report should be documented and the same have to be assessed by the Physical Director with the mentor. The evaluation should be for 100 marks. No examination is required.

Scheme of Evaluation

Part	Description	Marks
A	Report	40
B	Attendance	20
C	Activities (Observation During Practice)	40
	Total	100

References/Resource Materials:

The course acknowledges that individual needs for references and resources may vary. However, here are some general reference materials and resources that may be helpful:

1. **The Well-Being Wheel:**

2. **Facilities & Spaces:** Some activities may require access to specific facilities, resources or spaces. Students may need to coordinate with the college administration to reserve these as required.

3. **Online Resources:**
    1. United Nations Sustainable Development Goals - Goal 3 - Good Health & Well-Being: https://www.un.org/sustainabledevelopment/health/
    2. Mindfulness and Meditation: Stanford Health Library offers mindfulness and meditation resources: https://healthlibrary.stanford.edu/books-resources/mindfulness-meditation.html

3. Breaking Bad Habits: James Clear provides a guide on how to build good habits and break bad ones: https://jamesclear.com/habits

4. 6 Ways to Keep Your Brain Sharp
https://www.lorman.com/blog/post/how-to-keep-your-brain-sharp

5. What Is Social Wellbeing? 12+ Activities for Social Wellness
https://positivepsychology.com/social-wellbeing/

6. How Does Your Environment Affect Your Mental Health?
https://www.verywellmind.com/how-your-environment-affects-your-mental-health-5093687

7. How to say no to others (and why you shouldn't feel guilty)
https://www.betterup.com/blog/how-to-say-no

Major Elective Papers

(2 papers are to be chosen from the following 6 papers)

1. Laser Physics and Fiber Optics

2. Principles of Communication Systems

3. Materials Science

4. Measurement Systems

5. Introduction to Biophysics

6. Object Oriented Programming in C++

Programme Code: 03	B.Sc. Physics			
Title of the Paper	Major Elective Paper : Laser Physics and Fiber Optics			
Batch 2025-2026	Hours/Week 4	Total Hours 60	Credits 5	Employability

Course Objectives

To enable the learners to

1. Acquire knowledge about the principles of conventional and advanced lasers.
2. Understand the applications of lasers.
3. Understand fundamentals of optical fibers and their fabrication.

Course outcomes (CO)

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

	CO1	Understand the basic principles of lasers
	CO2	Explain the types of lasers and Laser amplifiers
K1 - K5	**CO3**	Illustrate the application of lasers in various fields.
	CO4	Understand optical fibers and its attenuations
	CO5	Know about fabrication of optical fibers.

Syllabus

UNIT I (12 hrs)

Basic principles of laser

Quantum Nature of Light - Energy Levels - Population inversion - Schawlow -Towne's Threshold Condition for Laser Oscillations in Terms of Population Difference – Absorption - Spontaneous and stimulated emission - Einstein Co-efficients A & B - Basic Components of a Laser - Laser active Medium - Different Pumping Methods - Optical Resonator - Cavity Configuration - Plane Parallel Cavity - Confocal Cavity – **Hemispherical and Long Radius Cavity*.**

UNIT II (12 hrs)

Types of lasers

Solid laser (Ruby laser and Nd:YAG laser) – Gas laser (He-Ne laser and CO_2 laser) – Liquid laser (Dye laser) - Semiconductor laser - **Laser amplifiers -** General description of Q switching – Production of Q switching : Electro-optic shutter (Kerr effect and Pockels effect) - Mechanical and Saturable absorber shutters.

UNIT III (12 hrs)

Applications of lasers

Materials processing with lasers: Drilling, Cutting and Welding - Nuclear fusion with lasers - Communication by lasers - Large range finders - Laser Gyro - LASIK - Optical computing - Principle of holography - Recording and reconstruction - Classification of hologram-Holographic interferometry in nondestructive testing - Lasers in compact disc players.

UNIT IV (12 hrs)

Fiber fabrication: Classification of fiber fabrication techniques: External chemical vapour deposition (External CVD), Axial vapour deposition (AVD), Internal chemical vapor deposition, Multielement glasses and Phasil system, Comparison of various fabrication processes, drawing and coating, double crucible method, rod in tube method- Mechanism of refractive index variation - Fiber strength – **Mechanical strength measurement of fibers*.**

UNIT V   **12 hrs**
Optical fibers and its attenuation

Basic structure of an optical fiber - Advantages of optical fibers –Propagation of light waves in an opticalfiber - Types of fibers: step index single mode fiber, step index multimode fiber and graded index fiber - Acceptance angle and acceptance cone of a fiber – Numerical aperture of a step index fiber and gradedindex fiber - Attenuation in optical fibers: Material losses – Rayleigh scattering loss – Absorption losses - Bending losses – Radiation induced losses – Inherent defect losses.

*Self study
Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. M.N.Avadhanalu, (2013), P.S.Hemne, An introduction to lasers and applications - S.Chand & Co.,New Delhi.
2. Subir Kumar Sarkar, (2010), Optical fibers and fibers optic communication systems S.Chand & Co,New Delhi.

Reference Books:
1. B.B Laud, (2011), Lasers and Nonlinear Optics - New Age International Pub. Ltd, New Delhi.
2. K.R. Nambiar, (2014), Lasers: Principles, Types and Applications - New Age International, NewDelhi.
3. William T. Silfvast, (2008), Laser fundamentals - University Press, Foundation books, New Delhi.

e-Resources:
1. https://www.youtube.com/watch?v=xZ9kSBHWpUM
2. https://www.youtube.com/watch?v=vd6Lo64s3vc
3. https://www.youtube.com/watch?v=2NNWPJj8hvU
4. https://www.youtube.com/watch?v=pavBq7HIoIE
5. https://www.youtube.com/watch?v=AEkIPwP0YI8

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	H	H
CO 2	H	S	H	S	S
CO 3	S	S	H	H	S
CO 4	H	H	S	S	S
CO 5	H	S	H	S	H

S- Strong   **H-High**   **M-Medium**   **L - Low**

Programme Code: 03	B.Sc. Physics			
Title of the Paper	Major Elective Paper - Principles of Communication Systems			
Batch 2024-2025	Hours/Week 4	Total Hours 60	Credits 5	Employability

Course Objectives

To enable the learners
1. To understand the basic idea of modulation and demodulation
2. To gain knowledge on transmission lines and antennas
3. To know about radio, cellular, fiber optic, television and satellite communications

Course Outcomes (CO)

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

	CO1	Get knowledge about modulation and demodulation
	CO2	Understand the working principles of transmission lines and antennas
K1 - K5	CO3	Acquire knowledge on radio and cellular communications
	CO4	Gain knowledge on fiber optic communications
	CO5	Understand television and satellite Communications

Syllabus

UNIT I (12 hrs)

Modulation and Demodulation

Amplitude modulation- modulation index – Expression for AM - Single side band generation – Suppression of carrier-Frequency modulation–Expression for FM wave - PM definition-Comparative advantages and disadvantages of AM, FM and PM – Basic principles of demodulation - AM diode detector – FM Ratio detector.

UNIT II (12 hrs)

Transmission Lines and Antennas

Line equations of transmission lines- Short circuited and open ended lines – Standing wave ratio- relation between SWR and reflection coefficient - Types of transmission lines - Properties of transmission lines - Mechanism of electromagnetic radiation from resonant circuit - Elementary dipole antenna-current and voltage distribution in a half-wave dipole antenna – Principle of radiation of a half-wave dipole antenna- directional pattern- Derivation of E and H in principle of radiation of half- wave.

UNIT III (12 hrs)

Radio and Cellular Communications

Classification of Radio Transmitters -AM radio transmitter stages – note on AM radio broadcast transmitters - Principle of superheterodyne receiver - Block diagram of the stages of superheterodyne AM receiver - Block diagram of stages of a FM radio receiver – difference between AM and FM receivers – Cellular communications (Elementary ideas).

UNIT IV   (12 hrs)
Fiber Optic Communications
Light sources: LED (Light Emitting Diode)- LASER- Light Emitting Transistor- Photo detectors: Photo-emissive photodetector- PN Junction photodetector -Phototransistor – Optical connectors- Optical couplers: Biconically tapered - Offset Butt-joint- Beam Splitting– Star couplers - T couplers- Transmitter for fiber optic communication – High performance circuit (LED digital transmitter) – Fiber optic receiver – High performance receiver –Repeaters – Fiber optic based modems : Transreceivers

UNIT V   (12 hrs)
Television and Satellite Communications
Principle of picture transmission and reception – Television standards - gross structure of a television - Picture elements – Scanning, image continuity and persistence of vision – Horizontal and vertical blanking pulses- TV camera tubes: image orthicon – Vidicon – The block diagram of a basic TV transmitter – Block diagram of a monochrome TV receiver- Introduction on satellite communications **- Satellite links and Satellite construction*** – Different domestic satellites.

* Self study
Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. D.A Deshpande, (1989).Communication Electronics - McGraw Hill Publications, India.
2. Subir. Kumar. Sarkar, (2007), Optical Fibers and Fiber Optic Communication - S.Chand & Co.
3. Bernard Grob and Charles Herndon, (1999), Basic Television and Video Systems -McGraw Hill

Reference Books:
1. George Kennedy, Bernard Davis and SRM Prasanna, (2017), Electronic Communication SystemsMcGraw Hill Publishers Ltd, India.
2. Sanjeeva Gupta, (1997), Electronics Communication Systems - Khanna Publications, Salem.

e-Resources:
1. https://www.youtube.com/watch?v=S8Jod9AtpN4
2. https://www.digimat.in/nptel/courses/video/108101092/L01.html
3. https://www.youtube.com/watch?v=yWWfKrbMRUs
4. https://www.digimat.in/nptel/courses/video/108104113/L01.html
5. https://www.digimat.in/nptel/courses/video/117105131/L01.html

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	H	H	H
CO 2	H	H	S	H	S
CO 3	H	H	S	S	H
CO 4	S	H	H	H	H
CO 5	H	S	H	S	H

S- Strong   **H-High**   **M-Medium**   **L - Low**

Programme Code: 03	B.Sc. Physics			
Title of the Paper	Major Elective Paper – Measurement Systems			
Batch 2025-2026	**Hours/Week** 4	**Total Hours** 60	**Credits** 5	**Employability**

Course Objectives

To enable the learners to

1. Understand the basic concepts of measurement and error analysis.
2. Get exposure to the knowledge on transducers on viscosity measurement.
3. Understand the working of ac bridges.

Course Outcomes (CO)

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

	CO1	Understand the methods of measurements
K1 to K5	**CO2**	Gain knowledge on asdic electrical measurements
	CO3	Acquire knowledge on different type of specific gravity monitoring
	CO4	Acquire knowledge on different applications of BG
	CO5	Understand the working of different electrical bridges

Syllabus

UNIT-I (12 Hrs)
FUNDAMENTALS OF MEASUREMENTS
Definition of measurement; Significance of measurement; Methods of measurements: Direct & Indirect; Generalized measuring system; Standards of measurements: Primary & Secondary; Factors influencing selection of measuring instruments; Terms applicable to measuring instruments: Precision and Accuracy, Sensitivity and Repeatability, Range, Threshold, Hysteresis, calibration; Errors in Measurements: Classification of errors, Systematic and Random error.

UNIT-II (12 Hrs)
BASIC ELECTRICAL MEASUREMENTS
Introduction-DC Voltage Measurements- Electromechanical DC voltmeters-Static Electric field and charged surface measurements-DC current measurements- Electro mechanical DC ammeter-Magneto optic current errors- AC voltage measurements-Electro mechanical AC voltmeters- Iron vane Voltmeters- Vacuum thermocouple- Analog electronic AC voltmeter- AC amplifier- Rectifier-AC voltmeter-AC current measurements.

UNIT-III (12 Hrs)
SPECIFIC GRAVITY MONITORING
Measurement of liquid level-Viscosity measurement of humidity and moisture- Measurement of PH value- Bio medical measurements / Bio metrics- measurement of environmental air pollution parameter-computer aided measurement-fibre optic transducer.

Unit – IV (12 Hrs)
BALLISTIC GALVANOMETER
Working principle - Measurement of current density - Measurement of absolute capacitance - Comparison of capacitance - Measurement of earth magnetic field - Measurement of High resistance by leakage method - Measurement of Inductance

Unit – V (12 Hrs)
ELECTRICAL BRIDGES
Wheatstone Bridge analysis - Kelvin Bridge - Andreson constant - Current loop – Potentiometer - AC Null measurement - AC operation of Wheatstone"s bridges-AC bridges - Schering Bridge - Wien Bridge - Maxwell's Bridge - Hay's Bridge - De Sauty Bridge.

TEXT BOOKS
1. B.C.Nakara, KK Chaudary (2005),Electronic instrumentation and measurement systems TMH Publication 3rd edition
2. Brijlal and Subramaniam, (2000), Electricity and Magnetism- Ratan Prakashan Mandir.

REFERENCE BOOK

1. Modern Electronic Instrumentation and Measurement Techniques -Albert D. Helfrick, William David Cooper - Prentice Hall PTR, 5th Ed (1990)

2. Advanced Electronic Systems - Wayne Tomasi - Prentice Hall PTR,4th edition (1998)

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	H	H	H
CO 2	H	H	S	H	S
CO 3	H	H	S	S	H
CO 4	S	H	H	H	H
CO 5	H	S	H	S	H

S- Strong   **H-High**   **M-Medium**   **L - Low**

Programme Code: 03		B.Sc. Physics		
Title of the Paper		**Major Elective Paper - Introduction to Biophysics**		
Batch **2025-2026**	**Hours/Week** **4**	**Total Hours** **60**	**Credits** **4**	**Employability**

Course Objectives

To enable the learners
1. To understand the concept of Physics principles and apply it to biological phenomenon
2. To know about Biophysics, fluid run and Gas transport
3. To know about audition of human ear and Physics of Vision

Course Outcomes (CO)

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

	CO1	Apply principles of Physics toward evaluation and analyses of biological phenomenon.
K1 to K5	**CO2**	Understand the basic concepts of biophysics and fluid run.
	CO3	Know about gas transport concepts.
	CO4	Acquire knowledge on Physics of audition.
	CO5	Acquire knowledge on Physics of vision.

Syllabus

Unit – I Biomechanics 12 hrs

Biostatics - Forces and Torques - Biophysics of Muscle –Muscle Power –Mass Specific Muscle Power -Strength of Bones - Biodynamics – Newton's law Frictional forces and stokes law – Frictional forces and Stokes Law - Locomotion of Land - Walking - Jumping - Propelling - Locomotion in Air - Locomotionin Water - Role of Gravity.

Unit – II Biophysics and Fluid run 12 hrs

Steady Laminar Flow - Co-efficient of viscosity - Temperature dependence - Newtonian Fluid - Poiseuille's Formula - Energetics of Fluid Flow – Turbulence – Reynolds's Number - Hemodynamics - Plasma skimming – Turbulence - Pressure flow relation

Unit – III Biophysics and Gas Transport 12 hrs

Ideal Gas – Dalton's law of Partial Pressure – Vapor Pressure – Solutions and Henry's Law - Convective transport of Gases – Airway resistance – Transport of O_2 in blood – Transport of CO_2 in Blood - Diffusionof gases - Fick's Laws – Gas exchange in lungs – Gas exchange in tissues – Physiology of respiration – Physics of alveoli – Work of breathing.
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Unit – IV Physics of Audition 12 hrs

Transverse and Longitudinal Waves - Physiological characteristics of Sound - Human Ear - phasesensitivity and determination of direction - Doppler Effect.

Unit – V Physics of Vision 12 hrs

Retina and Photoreceptors - Photochemistry of receptor cells – Intensity sensitivity – Spectral sensitivity - Resolving power of Eye – Diffraction – Polarization and Vision – Optical rotation – Birefringence and Dichroism - **Photoreceptors and Fiber optics***.

* **Self Study**

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. P.K.Srivastava, (2015), Elementary Biophysics: An Introduction - Narosa Publishing House, NewDelhi.

Reference Books:
1. Vasantha Pattabhi, N.Gautham, (2002), Biophysics – Springer.
2. M. Daniel, (2007), Basic Biophysics - Publisher Agrobios, India.

e-Resources:
1. https://www.youtube.com/watch?v=DNhLG1H7ttY
2. https://youtu.be/jFZHIPhmNTs?list=PLFn7fvIP7CbMun4daH24AZzX3r7ETT6aD
3. https://www.youtube.com/watch?v=VdoSff84Wqk
4. https://www.youtube.com/watch?v=fvQrbtRCH8I
5. https://www.youtube.com/watch?v=S1XeaNV4p38

Mapping

CO\PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	H	H	H
CO 2	S	S	S	S	S
CO 3	H	S	S	S	H
CO 4	S	H	H	H	S
CO 5	H	S	H	S	H

S- Strong **H-High** **M-Medium** **L - Low**

Programme Code: 03	B.Sc. Physics		
Title of the Paper	**Major Elective Paper - Materials Science**		
Batch 2025-2026	**Hours/Week 4**	**Total Hours 60**	**Credits 5**	**Employability**

Course Objectives

To enable the learners
1. To understand the electron theory of solids
2. To know about electric and dielectric properties of materials.
3. To know about magnetic and superconducting properties of materials.

Course Outcomes (CO)

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

K1 to K5	CO1	Understand the electron theory of solids.
	CO2	Know about electric properties of materials.
	CO3	Know about dielectric properties of materials.
	CO4	Understand magnetic properties of materials.
	CO5	Acquire knowledge about superconducting properties of materials.

Syllabus

Unit I (12 hrs)
Electron Theory of Solids
Classical free electron theory - quantum free electron theory - Electron energy in metals and Fermi energy - density of states - antisymmetric nature of the wave functions of the Fermi system – covalent bonding in crystals - electron in a periodic potential - energy bands in solids - Brillouin zones – distinction betweenmetals, insulators and semiconductors - effective mass of electron and concept of holes.

Unit II (12 hrs)
Conducting Properties of materials
Atomic interpretation of ohms law - relaxation time - electrical conductivity - collision time - mean freepath - heat developed in a current carrying conductor - sources of resistivity of metals and alloys - thermal conductivity - Wiedemann franz law - thermal expansion - electrical conductivity at high frequencies - geometrical and magnetic field effects on electrical conductivity - variation of electrical resistivity due to mechanical stress (strain gauge)- different types of conducting materials.

Unit III (12 hrs)
Dielectric Properties of materials
Dielectrics - different types of electric polarization - frequency and temperature effects on polarization - dielectric loss - local field or internal field - Clausius- Mossotti relation – determination of dielectric constant – dielectric break down - properties and different types of insulating materials – **Ferroelectric materials*.**

Unit IV (12 hrs)
Magnetic Properties of materials
Different type of magnetic materials – classical theory of diamagnetism (Langevin theory) - Langevin theory of paramagnetism- Weiss theory of paramagnetism- Weiss theory of ferromagnetism (molecular field theory on field magnetism) – Heisenberg interpretation on internal field and quantum theory of ferromagnetism - domain theory of ferromagnetism- hard and soft materials

Unit V (12 hrs)
Superconducting materials
Occurrence of superconductivity – general properties of superconductors – Meissner effect - types of superconductors - Isotope effect – Specific heat capacity - BCS Theory - applications of superconductors - SQUID.

*Self study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
1. M. Arumugam, (2012), Material Science - Anuradha Agencies, Chennai

Reference Books:
1. Vijaya, Rangarajan, (2005), Materials Science - Tata McGraw Hill Publishing Co. Ltd, India.
2. Raghavan, (2010), Materials Science - Prentice Hall of India, New Delhi.

e-Resources:
1. https://www.youtube.com/watch?v=D-9M3GWoBrw
2. https://youtu.be/hr08GUR2HQQ
3. https://youtu.be/Yl43KpsNncw
4. https://youtu.be/QQZ6EGf0Ju8
5. https://youtu.be/gtzNdfUD2wc

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	H	H	S
CO 2	H	S	H	H	S
CO 3	S	H	H	S	H
CO 4	H	S	H	S	H
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L – Low

UPH - 71 -

Programme Code: 03	B.Sc. Physics			
Title of the Paper	**Major Elective Paper - Object Oriented Programming in C++**			
Batch 2025-2026	**Hours/Week 4**	**Total Hours 60**	**Credits 5**	**Employability**

Course Objective

To enable the learners to

1. Know about the basics in C++ language
2. Develop programming skills in C++ language
3. Understand about various functions and operators.

Course Outcome (CO)

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

K1 to K5	CO1	Acquire basic knowledge about various data types, variables, operators and solving programs for real data.
	CO2	understand about function prototyping and function overloading
	CO3	Acquire relevant information about various classes, objects and programming with various functions and arguments.
	CO4	Gain knowledge on Constructors, Destructors
	CO5	Gain knowledge on Polymorphism and inheritance

UNIT I   (12 hrs)
Beginning with C++

Basic concepts of Object oriented Programming – tokens – keywords – identifiers and constants – basic data types – user defined data types – derived data types – declaration of variables – dynamic initialization of variables – reference variables – scope resolution operators – expression and their types – **control structures**[*].

UNIT II   (12 hrs)
Functions in C++

Main function – function prototyping – call by reference – return by reference - inline functions – default arguments – Const arguments – function overloading.

UNIT III   (12 hrs)
Classes and Objects

Specifying a class – defining member functions - C++ program with class – making an outside function inline – nesting of member functions – private member functions – arrays within class – memory allocation for objects – static data members and functions – arrays of objects – objects as function arguments – friendly functions.

UNIT IV   (12 hrs)
Constructors and Destructors

Constructors – parameterized constructors – multiple constructors in class – copy constructors – dynamic constructors – destructors.

UNIT V   (12 hrs)
Polymorphism and Inheritance

Defining operator overloading – overloading unary and binary operators – rules for overloading operators – Inheritance: Introduction – defining derived class – single inheritance – **multilevel**

inheritance[*] –multiple inheritance.

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UPH - 72 -

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*   Self study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz / Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Books for study:
  1.E. Balagurusamy, (2017), Object Oriented Programming with C++ - Tata McGraw Hill, India

Books for reference:
  1.   Yashwant Kaneetka, (2020), Let us C++ - BPB Publications, New Delhi.
  2.   H. Schildt, (2014), C++: A beginners guide, McGraw Hill, India.

e-Resources:
  1. https://www.digimat.in/nptel/courses/video/106105151/L01.html
  2. https://youtu.be/JenkXelhImM
  3. https://youtu.be/1puaGnJ9pyAA
  4. https://youtu.be/wtuks_f3vP4
  5. https://youtu.be/Qe8zcyTlvjc

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Mapping

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	H	S	H
CO 2	H	S	S	S	S
CO 3	S	S	S	H	S
CO 4	S	H	S	H	S
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L - Low

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Non - Major Elective Papers

1. Human Rights

2. Women's Rights

3. Consumer affairs

Sub. Code: 25UHR3N1

Programme Code:03	For B.A., BBA, B.Com, BCA and B.Sc., Degree Students		
Title of the Paper	Part IV – Non Major Elective - I Human Rights		
Batch 2025-2026	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives

To enable the learners
1. To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy
5. To appreciate the relationship between rights and duties
6. To foster respect for tolerance and compassion for all living creature.

Course Outcomes

After Completion of the Course the student will be able

K1 - K5	CO1	To understand the hidden truth of Human Rights by studying various provisions in the Constitution of India.
	CO2	To acquire overall knowledge regarding the Feminist perspectives in the Liberative Empowerment of Women.
	CO3	To gain knowledge about various gender roles and stereotypes involved in the comprehension of gender equality and women's rights.
	CO4	To comprehend the legal provisions and policies that foreground the safety of children in the society and to promote awareness.
	CO5	To gain enhanced knowledge about sexual and gender minorities to recognize, celebrate and acknowledge the diversified forms of gender expressions and rights.

Syllabus

UNIT I   **(6 Hours)**
HUMAN RIGHTS HUMANS RIGHTS CONSTITUTION OF INDIA: Humans Rights - Constitution of India

UNIT II   **(6 Hours)**
WOMEN EMPOWERMENT IN INDIA: Feminism and Sexual Violence - Women And Liberation

UNIT III   **(6 Hours)**
GENDER EQUALITY AND WOMEN'S RIGHTS: Stereotype Gender Roles - Women's Education, Power And Science

UNIT IV   **(6 Hours)**
RIGHTS OF THE CHILD IN INDIA: Status of child in contemporary Indian society - Special Laws and Policies for protection of children

UNIT V   **(6 Hours)**
SOGIESC RIGHTS: Understanding SOGIESC- basic Definitions- inclusivity of SOGIESC-importance of studying SOGIESC- presence of SOGIESC in Indian Traditions- temples and cultural practices that exemplify SOGIESC in India- Genetics of Sex determination- Genetics of Intersex community- Successful SOGIESC Personalities and achievers – Alan Turing- Sally Ride- Leonardo da vinci- Alan Hart- Virginia -Woolf- Bayard Rustin- Padmini Prakash- Akkai Padmashali- K Prithika Yashini- Laxmi Narayan Tripati- Madhu Bai Kinnar-Manabi Bandhopadhyay- SOGIESC Rights and laws

Teaching Methods: Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

Text Books
1. Human Rights (2024) Compiled by Kongunadu Arts and Science College, Coimbatore –29.

Reference
1. Human Rights, (2018) by Jaganathan,MA.,MBA.,MMM.,ML.,ML., (Humanitarian Law) and J.P. Arjun Proprietor: Usha Jaganathan, Refugee Law Law series, 1st floor, Narmatha Nanthi Street, Magathma Gandhi Nagar, Madurai – 625014.

2. Country Report on SOGIESC Rights In India: An Unfinished Agenda.
Weblink: https://www.ilgaasia.org/publications/india-country-report-an-unfinished-agenda

3. Intersex. Weblink: https://my.clevelandclinic.org/health/articles/16324-intersex

4. SOGIESC Personalities:
https://www.bbc.com/news/world-asia-india-29357630
https://en.wikipedia.org/wiki/Laxmi_Narayan_Tripathi
https://en.wikipedia.org/wiki/Akkai_Padmashali
https://www.indiatoday.in/india/story/prithika-yashini-india-first-transgender-police-officer-tamil-nadu-969389-2017-04-04
https://yourstory.com/2018/03/first-transgendre-college-principal-west-bengal

5. SOGIESC Rights and laws
https://www.openglobalrights.org/lgbtqia-to-sogiesc-reframing-sexuality-gender-human-rights/
https://static1.squarespace.com/static/5a84777f64b05fa9644483fe/t/625ead0484f9005d75b92dd0/1650371887436/ILGA+Asia+India+Report+2021.pdf

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Question Paper Pattern
(External only)

Duration: 3 hrs   **Max: 75 marks**
Answer ALL Questions

SECTION A   (5 x 5 = 25 marks)
Short answers, either or type, one question from each unit.

SECTION B   (5 x 10 = 50 marks)
Essay type questions, either or type, one question from each unit.

Programme Code: 03	B.Sc. Physics		
Title of the Paper	Part IV – Non Major Elective – II Women's Rights		
Batch 2025-2026	Hours/Week 2	Total Hours 30	Credits 2

Course Objectives

To enable the learners
1. To know about the laws enacted to protect Women against violence.
2. To impart awareness about the hurdles faced by Women.
3. To develop a knowledge about the status of all forms of Women to access to justice.
4. To create awareness about Women's rights.
5. To know about laws and norms pertaining to protection of Women.
6. To understand the articles which enables the Women's rights.
7. To understand the Special Women Welfare laws.
8. To realize how the violence against Women puts an undue burden on healthcare services.

Course Outcomes (CO)

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

K1 - K5	CO1	Understand the importance of Women's Studies and incorporate Women's Studies with other fields.
	CO2	Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication.
	CO3	Interpret the laws pertaining to violence against Women and legal consequences.
	CO4	Study the important elements in the Indian Constitution, Indian Laws for Protection of Women.
	CO5	To be Aware of Government Developmental schemes for women and to create Awareness on modernization and impact of technology on Women.

Syllabus

Unit I (6 hrs)
Women's Studies:
Basic concepts of Women's studies in Higher education, Women's studies perspectives-Socialization- Patriarchy- Women's studies as an academic discipline- Growth and development of Women's studies as a discipline internationally and in India.

Unit II (6 hrs)
Socio-Economic Development of Women:
Family welfare measures, role of Women in economic development, representation of Women in media,status of Women land rights, Women Entrepreneurs, National policy for the empowerment of women.

Unit III (6 hrs)
Women's Rights – Access to Justice:
Crime against Women, domestic violence – physical abuse- verbal abuse – emotional abuse - economic abuse – minorities, dowry- harassment and death, code of conduct for work place, abetment of suicide.

Unit IV   **(6 hrs)**

Women Protective acts:
Protective legislation for Women in the Indian constitution- Anti dowry, SITA, PNDT, and Prevention Sexual Harassment at Workplace (Visaka case), Domestic violence (Prevention) Act.

Unit V   **(6 hrs)**
Women and Child welfare:
Safety provisions - various forms of mass media, radio, visual, internet, cyber space, texting, SMS and smart phone usage. Healing measures for the affected Women and child society by private and public sector, NGO and society.

Teaching Methods: Smart Class Room / Power point Presentation / Seminar / Quiz / Discussion / Flipped Class

Text Book:
 1. Women's Rights (2021), compiled by Kongunadu Arts & Science College, Coimbatore – 641 029.

Reference Books:
 1. "Rights of Indian Women" by Vipul Srivatsava. Publisher: Corporate Law Advisor, 2014.
 2. "Women's security and Indian law" by Harsharam Singh. Publisher: Aabha Publishers and Distributors, 2015.
 3. "Women's Property Rights in India" by Kalpaz publications, 2016.

Question Paper Pattern
(External only)

Duration: 3 hrs   **Max: 75 marks**

Answer <u>ALL</u> Questions

<u>SECTION A</u>   (5 x 5 = 25 marks)
Short answers, either or type, one question from each unit.

<u>SECTION B</u>   (5 x 10 = 50 marks)
Essay type questions, either or type, one question from each unit.

Programme Code: 03	B.Sc. Physics		
Title of the Paper	Part IV – Non Major Elective III - Consumer Affairs		
Batch 2025-2026	Hours/Week 2	Total Hours 30	Credits 2

Course Objectives

To enable the learners

1. To familiarize the students with their rights and responsibilities as a consumer.
2. To understand the procedure of redress of consumer complaints.
3. To know more about decisions on Leading Cases by Consumer Protection Act.
4. To get more knowledge about Organizational set-up under the Consumer Protection Act
5. To impart awareness about the Role of Industry Regulators in Consumer Protection
6. To understand Contemporary Issues in Consumer Affairs

Course Outcomes (CO)

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

	CO1	Know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
K1 – K5	CO3	Apply the role of different agencies in establishing product and service standards.
	CO4	Analyze to handle the business firms' interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs

Syllabus

UNIT I (6 hrs)

Conceptual Framework - Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian ConsumerMarkets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000suite

UNIT II (6 hrs)

The Consumer Protection Law in India - Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice.
Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

UNIT III (6 hrs)

Grievance Redressal Mechanism under the Indian Consumer Protection Law - Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of

order, Appeal, frivolous and vexatious complaints; Offences and penalties. Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence;

Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

UNIT IV (6 hrs)
Role of Industry Regulators in Consumer Protection
  i. Banking: RBI and Banking Ombudsman
  ii. Insurance: IRDA and Insurance Ombudsman
  iii. Telecommunication: TRAI
  iv. Food Products: FSSAI
  v. Electricity Supply: Electricity Regulatory Commission
  vi. Real Estate Regulatory Authority

UNIT V (6 hrs)
Contemporary Issues in Consumer Affairs - Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.
Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

Note: Unit 2 and 3 refers to the Consumer Protection Act, 2086. Any change in law would be added appropriately after the new law is notified.
Teaching Methods: Smart Class rooms /Power Point Presentations / Seminars/Quiz /Discussion /Flipped Classrooms

Reference Books
1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) ConsumerAffairs, UniversitiesPress.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions andProcedure, Deep and Deep Publications PvtLtd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues andChallenges, RegalPublications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues andConcerns, IIPA, NewDelhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.

e-Resources
1. E-books : www.consumereducation.in
2. Empowering Consumers e-book, www.consumeraffairs.nic.in
3. The Consumer Protection Act, 2086 and its later versions.

Question paper pattern
Duration: 3 hrs   **Max: 75 Marks**
Section A (5 x 5=25)
Short notes
Either – or / type – question from each unit.

Section B (5 x 10=50)
Essay type
Either – or / type – question from each unit.

Skill Based Subjects (SBS)

1. Cyber Security

2. Scientific Computing- Python and Artificial Intelligence

3. Basics of Intellectual Property Right's

Sub.Code: 25UGC3S1

Programme Code: 03		B.Sc. Physics			
Title of the Paper		**SBS I – CYBER SECURITY**			
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**	**Skill Development**
2025-2026	**3**	**2**	**30**	**3**	

Course Objectives

To enable the learners to
1. Know the basic concepts of Cyber Security
2. Develop an ability to understand about various modes of Cyber Crimes and Preventive measures
3. Understand about the Cyber Legal laws and Punishments

Course Outcomes (CO)

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

	CO1	To Understand the Concepts of Cybercrime and Cyber Frauds
	CO2	To Know about Cyber Terrorism and its preventive measures
K1-K5	CO3	To Analyze about the Internet, Mobile Phone and E-commerce security issues
	CO4	To Understand about E-mail and Social Media Issues
	CO5	To Describe about various legal responses to Cybercrime

Syllabus

Unit I (6 hrs)

Introduction to Cyber Security: Definition of Cyber Security- Why is Cyber Security important? Layers of Cyber Security- Evolution of Cyber Security. Cyber hacking - Cyber fraud: Definition - Different modes of cyber fraud - Cyber fraud in India. Cyber pornography.

Unit II (6 hrs)

Cyber Terrorism: Modes of cyber terrorism. Cybercrime: What is Cybercrime? Cybercrime preventive methods - Preventive steps for individuals & organizations - Kinds of cybercrime - Malware and its types
– Cyber attacks.

Unit III (5 hrs)

Internet Mobile Phone and E-commerce Security issues: Data theft - Punishment of data theft- Theft of internet hours - Internet safety tips for children & parents. Mobile phone privacy- E-Commerce security issues.

Unit IV (6 hrs)

Email and Social media issues: Aspects of Social Media - The Vicious Cycle of unhealthy social media use- Modifying social media use to improve mental health. Computer Virus - Antivirus – Firewalls.

Unit V (7 hrs)

Cyber Forensics and Digital Evidence: What does Digital Footprint Mean? - Web Browsing and Digital Footprints- Digital Footprint examples – How to Protect Your Digital Footprints? - How to erase your Footprints? - Browser Extensions and Search Engine Deletion - Cyber Crime and Cyber Laws - Common Cyber Crimes and Applicable Legal Provisions: A Snapshot - Cyber Law (IT Law) in India – The Information Technology Act of India 2000 - Cyber Law and Punishments in India - Cyber Crime Prevention guide to users – Regulatory Authorities.

Teaching Methods: Chalk and Talk, Presentation, Seminar, Quiz, Discussion & Assignment

Text Book:
1. **"Cyber Security", Text Book** prepared by "Kongunadu Arts and Science College", Coimbatore -29,2022.

Reference Books:
1. Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security", BPB Publications, 1st Edition, 2017.
2. Anand Shinde, "Introduction to Cyber Security-Guide to the world of Cyber Security", Notion Press, 2021.
3. Paul Grishman, "Cyber Terrorism- The use of the Internet for Terrorist Purpose",Axis Publication, 1st Edition 2010.
4. Shilpa Bhatnagar, "Encyclopaedia of Cyber and Computer Hacking", Anmol Publications, 2009.

Web References:
1. http://deity.gov.in/ - Department of Electronics and Information Technology, Govt. of India
2. http://cybercellmumbai.gov.in/ - Cybercrime investigation cell
3. http://ncrb.gov.in/ - National Crime Records Bureau
4. http://catindia.gov.in/Default.aspx - Cyber Appellate Tribunal
5. http://www.cert-in.org.in/ - Indian Computer Emergency Response Team
6. http://cca.gov.in/rw/pages/index.en.do - Controller of Certifying Authorities
7. www.safescrypt.com - Safescrypt
8. www.nic.in – National Informatics Center
9. https://www.kaspersky.com/resource-center/definitions/what-is-a-digital-footprint
10. https://geekflare.com/digital-footprint/

Mapping

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	H	S	S	H	S
CO3	M	H	M	S	H
CO4	S	H	H	M	H

S – Strong   **H** – High   **M** – Medium   **L** – Low

Question Paper Pattern

Duration: 3 hrs   **Max: 75 marks**

Section - A (10x1=10)
Choose the correct answer

Section - B (5x5=25)
Short answer questions, either or type, one question from each unit.

Section - C (5x8=40)
Essay answer questions, either or type, one question from each unit.

CIA EXAMINATION MARK BREAKUP

S. NO	DISTRIBUTION COMPONENT	MARKS
1.	CIA I – 75 Marks Converted to 30	30
2.	CIA II – 75 Marks Converted to 30	30
3.	Assignment I	10
4.	Assignment II	10
5.	Attendance	05
6.	Any Case Study related to Cyber Security	15
Total		**100**

Programme Code: 03		B.Sc. Physics			
Title of the Paper		Skill Based Subject 2 – Scientific Computing – Python and Artificial Intelligence			
Batch 2025-2026	Semester 4	Hours/Week 2	Total Hours 30	Credits 3	Employability

Course Objectives

To enable the learners to

1. build basic programme using fundamental programming constructs
2. build programme for Physics related applications
3. know the applications Artificial intelligence

Course Outcomes (CO)

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

	CO1	Gain knowledge about how to use list
	CO2	Gain knowledge about conditions and loops
K1 to K5	CO3	Understand the concepts of functions and class
	CO4	Understand the concepts of python libraries
	CO5	Realize the applications Artificial intelligence in Physics

Syllabus

UNIT I (6 hrs)

Introduction to Python

Python on different operating systems - Variables – Strings – Numbers – Comments – List – Changing, Adding and Removing Elements – Organizing a List – Looping through List – **Making Numerical List***.

UNIT II (6 hrs)

Conditions and Loops

Conditional Tests - If statements with Lists – Dictionaries – Nesting - While statement – Infinite loops - Continue statement – For loops – Counting and summing loops – Maximum and minimum loops - Loop with Lists and Dictionaries.

UNIT III (6 hrs)

Functions and Class

Functions – Styling - Creating and Using a Class – Opening files – Text files – Reading files – Searching through files – Writing files – Testing a   Function – Testing a Class.

UNIT IV (6 hrs)

Python Libraries

Basic Numpy: 2D Numpy Arrays - Pandas: Basic data manipulation - Matplotlib: Basic plotting – Plot types - Image functions - Axis functions - Figure functions - 2D and 3D plots - Annotations and   texts.

UNIT V (6 hrs)
Applications of Artificial Intelligence in Physics
Introduction to AI – History of AI - Applications of AI in communication - Types of Artificial Intelligence (ANI, AGI, ASI) - Application of Artificial Intelligence in Physics (Particle Physics, Statistical Physics, Astrophysics, Quantum Mechanics, Materials Science, Atmospheric Physics)
* Self Study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books
1. Eric Matthes(2019), Python Crash Course - 2nd Edition, No Starch Press
2. Wes McKinney (2013), Python for Data Analysis - O'Reilly Media
3. International Journal of Education, Modern Management, Applied Science & Social Science (IJEMMASSS) ISSN : 2581-9925 Volume 05, No. 01(II), January - March, 2023, pp. 11-17

Reference Books
1. Charles R. Severance, (2017), Python for Everybody: "Exploring data using Python 3", Schroff Publishers, ISBN 978-9352136278.
2. Timothy C. Needham, (2017), Python for Beginners: A crash course guide to learn python in 1 week.

e-Resources:
1. https://www.python.org/about/gettingstarted/
2. https://www.w3schools.com/python/python_intro.asp
3. https://www.youtube.com/watch?v=QXeEoD0pB3E&list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3
4. https://archive.nptel.ac.in/courses/106/106/106106182/
5. https://www.youtube.com/watch?v=7wnove7K-ZQ&list=PLu0W_9lII9agwh1XjRt242xIpHhPT2llg

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	H	H
CO 2	H	S	H	S	S
CO 3	S	S	H	H	S
CO 4	H	H	S	S	S
CO 5	H	S	H	S	H

S- Strong   **H-High**   **M-Medium**   **L - Low**

Sub.Code: 25UBI6S3

Programme Code :	For B.A., BBA, B.Com, BCA and B.Sc., Degree Students			
Skill Based Subject 3 - BASICS OF INTELLECTUAL PROPERTY RIGHT'S				
Batch 2025-2026	Hours / Week 2	Total Hours 30	Credits 2	Skill Development

Course Objectives

To enable the learners to
1. create awareness about recent trends in IPR and Innovation
2. explore the basic concepts IPR
3. focus upon trademarks, copyrights, patents, industrial designs and traditional knowledge.
4. learn more about managing IP rights and legal aspects.

Course Outcomes

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

K1 - K5	CO1	Know about basic concepts of IPR and patent	
	CO2	Understand copyrights, industrial designs and geographical indication of goods.	
	CO3	Differentiate between trademarks and trade secrets	
	CO4	Acquire knowledge on parotection of traditional knowledge and plant varieties.	
	CO5	Manage and protect IP Rights	

UNIT – I   **(6 hours)**
Introduction -origin and development of Intellectual Property Rights (IPR), need for protecting IP, **Patents:** Foundation of patent law, patent searching process, basic criteria of patentability. Patentable and non - patentable subject matters in India. Patent prior art search, drafting the patent specification and filing procedure

UNIT – II   **(6 hours)**
Copyrights: Fundamentals of copyright law, originality of material, right of reproduction, right to perform the work publicly, copyright ownership issues, notice of copyright. **Industrial Designs:** Kind of protection provided in Industrial design. **Geographical Indication of Goods:** Basic aspects and need for the registration.

UNIT – III   **(6 hours)**
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, transfer of rights, selecting and evaluating trademark, registration of trademarks, claims. **Trade Secrets:** Trade secret law, determination of trade secret status, liability form is appropriation of trade secrets, trade secret litigation.

UNIT – IV   **(6 hours)**
Protection of traditional knowledge - Objectives, concept of traditional knowledge, issues concerning, bioprospecting and biopiracy. **Protection of Plant Varieties -** Objectives, international position, plant varieties protection in India. Rights of farmers, breeders and researchers.

UNIT- V   **(6 hours)**
Managing IP Rights: Acquiring IP Rights: letters of instruction, joint collaboration agreement, protecting IP Rights: non-disclosure agreement, cease and desist letter, settlement memorandum. **Transferring IP Rights:** Assignment contract, license agreement, deed of assignment. Infringement and enforcement.

Teaching Methods: Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Ramakrishna Chintakunta and M. Geethavani (2022). A Textbook of Intellectual Property \
   Rights. Blue Hills publications.
2. N.K Acharya (2021).Intellectual property rights(8[th]Edn). Asia Law House.
3. Craig Allen Nard, Michael J. Madison, and Mark P. McKenna. (2017). Law of Intellectual
   Property (5[th]Edn). New York Aspen publishers.
4. Barrett and Margreth (2009). Intellectual Property. New York Aspen publishers.
5. Deborah E.Bouchoux(2013). Intellectual property:The Law of Trademarks, Copyrights, Patents,
   and Trade Secrets. Publisher: Cengage India

REFERENCES

1. B.Ramakrishna and H.S.Anil Kumar (2017). Fundamentals of Intellectual Property Rights: For
   Students, Industrialist and Patent Lawyers.Notion Press.
2. V. K. Ahuja(2013). Law relating to Intellectual Property rights (2nd Edn). LexisNexis.
3. R. Radhakrishnan and S. Balasubramanian(2008).Intellectual property rights: Text and Cases.
   Excel Books India.
4. D. Goeland S. Parashar (2013). IPR Biosafety and Bioethics. Pearson Education India.

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	H	H
CO 2	H	S	H	S	S
CO 3	S	S	H	H	S
CO 4	H	H	S	S	S
CO 5	H	S	H	S	H

S- Strong   **H-High**   **M-Medium**   **L - Low**

CIA EXAMINATION MARK BREAKUP

The CIA Examination mark breakup for the course **Basics of IPR** is given below:

S.No.	Distribution Component	Marks
1	CIA I – 75 Marks Converted to 30	30
2	CIA II – 75 Marks Converted to 30	30
3	Assignment I	10
4	Assignment II	10
5	Attendance	05
6	Any Case Study related to IPR (as a Group)	15
	Total	**100**

QUESTION PAPER PATTERN
The following question paper pattern will be followed for the above said courses:

Section A - Multiple Choice $(10 \times 1 = 10$ Marks)
Section B - Either or Type $(5 \times 5 = 25$ Marks)
Section C - Either or Type $(5 \times 8 = 40$ Marks)

Maximum Marks : 75   Duration : 3 Hours

Sub Code: 25EVS101

Programme Code: 03		B.Sc. Physics		
Title of the Paper		**Part IV – Environmental Studies**		
Batch 2025-2026	**Semester 1**	**Hours/Week 2**	**Total Hours 30**	**Credits 2**

Course Objectives

1. The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi- disciplinary nature of environmental health sciences
2. To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
3. To shape students into good "Ecocitizens" thereby catering to global environmental needs.
4. This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil
5. The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

Course Outcomes (CO)

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

	CO 1	Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems
	CO2	Develop an in depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues
K1-K5	CO3	Acquire values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones
	CO4	Gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity
	CO5	Appraise the major concepts and terminology in the field of environmental pollutants,its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems

Syllabus

UNIT I (6 hrs)
Multidisciplinary nature of Environment
Definition : scope and importance – Need for public awareness - Natural resources – Types of resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – EnergyResources – Land Resources.

UNIT II (6 hrs)
Ecosystems
Concept of an ecosystem – Structure and functions of an ecosystem – Procedures, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids – Structure and function of the following ecosystem – Forest Ecosystem – GrasslandEcosystem – Desert Ecosystem – Aquatic Ecosystem.

UNIT III (6 hrs)
Biodiversity and its conservation
Introduction – Definition – Genetic – Species and ecosystem diversity- Bio geographical classification of India – Value of biodiversity – Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity – Threats to biodiversity - Endangered and endemic species of India – Conservation of Biodiversity – *Insitu* Conservation of Biodiversity – *Exsitu* Conservation of Biodiversity

UNIT IV (6 hrs)
Environmental Pollution
Definition - Causes, effects and control measures of : Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution – Disaster Management – Food, Drought, Earthquake, Tsunami, Cyclone and Landslide.

UNIT V (6 hrs)
Social issues and the environment
Sustainable Development – Smart City, Urban planning, Town Planning , Urban problems related to energy – Water Conservation: Rain Water Harvesting and Watershed Management – Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl – Consumerism and waste products – Environmental Protection Act – Air Pollution Act (Prevention and Control) – Water Pollution Act (Prevention and control) – Wild Life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness – Human Population and the environment – Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV/ AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health.

Teaching Methods
- Smart Class Room / Power point presentation / Seminar / Quiz / Discussion

Text Book:
1. P.Arul, (2004), A Text Book of Environmental Studies, Environmental Agency, No. 27, Nattar street, Velacherry main road, Velacheery, Chennai - 600042, First Edition 2004.

Reference Books:
1. Purohit Shammi Agarwal, A Text Book of Environmental Sciences - Publisher Mrs.Saraswati Prohit, Student Education, Behind Naswan Cinema, Chopansi Road, Jodhpur – 342003.

2. Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering - Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, New Delhi -110 006.

3. J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering - Publisher Prentice Hall of India Private Ltd., New Delhi – 110 001.

UPH -90 –

Question Paper Pattern

Duration: 3 hours   **Total Marks: 50**

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

Sub.Code: 25VED201	Programme Code:	For B.A., BBA, B.Com, BCA and B.Sc., Degree Students	
	VALUE EDUCATION – MORAL AND ETHICS		
Batch 2025-2026	Hours / Week 2	Total Hours 30	Credits 2

COURSE OBJECTIVES

1. To impart Value Education in every walk of life.
2. To help the students to reach excellence and reap success.
3. To impart the right attitude by practicing self introspection.
4. To portray the life and messages of Great Leaders.
5. To insist the need for universal brotherhood, patience and tolerance.
6. To help the students to keep them fit.
7. To educate the importance of Yoga and Meditation.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 - K5	CO1	will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice
	CO2	will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations
	CO3	can emulate the principled life of great warriors and take it forward as a message to self and the society
	CO4	will be able to Analyse the Practical outcome of practicing Moral values in real life situation
	CO5	could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills

SYLLABUS

UNIT I: (4 hrs)
Moral and Ethics: Introduction – Meaning of Moral and Ethics – Social Ethics – Ethics and Culture – Aim of Education.

UNIT II: (6 hrs)
Life and Teachings of Swami Vivekananda: Birth and Childhood days of Swami Vivekananda – At the Parliament of Religions – Teachings of Swami Vivekananda

UNIT III: (4 hrs)
Warriors of our Nation: Subhas Chandra Bose – Sardhar Vallabhbhai Patel – Udham Singh – V. O. Chidambaram Pillai – Bhagat Singh – Tiruppur Kumaran – Dheeran Chinnamalai – Thillaiaadi Valliammai – Velu Nachiyar – Vanchinathan

UNIT IV: (8 hrs)
Introduction -yoga and its benefits - Ardhasiddhasana- Yoga for peace- Yoga for health - Yoga for wellbeing - Yoga for success - Brain yoga benefits - The science of Yoga.

UNIT V: (8 hrs)
Isha kriya -Surya Shakthi and it's benefits.

Teaching Methods: Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

Text Books:
- Value Based Education – Moral and Ethics – compiled by Kongunadu Arts and Science College (Autonomous), 3rd Edition (2024).

Reference Books:
1. Swami Vivekananda - A Biography, Swami Nikhilananda, Advaita Ashrama, India, 24th
   Reprint Edition (2010).
2. Gandhi, Nehru, Tagore and other eminent personalities of Modern India, Kalpana Rajaram,
   Spectrum Books Pvt. Ltd., revised and enlarged edition(2004).
3. Freedom Fighters of India, Lion M.G. Agrawal, Isha Books Publisher, First Edition (2008).
4. Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication(2000).

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Question Paper Pattern

Duration: 3 hours   **Total Marks: 50**

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

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Extra Departmental Course (EDC)

Physics in Everyday life (25UPH5X1)

Sub. Code: 25UPH5X1

Programme Code: 03			B.Sc. Physics		
Title of the Paper			**Extra Departmental Course (EDC) - Physics in Everyday life**		
Batch 2025-2026	**Semester 5**	**Hours/Week 2**	**Total Hours 30**	**Credits 3**	**Skill Development**

Course Objectives

To study about the

1.Physics of Universe and solar systems

2.Principles, advancements and applications of Physics in various fields.

3.Physics principles involved in common household appliances

Course outcomes (CO)

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

K1 to K5	CO1	Understand origin of universe and study about planets.	
	CO2	Study Physics in Human anatomy.	
	CO3	Study about various Physics principles behind sports.	
	CO4	Apply of Physics in Technology.	
	CO5	Realize Physics in appliances	

Syllabus

Unit I (6 hrs)

Physics of Universe and Solar system

Origin of the Universe - Big bang theory - Oscillating theory – Steady state theory – Sun – Solar system – Interior planets – exterior planets - Moon - Bode's law.

Unit II (6 hrs)

Physics in Human Body

Eyes as an optical instrument - Vision defects - Rayleigh criterion and resolving power, Sound wavesand hearing - Sound intensity - Decibel scale - temperature control.

Unit III (6 hrs)

Physics in Sports

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

Unit IV (6 hrs)

Physics in Technology

Microwave ovens - CCDs – Lasers – Displays - Optical recording: **CD, DVD Player *** - Electric motors : Hybrid car - Telescope – Microscope - Projector.

Unit V (6 hrs)

Physics in Appliances

Pressure cooker - Automatic wrist watches - Air conditioner - Refrigerator - Television - Computer -Global Positioning System - Smoke Detectors - Polaroid Sunglasses

* Self Study

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion /

Flipped Class / Peer Learning / Experiential Learning / Blended Learning.

UPH - 95 –

Text Books:
1. F.W.Sears, M. Zemansky, R.A.Freedman, and H.D.Young, (2004), University Physics - PearsonEducation, UK
2. The Hindu Speaks on Scientific facts, (2017) - Kasturi & Sons Ltd, India.

Reference Books:
1. Hugh D. Young, (2012), College Physics - Pearson Education, UK
2. D. Halliday, R. Resnick, J. Walker, (2014), Fundamentals of Physics – John Wiley & Sons, India.

e-Resources:
1. https://www.youtube.com/watch?v=pivS9HzattI
2. https://www.youtube.com/watch?v=XV3PTLBBTzs
3. https://www.youtube.com/watch?v=k6zRYoUs_YA
4. https://www.youtube.com/watch?v=D9_2qtD8flo
5. https://www.youtube.com/watch?v=SQDWNdO6xE4

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	S	H
CO 2	H	S	S	S	S
CO 3	S	S	S	H	S
CO 4	S	H	S	S	S
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L - Low

EDC - Question Paper Pattern

Duration: 3 hrs   **Max: 75 marks**

Section - A (10x1=10)
Choose the correct answer

Section - B (5x5=25)
Short answer questions, either or type, one question from each unit.

Section - C (5x8=40)
Essay answer questions, either or type, one question from each unit.

CIA EXAMINATION MARK BREAKUP
(For Theory Only)

S. NO	DISTRIBUTION COMPONENT	MARKS
1.	CIA I – 75 Marks Converted to 40	**40**
2.	CIA II – 75 Marks Converted to 40	**40**
3.	Assignment I	**05**
4.	Assignment II	**05**
5.	Attendance	**05**
6.	Others (Seminar, Group Discussion, Flipped Class room, etc.,)	**05**

	Total	100

Add on Courses

1. Job Oriented Course

2. Advanced Learners Course

Programme Code: 03				B.Sc. Physics		
Title of the Paper				**JOC - Electrical Appliances: Maintenance and Servicing**		
Batch 2025-2026	**Semester 3 / 5**	**Hours/Week 2**	**Total Hours 30**	**Extra Credits 2**	**Employability**	

Course Objectives

To study about

1. Fundamentals of electricity, electrical connections and wiring
2. Heating and motorized appliances
3. Refrigerator, air cooler and air conditioner appliances

Course Outcomes (CO)

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

K1- K5	CO1	Understand the fundamentals of electricity
	CO2	apply the fundamentals of electrical connections and wiring
	CO3	Know about heating appliances
	CO4	Apply motorized appliances
	CO5	Know about refrigerator, air cooler and air conditioner appliances

Syllabus

UNIT I (6 hrs)

Fundamentals of electricity

Electrical charge – current – potential – Ohm's law – electrical energy – power – consumption of electrical power – resistance – capacitance – inductance – Meters: Galvanometer, ammeter, voltmeter and Megger - Measuring and Checking: Basics and usage of Multimeter - Checking transistors and diodes in circuit measurements.

Unit II (6 hrs)

Electrical connections and wiring

Soldering station: Soldering Iron – Flux – lead - Zero defect soldering – Desoldering pump - AC and DC – single phase and three phase connections. Switches – ceiling rose – lamp holders, sockets – Fuse base – Distribution box – Miniature Circuit Breaker (MCB) – Electromagnetic relays - Earthing Process - Electrical Wiring – Main board preparation – Distribution – Cut-out preparation – Switch board preparation – Safety precautions.

Unit III (6 hrs)

Heating appliances

Heater types – working principle – Heating Rod – Iron Box – Iron box with steamer – Toasters – Geysers – Microwave Oven: Oven disassembling and assembling procedure – Fault indicator – Testing and troubleshooting methods.

Unit IV (6 hrs)

Motorized appliances

Types of Motors: DC and AC motors – fans – mixers – blenders – wet grinders: circuit connection - testing methods - Washing machine: Electrical connections – assembly – Dish washer : Electrical connection – Testing and troubleshooting methods.

Unit V 6 hrs

Refrigerator and Air conditioner appliances

Refrigerator: Electrical connection – Compressor – coolants – automatic defrost circuits – Testing

and troubleshooting of refrigerators – Air coolers and Air conditioners: Mounting and fixing of air conditioners – testing and troubleshooting methods.

UPH - 98 –

Text Books:
1. B.L.Theraja, A.K.Theraja, (2006), A Textbook of Electrical Technology - S.Chand & Co., New Delhi.
2. J.B.Gupta, (2013), An Integrated Course in Electrical Engineering - S.K.Kataria & Sons, New Delhi.

Reference Books:
1. Eric Kleinert, (2012), Troubleshooting and Repairing Major Appliances - Mc Graw Hill, India.
2. H.Partas, (2017), Arts And Science of Utilization of Electrical Energy - Dhanpat Rai & Sons, New Delhi.

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	S	H
CO 2	H	S	S	S	S
CO 3	S	S	S	H	S
CO 4	S	H	S	S	S
CO 5	H	S	S	S	H

S- Strong	H-High	M-Medium	L - Low

UPH - 99 –

Programme Code: 03			B.Sc. Physics		
Title of the Paper			**ALC - Measurement techniques and Data analysis**		
Batch 2025-2026	Semester -	Hours/Week -	Total Hours -	Extra Credits 2	Entrepreneurship

Course Objectives

To study about

1. Basic concept of measurement & transducers
2. Measurement of error and standards of measurements
3. Electronic and vibration measuring instruments

Course Outcomes (CO)

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

	CO1	Understand the basic concept of measurement & transducers
	CO2	Know about measurement of error
K1 - K5	CO3	Gain idea on standards of measurements
	CO4	Know about electronic measuring instruments
	CO5	Know about vibration measuring instruments

Syllabus

Unit I (6 hrs)
Basic concept of measurement & transducers
Introduction - System configuration – Problem Analysis – Basic Characteristics of measuring devices,Calibration - Transducers: capacitive, transducer - Photoelectric effect – Photoconductive Transducers - Piezoelectric transducers - temperature and pressure transducers.

Unit II (6 hrs)
Measurement of errors
Accuracy, precision, Significant Figures - types of errors - Statistical Analysis - Probability of errors -limiting error

Unit III (6 hrs)
Standards of measurements
Classification of standards - Standards for Mass, Length and Volume - time and frequency standards,electrical standards, standards of temperature and luminous intensity.

Unit IV (6 hrs)
Electronic Measuring Instruments
Q meter - Vector impedance meter - Digital frequency meter – Digital voltmeter – Phase meter - RF power and voltage measurement – Power factor meter – Vector voltmeter.

Unit V
Vibration measuring instruments (6 hrs)
Random vibration – Shock – analyzing vibration sensing devices – generalized second order system – Absolute displacement – Absolute velocity and acceleration vibrating sensing devices - Banded strain gauge accelerators – Piezoelectric accelerometer.

Text Books:
1. Hefrick. A.O, Cooper, (2019), Modern Electronic Instrumentation and Measurement Techniques

Prentice Hall India, New Delhi.

2. C.S. Rangan, G.R. Sharma, (1997), Instrumentation Devices and Systems - Tata McGraw Hill

UPH -100 –

Reference Books:

1. WD. Cooper, (2015), Electronic Instrumentation and Measurement Techniques – Prentice Hall India,New Delhi.
2. William Bolton, (1996), Measurement and Instrumentation Systems – Newnes Books, UK.

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Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	S	H
CO 2	H	S	S	S	S
CO 3	S	S	S	H	S
CO 4	S	H	S	S	S
CO 5	H	S	S	S	H

S- Strong   **H-High**   **M-Medium**   **L - Low**

Certificate Courses

1. Certificate course in Astrophysics

2. Certificate course in Non-Conventional Energy

3. Certificate course in Electronic Instrumentation

CAP -2 -

Certificate course in Astrophysics

Scheme of CurriculumDuration: 6 months

Sub. Code	Subject	Instr. Hours /week	Internal	External	Max marks	Exam. Hrs.	Credits
25CAP101	**Theory 1-** Astronomy and Astrophysics	2	25	75	100	3	2
25CAP102	**Theory 2-** Stellar Evolution and Astronomical Imaging	2	25	75	100	3	2
25CAP1Z1	**Project and Viva-voce**	-	20	80	100	3	2
Total marks					300		6

Question Paper Pattern

Theory Examination: **External Max. Marks: 75**

Section - A (10× 1 = 10 Marks)
Multiple Choice (2 Questions from Each Unit)

Section -B (5 × 5 = 25 Marks)
Either or type (1 Question from Each Unit)

Section - C (5 × 8 = 40 Marks)
Either or type (1 Question from Each Unit)

Project and viva-voce:	External Max. Marks: 80
Project Report Presentation	: 60 Marks
Viva-voce	: 20 Marks

CAP - 3 –

Programme Code: 03		B.Sc. Physics			
Title of the Paper		Astronomy and Astrophysics			
Batch 2025-2026	Semester Odd	Hours/Week 2	Total Hours 30	Credits 2	Skill Development

Course Objectives

To enable the learners
1. To know about the universe and astronomical objects
2. To know about the astronomical instruments, Indian astronomy and astronomers
3. To know about the applications of astronomy

Course Outcomes (CO)

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

	CO1	Understand the origin of universe.
K1 - K5	CO2	Gain knowledge on astronomical objects
	CO3	Acquire knowledge on astronomical instruments
	CO4	Know about Indian Astronomy and Astronomers
	CO5	Realize various applications of astronomy

UNIT I (6 hrs)
Origin of Universe
Big bang theory- Evidences of big bang theory- Steady state theory - Future of Universe - Pulsating theory - Tidal and planetesimal theories- Hertzprung Russel Diagram- Saha's ionization theory

UNIT II (6 hrs)
Astronomical Objects
Classification of celestial bodies: Stars- Planets- Satellites- Comets- Asteroids- Meteors and meteorites-Galaxies- Red giants- White drawfs - Quasers- Chandrasekar's mass limit - Rotating black holes- Schwarzchild radius

UNIT III (6 hrs)
Astronomical Instruments
Hubble Space telescope- Basics of orbiting telescope - Reflecting telescope - Types of reflecting telescope - Parapoloid reflection antenna- Broad band antenna- Arrays

UNIT IV (6 hrs)
Indian Astronomy and Astronomers
Hindu calendar – Indian Astronomers: Lagadha – Aryabhatta - Bhramagupta - Varahamihira - Bhaskara I – Indian astronomy in comparison with greek, Chinese and Europe astronomies - Astronomy research institutes in India – Modern day astrophysicists in India.

UNIT V (6 hrs)
Applications of Astronomy
Bioastronomy- Habitable planets- Space shuttles- Geosynchronous satellite-Search for extraterrestrial intelligence (SETI) - UFO phenomenon- Radio telemetry- space probes.

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz / Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

CAP - 4 –

Sub. Code: 25CAP101

Text Books:
1. A.B.Bhattacharya, S.Joardar, R.Bhattacharya, (2010), Astronomy and Astrophysics - OverseasPress, New Delhi
2. Baidyanathan Basu, (2001), An Introduction to Astrophysics - Prentice Hall of India, NewDelhi.

Reference Books:
1. J.V.Narlikar, (1983), Introduction to Cosmology - Cambridge University Press, UK.
2. K.D.Abhyankar, (1992), Astrophysics- Stars and galaxies - University Press, India.
3. K.S.Krishnaswamy, (2002), Astrophysics: A modern perspective - New Age International Pvt.Ltd, New Delhi.

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	H	H
CO 2	H	S	H	S	S
CO 3	S	S	H	H	S
CO 4	H	H	S	S	S
CO 5	H	S	H	S	H

S- Strong   H-High   M-Medium   L - Low

CAP - 5 –

Programme Code: 03		B.Sc. Physics			
Title of the Paper		**Stellar Evolution and Astronomical imaging**			
Batch 2025-2026	**Semester Odd**	**Hours/Week 2**	**Total Hours 30**	**Credits 2**	**Skill Development**

Course Objectives

To enable the learners
1. To know about the calendar and constellations
2. To know about the stellar distances and stellar evolution
3. To know about the luminosity of stars and advanced astronomical imaging techniques

Course Outcomes (CO)

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

	CO1	Understand sky and calendar
	CO2	Get exposure to measure the distances in space
K1 - K5	CO3	Gain knowledge about the evolution of stars, their birth and decay
	CO4	Understand intensity of stars and their measurements
	CO5	Acquire knowledge on advanced imaging methods and analysis

Unit I (6 hrs)
Sky and Calendar
Motion of the Earth - Sidereal day and sidereal time - Celestial co-ordinates - Celestial sphere - Universal equatorial system – Calendars : Moon - Sun and stars as calendars - Constellations – Aries, Pisces - Orion and Cassiopeia - Interesting objects in the sky : Summer triangle - North Polaris and Big dipper (Saptarishi).

Unit II (6 hrs)
Stellar distances
Measurement of terrestrial distances - Measurement of distances within solar system (Moon, planet and Sun) - Astronomical unit and its measurement by aberration of star light - Trigonometric parallaxes of stars - Method of luminosity distance (concept of absolute magnitude) - Spectroscopic parallax - Period luminosity law.

Unit III (6 hrs)
Stellar Evolution
Protostar – Birth - Maturity - Aging of stars (main sequence) - Death of small stars - Death of massive stars (supernova explosion) - Pulsars and neutron stars - Binary Stars.

Unit IV (6 hrs)
History and Luminosity of Stars
Ptolemy's astronomical work - Copernican heliocentric system - Tycho and Kepler's system - Galileo work - Newton's law of gravitation - Kepler's laws of planetary motion - Luminosity (apparent and absolute) of stars - Magnitude scale - Measurement of apparent luminosity by visual, photographic and photoelectric methods.

Unit V (6 hrs)
Advanced Astronomical Imaging
Imaging and detector basics - Fourier transform - Deconvolution and Image reconstruction – Photography - CCD - Large optical / IR telescopes and their designs - Thin lens - Segmented mirrors - Active optics - Designs of few upcoming large telescopes (eg. EVLT, TMT) - Interferometry -

Michelson stellar interferometer.

<div align="center">CAP – 6 –</div>

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz / Discussion / Flipped
   Class / Peer Learning / Experiential Learning / Blended Learning

Study Books:
1.Thomas T. Arny, (1994), Exploration – An Introduction to Astronomy- Mosley-Year Book Inc.
2.Baidhnath Basu, (2014), An Introduction to Astrophysics- PHI Course Pvt. Ltd.
3.Ian S. McLean, (2008), Electronic Imaging in Astronomy: Detectors and Instrumentation, Springer.

Reference Books:
1. R. Jastrow, M. H. Thomson, (1984), Astronomy Fundamentals and Frontiers- John Wiley.
2. M. Jay, Astronomy, (1992), From the Earth to the Universe - Pasachoff Books / Cole ThomsonCourse, W B Saunders Co Ltd, UK.
3. Theo Koupelis Jones, Barttlett Course, (2010), In Quest of the Universe - LLC Publications,New York.
4. K.D.Abhyankar, (2012), Astrophysics: Stars and Galaxies - Tata McGraw Hill Publication, India

<div align="center">**Mapping**</div>

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	H	H
CO 2	H	S	H	S	S
CO 3	S	S	H	H	S
CO 4	H	H	S	S	S
CO 5	H	S	H	S	H

S- Strong   **H-High**   **M-Medium**   **L - Low**

Certificate course in Non-Conventional Energy

Scheme of Curriculum Duration: 6 months

Sub. Code	Subject	Instr. Hours /week	Internal	Exter nal	Max marks	Exam .Hrs.	Credits
25CNE101	**Theory 1** Non-Conventional Energy sources and Storage System	2	25	75	100	3	2
25CNE102	**Theory 2** Energy Management and Auditing	2	25	75	100	3	2
25CNE1Z1	**Project and Viva voce**	-	20	80	100	3	2
Total marks					**300**		**6**

Question Paper Pattern

Theory Examination: **External Max.Marks: 75**

Section - A (10× 1 = 10 Marks)
Multiple Choice (2 Questions from Each Unit)

Section -B (5 × 5 = 25 Marks)
Either or type (1 Question from Each Unit)

Section - C (5 × 8 = 40 Marks)
Either or type (1 Question from Each Unit)

Project and viva voce: **External Max.Marks: 80**
Project Report Presentation   : 60 Marks
Viva voce   : 20 Marks

CAP – 8 –

Programme Code: 03		B.Sc. Physics			
Title of the Paper		**Non-Conventional Energy sources and storage system**			
Batch **2025-2026**	**Semester** **Odd**	**Hours/Week** **2**	**Total Hours** **30**	**Credits** **2**	**Skill Development**

Course Objectives

To enable the learners to
1. Understand various forms of non-conventional energy sources and ways to harness energy from theseenergy sources.
2. Have a broad understanding of scientific principles that underpin the operation of such systems.
3. Acquire knowledge on different types of energy storage systems.

Course Outcomes (CO)

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

	CO1	Know about the need of non-conventional energy
	CO2	Gain knowledge on solar and wind energy
K1 - K5	CO3	Acquire knowledge on Biomass, Wave, Tidal and Geothermal energy
	CO4	Understand MHD, Thermal and Hydrogen energy
	CO5	Acquire knowledge on different energy storage systems

Syllabus

UNIT I (6 hrs)
Need of Non-conventional energy Sources
Energy Resources- Global warming and ocean acidifications- Classifications- Energy Parameters- Non- conventional sources- Significance- Merits and Demerits- Environmental Aspects- Energy Chain.

UNIT II (6 hrs)
Solar and Wind Energy
Solar radiation measurements- Solar Collectors- Flat plate type- Concentrating collectors- Applications of Solar Energy- Solar water heater- Solar Cell- Solar distillation- Solar pump - Wind energy conversionsystem.

UNIT III (6 hrs)
Biomass, Wave, Tidal and Geothermal energy
Biomass energy generation- Wave energy generation and conversion devices- Advantages and Limitations of wave energy- Tidal power generation systems- Advantages and Limitations of tidal energy- Geothermal energy- Origin and Nature- Energy extraction- Advantages and Limitations of geothermal energy.

UNIT IV (6 hrs)
MHD, Thermal and Hydrogen energy
Magnetohydrodynamics (MHD) generation - Thermionic convertor - Thermoelectric power - Thermonuclear fusion energy - Hydrogen energy - Solar hydrogen.

CAP – 9 –

Sub. Code : 25CNE101

UNIT V   **(6 hrs)**
Energy Storage Systems
Electrical storage- Batteries- Supercapacitor- Mechanical storage- Compressed air storage- Flywheel- Chemical storage- Energy storage via Hydrogen- Ammonia- Reversible chemical reaction- Thermal energy storage- Sensible heat storage- Latent heat storage.

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books:
 1. G.D. Rai, (1998), Non-conventional Energy Sources, Khanna Publishers, New Delhi.
 2. Tasneem Abbasi, S.A. Abbasi, (2010), Renewable Energy Sources: Their impact on globalwarming and pollution - PHI Learning, India.

Reference Books:
 1. D.P. Kothari, K.C. Singal, Rakesh Ranjan, (2018), Renewable energy sources and technologies - PHI Learning, New Delhi.
 2. Godfrey Boyle, (2010), Renewable energy: Power for a Sustainable future - Oxford University Press, UK.
 3. John Andrews, Nick Jelley, (2007), Energy Science: Principles, Technologies and Impacts - Oxford University Press, UK.

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	H	S	H
CO 2	H	H	S	S	S
CO 3	S	S	H	H	H
CO 4	H	S	S	H	S
CO 5	S	H	S	H	H

S- Strong   **H-High**   **M-Medium**   **L - Low**

Sub. Code : 25CNE102

Programme Code: 03		B.Sc. Physics			
Title of the Paper		**Energy Management and Auditing**			
Batch 2025-2026	**Semester Odd**	**Hours/Week 2**	**Total Hours 30**	**Credits 2**	**Employability**

Course Objectives

To enable the learners to

1. Understand the concepts and features of energy conservation.
2. Gain knowledge on energy management techniques.
3. Acquire knowledge on energy audit.

Course Outcomes (CO)

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

K1 to K5	CO1	Understand the concept of energy conservation.
	CO2	Know about energy management techniques.
	CO3	Gain knowledge on methodologies of energy audit.
	CO4	Acquire knowledge on material and energy balance.
	CO5	Understand the duties and responsibilities of energy manager and energy auditors.

Syllabus

UNIT I (6 hrs)
Energy conservation
Introduction- Salient features- Opportunities- Energy conservation in households- Transport sector- Agricultural sector- Industrial sector- Lighting- Energy saving opportunities.

UNIT II (6 hrs)
Energy management
Concept of Energy management– Techniques- Tariff- Objectives- Characteristics- Types: Simple- Flat rate- Block rate- Two part- Maximum demand- Power factor- Three part.

UNIT III (6 hrs)
Energy Audit
Concept of Energy Audit- Type- Methodology: Preliminary and Detailed- Procedure for conducting Energy Audit- Preparation- Execution- Reporting- Collecting data strategy- Technical and Economic feasibility.

UNIT IV (6 hrs)
Material and Energy Balance
Components of material and energy balance- Basics principles- Classification of Processes- Procedures of Material and Energy balance- Facility as an Energy system-Energy analysis- Sankey Diagram.

UNIT V (6 hrs)
Energy Managers and Auditors
Energy Conservation Act- Characteristics- Energy Managers: Duties- Responsibilities- Energy Auditors: Duties- Responsibilities- Energy Audit instruments- Energy audit applied to Buildings- Computer software and Formats for Energy Audits.

CAP – 11–

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped
 Class / Peer Learning / Experiential Learning / Blended Learning

Study Books:

1. Anil Kumar, Om Prakash, Prashanth Singh Chauhan, Samsher, (2020), Energy Management, Conservation and Audits- CRC Press, Florida.
2. Albert Thumann, Terry Niehus, William J. Younger, (2013), Handbook of Energy Audits, The Fairmont Press Inc., Georgia.

Reference Books:

1. General Aspects of Energy management and Energy Audit (2015), Bureau of EnergyEfficiency, New Delhi.
2. Sonal Desai, (2015), Handbook of Energy Audits- Mc Graw Hill, India.

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	H	S	H
CO 2	H	H	S	S	S
CO 3	S	S	H	H	H
CO 4	H	S	S	H	S
CO 5	S	H	S	S	H

S- Strong   H-High   M-Medium   L - Low

Certificate course on Electronic Instrumentation
Scheme of CurriculumDuration: 6 months

Sub. Code	Subject	Instr. Hours /week	Internal	External	Max marks	Exam. Hrs.	Credits
25CEI101	**Theory 1** Basic Electronic Instrumentation	2	25	75	100	3	2
25CEI102	**Theory 2** Modern Electronic Instrumentation	2	25	75	100	3	2
25CEI1Z1	**Project and Viva voce**	-	20	80	100	3	2
Total marks					300		6

Question Paper Pattern

Theory Examination: **External Max.Marks: 75**

Section - A ($10\times 1 = 10$ Marks)
Multiple Choice (2 Questions from Each Unit)

Section -B ($5 \times 5 = 25$ Marks)
Either or type (1 Question from Each Unit)

Section - C ($5 \times 8 = 40$ Marks)
Either or type (1 Question from Each Unit)

Project and viva voce: **External Max. Marks: 80**
Project Report Presentation   : 60 Marks
Viva voce   : 20 Marks

Subject Code : 25CEI101

Programme Code: 03		B.Sc. Physics			
Title of the Paper		**Basic Electronic Instrumentation**			
Batch 2025-2026	**Semester Even**	**Hours/Week 2**	**Total Hours 30**	**Credits 2**	**Employability**

Course Objectives

To enable the learners to

1. Understand the basic concepts of measurement and error analysis.
2. Get exposure to the knowledge on transducers and basic meters.
3. Understand the working of regulated power supply.

Course Outcomes (CO)

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

	CO1	Understand the concept of analog and digital measurement techniques
	CO2	Gain knowledge on accuracy of measurements and their error analysis
K1 to K5	CO3	Acquire knowledge on different type of transducers
	CO4	Acquire knowledge on different type of meters
	CO5	Understand the working of regulated power supply

Syllabus

UNIT-I (6 hrs)
Measurements
Measurements-methods of measurement: Direct methods – indirect methods - Classification of instruments: absolute & secondary instruments - Analog and digital modes of operations-Static characteristics of the measurement: Ture value- static error – static correction– Scale range and scale span – Repeatability – Noise.

UNIT-II (6 hrs)
Error Analysis
Accuracy and precision – indication of precision – signification figures - Linearity – Hysteresis – Threshold – Dead time - Dead Zone – Resolution - Loading effects: Loading effect due to shunt connected instruments and series connected instruments – Impedance matching and maximum power transfer theorem.

UNIT-III (6 hrs)
Transducers
Classification of transducers – classification based on electrical principle involved – Resistive position transducer – Resistive pressure transducer – self generating inductive transducer - Piezoelectric transducer – Strain gauge transducer.

UNIT-IV (6 hrs)
Meters
Basic meter movement (BMM) – characteristics of BMM – Conversion of BMM into a DC single range ammeter – multirange ammeter – DC single range voltmeter – multirange voltmeter – ohmmeter - Rectifier type of AC meters- Watt meters: Electrodynamic wattmeter – Induction wattmeter - Energy meter: Single phase induction type energy meter.

UNIT-V   **6 hrs**

Regulated Power Supply

Filter Circuits: Low pass filter - High pass filter – Band pass filter - Half wave and Full wave bridge rectifier – efficiency - Zener diode: Shunt regulator - Transistor: Series & Shunt regulator - Switched mode power supply (SMPS).

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped

   Class / Peer Learning / Experiential Learning / Blended Learning

Book for Study:

1. A.K.Sawhaney, (2005), A course in Electrical and Electronic Instruments and Instrumentation – Dhanpat Rai & Co Pvt. Ltd, New Delhi.
2. B.L.Theraja, (2019), Basic Electronics – Solid state – S.Chand & Co., New Delhi.

Books for Reference:

1. R.S.Sedha, (2019), A Text Book of Applied Electronics - S.Chand & Co., New Delhi.
2. Rajendra Prasad, (2012), Electrical Measurement and Measuring Instruments – Khanna Publishers, New Delhi.

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	H	H
CO 2	H	S	H	S	S
CO 3	S	S	H	H	S
CO 4	H	H	S	S	S
CO 5	S	H	S	H	H

   S- Strong   **H-High**   **M-Medium**   **L – Low**

Programme Code: 03		B.Sc. Physics			
Title of the Paper		**Modern Electronic Instrumentation**			
Batch 2025-2026	Semester Even	Hours/Week 2	Total Hours 30	Credits 2	Employability

Course Objectives

To enable the learners to

1. Understand different types of display techniques.
2. Acquire knowledge on waveform generators and household wiring
3. Understand the function of Ardrino platform and Internet of Things

Course Outcomes (CO)

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

	CO1	Understand the different types of display techniques
	CO2	Gain knowledge on wave form generators
K1 to K5	CO3	Get exposure to modern house hold wiring techniques
	CO4	Acquire knowledge on Arduino software interface
	CO5	Understand the concept of Internet of Things

Syllabus

UNIT-I (6 hrs)

Displays

Cathode ray tube (CRT) – Color theory - Pixel information – Resolution – Refresh rate – Active and Passive addressing - Plasma display panels (PDP) - Liquid crystal display (LCD) - Light emitting diodesdisplay (LED) - Quantum Dot LED – Flexible display.

UNIT-II (6 hrs)

Signal Generator and counter

Sine wave generator - Square wave generator - Triangle wave generator - Sawtooth wave generator – Astable and Monostable multivibrator – Frequency counter – Analog and digital oscilloscope – Digital storage Oscilloscope.

UNIT-III (6 hrs)

Household Wirings

House hold wiring – Circuit diagram – Short circuit protection – Current consumption of household appliances – Power calculation – power distribution – AC load – DC load : DC fan - LED lighting - Advantages and limitations of DC load.

UNIT-IV (6 hrs)

Arduino

Arduino interfaces – Different models of Arduino kit - Display devices - Timer display - IR Sensor - Motion sensor – Hall sensor - Humidity sensor - DC motor control - Brushless DC motor control - Temperature   sensor.

UNIT-V (6 hrs)

Internet of Things

Control of wireless relay communication through internet – Tracking of movable objects: Global Positioning System (GPS) - Navigation with Indian Constellation (NavIC) - Internet through cellular communication: Global System for Mobile (GSM) – Code division multiple access (CDMA) – Drones.

Sub. Code : 25CEI102

Teaching Methods: Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

Text Books
1. Janglin Chen, Wayne Cranton, Mark Fihn, (2016), Handbook of Display Technology - Springer International Publishing
2. R. M. Marston, (1997), 110 Waveform Generator Projects for the Home Constructor - Butterworth-Heinemann.
3. K. C. Agrawal, (2020), Electrical Power Engineering - Elsevier Science.
4. Neerparaj Rai, (2019), Arduino Projects for Engineers - BPB Publications, New Delhi.
5. Cuno Pfister, (2011), Getting Started with the Internet of Things - Maker Media.

Reference Books
1. https://create.arduino.cc/projecthub
2. https://engineering.case.edu/lab/circuitslab/sites/engineering.case.edu.lab.circuitslab/files/docs/Signal_Generator_Fundamentals-_Tektronix.pdf
3. Rajkumar Buyya, Amir Vahid Dastjerdi, (2016), Internet of Things: Principles and Paradigms - Morgan Kaufmann Press.

Mapping

CO PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	H	S	H	H
CO 2	H	S	H	S	S
CO 3	S	S	H	H	S
CO 4	H	H	S	S	S
CO 5	S	H	S	H	H

S- Strong   **H-High**   **M-Medium**   **L – Low**

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