KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE -641029

DEPARTMENT OF PHYSICS (UG)

CURRICULM AND SCHEME OF EXAMNINATIONS (CBCS)

(2022-2023)

KONGUNADU ARTS AND SCIENCE COLLGE (Autonomous)
COIMBATORE-641029

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

UPH

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

Course Name: B.Sc. PHYSICS

Curriculum and Scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2022-2023)

Semester	Part	Subject code	Title of the Paper	Instruction hours / cycle	Exam. Marks			Duration of Exam. Hrs.	Credits
					CIA	ESE	Total		
I	I	22TML101@	**Language I @**	6	50	50	100	3	3
	II	22ENG101	English I	6	50	50	100	3	3
	III	22UPH101	**Core Paper 1** - Properties of Matter and Sound	6	50	50	100	3	4
			Core Practical 1 - Practical I	3	-	-	-	-	-
		22UMA1A1	**Allied Paper 1 -** Mathematics I	7	50	50	100	3	5
	IV	22EVS101	Environmental Studies**	2	-	50	50	3	2
				30	**-**	**-**	**450**	**-**	**17**
II	I	22TML202@	**Language II @**	6	50	50	100	3	3
	II	22ENG202	English II	6	50	50	100	3	3
	III	22UPH202	**Core Paper 2** - Heat and Thermodynamics	6	50	50	100	3	4
		22UPH2CL	**Core Practical 1 -** Practical I	3	50	50	100	3	3
		22UMA2A2	**Allied Paper 1 -** Mathematics II	7	50	50	100	3	5
	IV	22VED201	**Value Education –** Moral and Ethics**	2	-	50	50	3	2
				30	**-**	**-**	**550**	**-**	**20**

III	I	22TML303@	**Language III** @	6	50	50	100	3	3
	II	22ENG303	English III	6	50	50	100	3	3
	III	22UPH303	**Core Paper 3** - Mechanics	4	50	50	100	3	4
			Core Practical 2 - Practical II	3	-	-	-	-	-
		22UCH3A3	**Allied Paper 2 -** Chemistry I	4	30	45	75	3	4
			Allied Practical - Chemistry Practical	3	-	-	-	-	-
	IV	22UGC3S1	**Skill based Subject 1 -** Cyber Security	2	100	-	100	3	3
		22TBT301/ 22TAT301/ 22UHR3N1	Basic Tamil * / Advanced Tamil** / Non-Major Elective - I **	2	-	75	75	3	2
				30	**-**	**-**	**550**	**-**	**19**
IV	I	22TML404@	**Language IV** @	6	50	50	100	3	3
	II	22ENG404	English IV	6	50	50	100	3	3
	III	22UPH404	**Core Paper 4 -** Electricity and Magnetism	4	50	50	100	3	4
		22UPH4CM	**Core Practical 2 -** Practical II	3	50	50	100	3	3
		22UCH4A4	**Allied Paper 2** - Chemistry II	4	30	45	75	3	4
		22UCH4AL	**Allied Practical -** Chemistry Practical	3	25	25	50	3	2
	IV	22UPH4S2	**Skill based Subject 2 -** Medical Instrumentation	2	50	50	100	3	3
		22TBT402/ 22TAT402/ 22UWR4N2	Basic Tamil ***** / Advanced Tamil ** / Non-Major Elective - II**	2	-	75	75	3	2
				30	**-**	**-**	**700**	-	**24**

V	III	22UPH505	**Core Paper 5** - Mathematical Physics	4	50	50	100	3	4
		22UPH506	**Core Paper 6** - Optics	4	50	50	100	3	4
		22UPH507	**Core Paper 7** - Principles of Electronic Devices and Circuits	4	50	50	100	3	4
		22UPH508	**Core Paper 8** - Quantum Mechanics and Relativity	4	50	50	100	3	4
		22UPH5E1	**Major Elective 1**	4	50	50	100	3	5
			Core Practical 3 - Practical III - General Experiments	3	-	-	-	-	-
			Core Practical 4 - Practical IV - Electronics	3	-	-	-	-	-
			Core Practical 5 - Practical V - Digital Electronics and Microprocessor	2	-	-	-	-	-
	IV		**EDC**	2	100		100	3	3
	-	22UPH5IT	Internship Training / Mini Project ****	Grade					
				30	**-**	**-**	**600**	**-**	**24**
VI		22UPH609	**Core Paper 9** - Atomic and Solid State Physics	5	50	50	100	3	4
		22UPH610	**Core Paper 10** - Fundamentals of Digital Electronics	5	50	50	100	3	4
		22UPH611	**Core Paper 11** - Nuclear Physics	5	50	50	100	3	4
		22UPH6E2	**Major Elective 2**	4	50	50	100	3	5
		22UPH6Z1	**Project and viva voce *****	-	50	50	100	-	5
		22UPH6CN	**Core Practical 3** - Practical III - General Experiments	3	50	50	100	3	4
		22UPH6CO	**Core Practical 4** - Practical IV - Electronics	3	50	50	100	3	3
		22UPH6CP	**Core Practical 5** - Practical V - Digital Electronics and Microprocessor	3	50	50	100	3	3
	IV	22UPH6S3	**Skill Based Subject 3** - Introduction to Microprocessor	2	50	50	100	3	3
	V	22 NCC $ /NSS/ YRC/ PYE/ECC/ RRC/WEC 101#	**Cocurricular Activities ***	-	50	-	50	-	1
				30	**-**	**-**	**950**		**36**
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 Cocurricular 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 – 22HIN/MLM/FRN/SAN 101 – 404

* No End-of-Semester Examinations (ESE), only Continuous Internal Assessment (CIA)

** No Continuous Internal Assessment (CIA), only End-of-Semester Examinations (ESE)

*** Project Report - 30 marks; Viva-voce - 20 marks; Internal - 50 marks.

**** The students shall undergo Mini project / Internship training for a minimum period of 2 weeks at the End of the fourth semester during summer vacation and submit the report in the fifth semester. The report will be evaluated for 100 marks along with the internal viva-voce by the respective Faculty. 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)

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. Introduction to Biophysics
4. Materials Science
5. Object orientation programming in C++
6. Soil Physics

Non - Major Elective Papers

1. Human Rights
2. Women's Rights
3. Consumer Affairs

Sub. Code & Title of the Extra Departmental Course (EDC):

22UPH5X1 - Physics in everyday life

Certificate Courses

1. Certificate course in Astrophysics
2. Certificate course in Non-Conventional Energy
3. Certificate course in Electronic Instrumentation

Add on Courses

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

 # List of Cocurricular 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	Cocurricular Activities	50	1
Total			3800	140

- 50 % CIA is applicable to all subjects except SBS1, EDC, JOC and SWAYAM courses. CC, JOC and SWAYAM courses are considered to be extra credit courses.

- The students should complete a **SWAYAM-MOOC** before the completion of the 5th semester and the course completed certificate should be submitted through the HOD to the Controller of Examinations. Two **extra credits** will be given to the candidates who have successfully completed. In case the students have completed more than one online course, the appropriate two extra credits shall be awarded to such candidates upon the submission of certificate through the HOD to the Controller of Examinations.

- A **Field Trip** preferably relevant to the course should be undertaken every year.

Components of Continuous Internal Assessment (50 Marks)

Components		Marks	Total
Theory			
CIA I	75	(75+75) converted to 30	50
CIA II	75		
Problem based Assignment**		10	
Attendance		5	
Others*		5	
Practical			
CIA Practical		(50) converted to 30	50
Observation Notebook		15	
Attendance		5	
Project			
Review		45	50
Regularity		5	

Components of Continuous Internal Assessment – Allied subjects (30 Marks & 25 Marks)

Components		Marks	Total
Theory			
CIA I	45	(45+45) converted to 15	30
CIA II	45		
Problem based Assignment**		5	
Attendance		5	
Others*		5	
Practical			
CIA Practical		(25) converted to 10	25
Observation Notebook		10	
Attendance		5	

* Class Participation, Case Studies Presentation, Field Work, Field Survey, Group Discussion, Term Paper, Workshop/Conference Participation, Presentation of Papers in Conferences, Quiz, Report/Content writing, etc.

** Two Assignments to be given (Each 5 marks).

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

(K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating)

1. Theory Examination - Part I, II, III & IV (SBS only)

i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 – K2 Q1 to 20	A (Answer all)	20 x 1 = 20	MCQ-10/ Fill ups-5/ One word-5	75**
K2 – K5 Q21 to 28	B (5 out of 8)	5 x 5 = 25	Short Answers	
K2 – K5 Q29 to 33	C (3 out of 5)	3 x 10 = 30	Descriptive / Detailed	

**** For ESE 75 marks converted to 50 marks.**

ii) CIA I & II and ESE: 45 Marks

Knowledge Level	**Section**	**Marks**	**Description**	**Total**
K1 – K2 Q1 to 10	A (Answer all)	10 x 0.5 = 5	MCQ	45
K2 – K5 Q11 to 15	B (either or type)	5 x 3 = 15	Short Answers	
K2 – K5 Q16 to 20	C (either or type)	5 x 5 = 25	Descriptive / Detailed	

2. ESE Practical Examination:

Knowledge Level	Section	Marks	Total
K3, K4, K5	Experiments	40	50
	Record Work	10	

Knowledge Level	Section	Marks	Total
K3, K4, K5	Experiments	20	25
	Record Work	05	

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

Knowledge Level	Section	Marks	Total
K3, K4, K5	Project Report	30	50
	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: 22UPH101

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Core Paper 1 - Properties of Matter and Sound		
Batch 2022-2023	Semester I	Hours/Week 6	Total Hours 90	Credits 4

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 properties of sound and applications.

Course Outcomes (CO)

K1 to 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	Compare the properties of liquids by surface tension
	CO4	Compare the properties of liquids by viscosity experiments
	CO5	Production and application of ultrasonics and acoustics in different types of Buildings

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 iii) 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

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 – Rise of a liquid in a capillary tube – Experimental determination of Surface Tension: Searle's Torsion Balance Method, drop-weight method, Quincke's method – Variation of surface tension with temperature – Jaeger's method.

Sub. Code: 22UPH101

UNIT IV **18 hrs**

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, Searle's viscometer method to find η of a high viscous liquid – Comparison of viscosities – Ostwald Viscometer – Viscosity of Gas – Meyer's formula – Rankine's method – Searle's method.

UNIT V **18 hrs**

Acoustics and Ultrasound

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***.

*** Self study**

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

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.

Reference Books:

1. Brijlal and N.Subramaniam, (2018), A Textbook of Sound- S.Chand & Co. New Delhi.
2. D.S.Mathur, (2019), Mechanics - S.Chand & Co., New Delhi.
3. R.Murugesan, (2018), Properties of Matter, S.Chand & C.o, New Delhi.
4. Alex A.Kaufman, (2007), Principles of the Gravitational method, Elsevier

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://yohttps://www.vedantu.com/physics/acousticsutu.be/DCAV51nkxDE

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: 22UPH202

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Core Paper 2 - Heat and Thermodynamics		
Batch 2022-2023	Semester 2	Hours/Week 6	Total Hours 90	Credits 4

Course Objectives

To enable the learners to understand

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

Course Outcomes (CO)

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 theory 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 and Isothermal 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

UNIT III **18 hrs**

Gas equations

Van der waals equation of a state – Estimation of Critical constants – Constants of Van der waals equation – 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 its limitation – Debye's theory – **Specific heat of diatomic gases***.

Sub Code: 22UPH202

UNITIV **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

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

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, TMH, (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**

Sub Code: 22UPH303

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Core Paper 3 - Mechanics		
Batch 2022-2023	Semester 3	Hours/Week 4	Total Hours 60	Credits 4

Course Objectives

To enable the learners to

1. Understand the principles of rigid body dynamics
2. Understand the fundamental ideas of projectile motions
3. Understand the statics, hydrostatics and hydrodynamics

Course Outcomes (CO)

K1 to K5	**CO1**	Understanding the behaviour of various bodies due to kinematic and dynamic forces acting on the body
	CO2	The study of projectiles enables the students to apply the knowledge of mathematics, fundamental sciences to obtain solution of complex mechanical problems
	CO3	Study of statics promotes analysis and interpretation of numerical problems
	CO4	Gain knowledge on hydrostatics
	CO5	Understand hydrodynamics

Syllabus

UNIT I **12 hrs**

Rigid body dynamics

Rigid body – rotational and vibrational motion –Torque – moment of inertia – radius of gyration – kinetic energy of rotation – M.I. of a fly wheel – experimental determination – precession – **gyrostat – gyrostatic application *** – 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 energy during 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: 22UPH303

UNIT V **12 hrs**

Hydrodynamics

Fluids in Motion – Steady or stream line flow- Equation of continuity of flow – Energy of liquids - Bernoulli's theorem – Euler's equation and Bernoulli's equation – verification – practical applications: Ventury meter - Pitot tube.

*** Self study**

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

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**

Sub Code: 22UPH404

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Core Paper 4 - Electricity and Magnetism		
Batch 2022-2023	Semester 4	Hours/Week 4	Total Hours 60	Credits 4

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)

K1 to K5	CO1	Acquire knowledge about electrostatics
	CO2	Understand the magnetic properties of materials and magnetic effect of electric current
	CO3	Gain knowledge on thermo electricity
	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 to thermocouple – thermoelectric power diagrams and their uses.

UNIT IV **12 hrs**

Alternating Current

EMF induced in a coil rotating in a magnetic field – AC circuits containing resistance, inductance and capacitance 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

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

Sub. Code: 22UPH505

Programme code: 03		B.Sc. Physics		
Title of the Paper		Core Paper 5 - Mathematical Physics		
Batch 2022-2023	Semester 5	Hours/Week 4	Total Hours 60	Credits 4

Course Objectives

To enable the learners to

1. Apply Fourier series and vector analysis to physical problems
2. Know about differential operators in various coordinate systems
3. Apply Lagrangian formulation to physical bodies.

Course Outcomes (CO)

K1 to K5	CO1	To understand physical examples of Fourier series
	CO2	To understand coordinates of operators in vectors
	CO3	To apply vectors for physical examples
	CO4	To solve problems using classical mechanics
	CO5	To solve problems using Lagrange's equations

Syllabus

UNIT I **12 hrs**

Fourier series

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.

UNIT II

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 III

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).

UNIT IV

Classical Mechanics **12 hrs**

Review of mechanics for a system of particles - Basic concepts – Constraints -generalized coordinates - Transformation equations – Configuration – Space generalized notations - Principle of virtual work - D'Alembert's Principle - The Lagrangian formulation - Lagrange's Equation from D'Alembert's principle - Lagrange's equation for systems containing dissipative forces.

UNIT V

Application of Lagrange's Equations **12 hrs**

Lagrangian for a simple pendulum - The Atwood's machine - Lagrangian for the resulting motion of a bead sliding on an uniformly rotating wire - Lagrangian for the motion of two particles under gravitational field - Equation of motion of a spherical pendulum - Lagrangian formulation of conservation theorem - Generalized momentum - Conservation theorem for energy - **Conservation Theorem for Linear momentum*.**

*** Self study**

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

Text Books:

1. Satya Prakash, (2021), Mathematical Physics- S.Chand & Co., New Delhi.
2. S.L. Gupta, V.Kumar H.V.Sharma, (2012), Classical Mechanics-Pragati Prakashan, Meerut

Reference Books:

1. P.K.Chattopadhyay, (2013), Mathematical Physics-New Age International, New Delhi.
2. B.D. Gupta, (2010), 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-JI&list=RDCMUCVtCdIa5rA8PwQbz4hixtpQ&index=3
3.https://www.youtube.com/watch?v=_87AM0wyMp0&list=RDCMUCVtCdIa5rA8PwQbz4hixtpQ&index=1
4.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**

Sub Code: 22UPH506

Programme code: 03		B.Sc. Physics		
Title of the Paper		Core Paper 6 - Optics		
Batch 2022-2023	Semester 5	Hours/Week 4	Total Hours 60	Credits 4

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)

K1 to K5	CO1	Learn to use geometric approximation, the ray equations, understand the aberrations with an emphasis on image forming systems and how they can be reduced
	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 finite distance.

UNIT II **12 hrs**

Interference

Fresnel's bi prism – interference in thin films due to reflected and transmitted light – fringes due to wedge shaped 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.

Sub Code: 22UPH506

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

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**

Sub. Code: 22UPH507

Programme code: 03		B.Sc. Physics		
Title of the Paper		Core Paper 7 - Principles of Electronic Devices and Circuits		
Batch 2022-2023	Semester 5	Hours/Week 4	Total Hours 60	Credits 4

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)

K1 to K5	CO1	Understand the fundamentals of semiconductor devices
	CO2	Understand transistor biasing and stabilization
	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 minority carriers - pn junction – volt ampere characteristics.

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

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

Sub. Code: 22UPH507

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.
Unijunction 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

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/free-samples%5Camie%5Cchapters%5CSingle%20Stage%20and%20Multi%20Stage%20Amplifiers-sec-b-ec.pdf
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: 22UPH508

Programme code: 03		B.Sc. Physics		
Title of the Paper		Core Paper 8 - Quantum Mechanics and Relativity		
Batch 2022-2023	Semester 5	Hours/Week 4	Total Hours 60	Credits 4

Course Objectives

To enable the learners to

1. Know about DeBroglie concept and uncertainty relation
2. Know about the applications of Schrodinger's equation
3. Know about the constancy of light as well as mass energy relation

Course Outcomes (CO)

K1 to K5	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
	CO4	Understand Schrodinger's equation, wave function, , elementary concepts in statistics and to solve Schrodinger's equation for simple systems in one to three dimensions
	CO5	Understand the theory of relativity

Syllabus

UNIT I **12 hrs**

Origin of Quantum Mechanics

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 **12 hrs**

Wave and Group velocity

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 **12 hrs**

Wave particles and Uncertainty principles

Operators associated with different observables – Expectation values of dynamical quantities – probability current density – Ehrenfest theorem – related problems - 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.

Sub Code: 22UPH508

UNIT IV **12 hrs**

Physical applications of Schrödinger's Equation

Free particle - Particle in a box - Potential step – Reflectance and Transmittance for $E>V_0$ and $E<V_0$ - Particle in one dimensional infinitely deep potential well - Particle in three dimensional infinitely deep potential well - One dimensional linear harmonic oscillator.

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 of relativity.

*** Self study**

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

Text Books:

1. Satya Prakash and Swati Saluja, (2013), 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: 22UPH609

Programme code: 03		B.Sc. Physics		
Title of the Paper		Core Paper 9 - Atomic and Solid State Physics		
Batch 2022-2023	Semester 6	Hours/Week 5	Total Hours 75	Credits 4

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)

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

Sub Code: 22UPH609

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**

Electron Theory of Metals

Drude-Lorentz theory and its applications – Somerfield theory – Fermi-Dirac distribution – Brillouin Zone theory – Relation between energy and wave number.

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/Flipped Class

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

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**

Sub Code: 22UPH610

Programme code: 03		B.Sc. Physics		
Title of the Paper		Core Paper 10 - Fundamentals of Digital Electronics		
Batch 2022-2023	Semester 6	Hours/Week 5	Total Hours 75	Credits 4

Course Objectives

To enable the learners to acquire knowledge about

1. Four different number systems & binary codes
2. Logic gates, Boolean algebra and Karnaugh map
3. Flip- flops, counters, arithmetic circuits, data processing circuits, shift registers, semiconductor memories, A/D and D/A converters

Course Outcomes (CO)

K1 to 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 arithmetic and data processing circuits
	CO5	Be familiar with semiconductor memories, A/D and D/A converters

Syllabus

UNIT I **15 hrs**

Number System, Binary Arithmetic and Binary Codes

Decimal, Binary, Octal, Hexadecimal number systems – Conversion from one system to another system- Binary arithmetic operations – Representation of negative numbers – Binary subtraction using 1's and 2's compliments – weighted codes – non weighted codes – alpha numeric codes: ASCII codes and EBCDIC codes – Parity: even parity and odd parity method of single bit error detection.

UNIT II **15 hrs**

Logic gates, Boolean algebra and Karnaugh map

Basic Logic gates (NOT,OR,AND) – Universal building blocks (NAND and NOR gates) – EX-OR and EX-NOR gates – construction of basic gates using discrete components – Laws of Boolean algebra – DeMorgan's theorems – Construction of Karnaugh maps – Simplification of Boolean expressions using laws of Boolean algebra, DeMorgan's theorems and Karnaugh maps.

UNIT III **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.

Sub Code: 22UPH610

UNIT IV **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 V **15 hrs**

Semiconductor Memories, A/D Converters and D/A converters

Memory addressing – Volatile and Non-Volatile: ROM – PROM – EPROM – RAM - Static and dynamic RAM – Binary weighted register D/A converter – R-2R ladder D/A converter – Counter type A/D converter - **Successive approximation A/D converter*.**

*** Self study**

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

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 Pvt. Ltd, 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.

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.youtube.com/watch?v=QyKIuJY4u8A
5. https://www.youtube.com/watch?v=CyQoiZjR_Wk

Mapping

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

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

Sub Code: 22UPH611

Programme code: 03		B.Sc. Physics		
Title of the Paper		Core Paper - 11: Nuclear Physics		
Batch 2022-2023	Semester 6	Hours/Week 5	Total Hours 75	Credits 4

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)

K1 to K5	**CO1**	Know about basic nuclear properties and particle accelerators.
	CO2	Gain knowledge on radioactivity
	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 drop model – 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 particle disintegration 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.

Sub Code: 22UPH611

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 Quark model .

*** Self study**

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

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 (5^{th} edition) Himalaya Publishing House, Bombay.
2. M.L.Pandya, R.P.S.Yadav and Amiya Dash (2020), Elements of Nuclear Physics- Kedar Nath Ram Nath, Meerut.
3. B.C.Theraja, (2008), Modern Physics- (16^{th} 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_Nuclear_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**

Sub. Code: 22UPH2CL

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Core Practical I – Practical 1		
Batch 2022-2023	Semester 1 & 2	Hours/Week 3	Total Hours 90	Credits 3

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)

K3,K4,K5	CO1	Provide hands on experiences in conducting scientific investigations and laboratory experiments.
	CO2	Develop the ability to analyze basic experiments
	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 co-efficient of viscosity - Stokes's method
6. Determination of A.C. frequency - Sonometer
7. Determination of A.C. frequency - Melde's method
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

Sub. Code: 22UPH2CL

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 method - 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 self-inductance of a coil - Maxwell's bridge
19. Determination of temperature co-efficient of resistance of a coil – Post office box.
20. Determination of pole strength – Tan C position
21. Characteristic of a PN junction diode
22. Determination of wavelength of laser - Diffraction method

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

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

Practical beyond the syllabus

1. Measurement of error on simple pendulum

Sub. Code: 22UPH4CM

Programme Code: 03		B.Sc. Physics		
Title of the Paper		**Core Practical II – Practical 2**		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2022-2023	**3 & 4**	**3**	**90**	**3**

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)

K3,K4,K5	**CO1**	Provide hands-on experiences in conducting scientific investigations and laboratory experiments.
	CO2	Develop the ability to analyze basic experiments
	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 specific gravity of liquid – Joule's Calorimeter
4. Determination of wavelength of mercury spectral lines – grating – minimum deviation – Spectrometer
5. Determination of refractive index of a prism (i-i') – Spectrometer
6. Determination of thickness of a thin wire – Air wedge method
7. Study of solar spectrum – Spectrometer
8. Calibration of high range voltmeter – Potentiometer
9. Determination of emf. of a thermocouple – Potentiometer
10. Determination of specific resistance of a wire – Potentiometer

Sub. Code: 22UPH4CM

11. Determination of temperature co-efficient of resistance of a wire - Carey Foster's Bridge
12. Study of series resonance circuit
13. Study of parallel resonance circuit
14. Determination of figure of merit - B.G.
15. Determination of absolute capacitance of a condenser – B.G.
16. Determination of moment of a magnet - circular coil – Deflection magnetometer
17. Determination of field intensity of a circular coil - Vibrational magnetometer
18. Characteristics of Zener diode
19. Study of Multimeter as Ammeter, Voltmeter and Ohm meter
20. Determination of specific rotation of light and concentration of the solution - Polarimeter experiment

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

Sub Code: 22UPH6CN

Programme code: 03		B.Sc. Physics		
Title of the Paper		Core Practical III – Practical 3 - General Experiments		
Batch 2022-2023	Semester 5 & 6	Hours/Week 3	Total Hours 90	Credits 4

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)

K3,K4,K5	CO1	Develop the ability to analyze basic experiments.
	CO2	Take measurements to compare experimental results in the laboratory with the theoretical analysis.
	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. Study of rotation of plane of polarization - Polarimeter

Sub Code: 22UPH6CN

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 band gap energy of a semiconducting material
15. Determination of melting point of wax - Thermistor
16. Determination of impedance and power factor of an LR circuit
17. Determination of self inductance of a coil- Anderson bridge
18. Determination of capacitance - Schering bridge
19. Determination of capacitance - DeSauty bridge
20. Determination of inductance - Owen's bridge
21. Determination of particle size - Laser diffraction method
22. Determination of quantization of angular momentum – Stern Gerlach Experiment

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

Sub Code: 22UPH6CO

Programme code: 03		B.Sc. Physics		
Title of the Paper		Core Practical IV – Electronics		
Batch 2022-2023	Semester 5 & 6	Hours/Week 3	Total Hours 90	Credits 3

Course Objectives

To enable the learners to

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)

K3,K4,K5	CO1	Acquire basic knowledge in solid state electronics.
	CO2	Analyze and design analog electronic circuits using discrete components.
	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

Sub Code: 22UPH6CO

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 and non-inverting amplifiers using op-amp.
17. Construction of adder, subtractor and scalar using op-amp.
18. Construction of integrator and differentiator using op-amp.

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

Sub Code: 22UPH6CP

Programme code: 03		B.Sc. Physics		
Title of the Paper		**Core Practical V - Digital Electronics & Microprocessor**		
Batch	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2022-2023	**5 & 6**	**3**	**90**	**3**

Course objectives

To enable the learners to

1. Have foundations in the fundamentals of digital electronics.
2. Acquire the skill of writing and executing assembly language programming using 8085 microprocessor
3. Visualize the applications of digital electronics and microprocessor in arithmetic operations

Course Outcomes (CO)

K3,K4,K5	**CO1**	Construct basic logic gates.
	CO2	Gain expertise to construct digital electronic circuits.
	CO3	Get familiarized to develop microprocessor based programming.
	CO4	Accomplish microprocessor 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. Study of Karnaugh Map Reduction
7. Construction and study of Half adder and Full adder
8. Construction and study of Half subtractor and Full subtractor
9. Construction and study of 4 bit parallel adder
10. Construction and study of 4 bit parallel subtractor

Sub Code: 22UPH6CP

11. Construction and study of T flip flop
12. Construction and study of JK flip flop
13. Construction of square wave generator
14. 8085 - ALP for 8-bit addition and subtraction
15. 8085 - ALP for 8-bit multiplication and division
16. 8085 - ALP for sorting the array in descending and ascending order
17. 8085 - ALP to find square root of a number
18. 8085 - ALP for Hexadecimal to decimal and binary conversion
19. 8085 - ALP for ASCII to decimal conversion and BCD to Hexadecimal conversion
20. 8085 - ALP for 16-bit Addition and Subtraction

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://www.youtube.com/watch?v=cdMJvFT-Afc
5. https://www.youtube.com/watch?v=wvJc9CZcvBc

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

Sub Code: 22UPH6Z1

Programme: 03		**B.Sc. Physics**		
Title of the Paper		**Project and Viva Voce**		
Batch **2022-2023**	**Semester** **6**	**Hours/Week** **-**	**Total Hours** **-**	**Credits** **5**

Marks Distribution

CIA/ESE	**Particulars**	**Marks**
CIA	Project Review	45
	Regularity	5
	Total Internal Marks	50
*ESE	Project Report Presentation	30
	Viva Voce	20
	Total External Marks	50
Total Marks (CIA + ESE)		100

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

Allied Physics

Allied Subject II - Physics I

Allied Subject II - Physics II

Sub. Code: 22UPH3A1

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	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2022-2023	**3**	**4**	**60**	**4**

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)

K1 to K5	**CO1**	Know about simple harmonic motion and projectile motion
	CO2	Understand moduli of elasticity and propagation of sound
	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 equation of state – derivation of critical constants – Black body radiation – Stefan's law – Laws of thermodynamics – Change of entropy in reversible and irreversible processes.

Sub. Code: 22UPH3A1

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 sharing of 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

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=PLyQSN7X0ro2314mKyUiOILaOC2hk6Pc3j

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

Sub. Code: 22UPH4A2

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	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2022-2023	**4**	**4**	**60**	**4**

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)

K1 to K5	**CO1**	Understand atomic Physics and concepts of relativity
	CO2	Know about nuclear Physics
	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 – Nuclear structure – 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 and photovoltaic 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.

Sub. Code: 22UPH4A2

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

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_NuclearPhysics.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**

Sub. Code: 22UPH4AL

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	**Semester**	**Hours/Week**	**Total Hours**	**Credits**
2022-2023	**3 & 4**	**3**	**90**	**2**

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)

K3,K4,K5	**CO1**	Provide hands-on experiences in conducting laboratory experiments.
	CO2	Analyze relationship between theory and experimental results.
	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

Sub. Code: 22UPH4AL

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

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. Introduction to Biophysics
4. Materials Science
5. Object Oriented Programming in C++
6. Soil Physics

UPH

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Major Elective Paper : Laser Physics and Fiber Optics		
Batch 2022-2023	Semester 5 / 6	Hours/Week 4	Total Hours 60	Credits 5

Course Objectives

To enable the learners to

1. Acquire knowledge about principle, types and applications of lasers.
2. Understand about fabrication of optical fibers, fiber optic sensors and their applications.
3. Understand about optical fiber communication.

Course outcomes (CO)

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

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 and Laser amplifiers

Types of lasers

Solid laser (Ruby laser and Nd:YAG laser) – Gas laser (He-Ne laser and CO2 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**

Optical fibers and its attenuation

Basic structure of an optical fiber - Advantages of optical fibers –Propagation of light waves in an optical fiber - 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 graded index fiber - Attenuation in optical fibers: Material losses – Rayleigh scattering loss – Absorption losses – Bending losses – Radiation induced losses – Inherent defect losses.

UNIT V **12 hrs**

Fiber fabrication and communication: Classification of fiber fabrication techniques: External chemical vapour deposition, Internal chemical vapor deposition, Multielement glasses and Phasil system - Mechanism of refractive index variation - Fiber strength – Mechanical strength measurement of fibers.

Fiber communication: Light sources and detectors - optical connectors and couplers - **repeaters***- transmitter for fiber optic communication - high performance circuit (LED digital transmitter) – fiber optic receiver - high performance receiver

*** Self study**

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

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, New Delhi.
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**

UPH

Programme code: 03		B.Sc. Physics		
Title of the Paper		Major Elective Paper - Principles of Communication Systems		
Batch 2022-2023	Semester 5 / 6	Hours/Week 4	Total Hours 60	Credits 5

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)

K1 to K5	CO1	Get knowledge about modulation and demodulation
	CO2	Understand the working principles of transmission lines and antennas
	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 superhet 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

Fiber cable construction - Fiber optic cable applications – Acceptance angle and numerical aperture – Propagation of light through an optical fiber (Single mode, Multimode, Step index, Graded index) – Fiber configuration (Single mode step index, Multimode step index and Multimode graded index fibers) - Light sources and detectors – Optical connectors and 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*** – Différent domestic satellites.

*** Self study**

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

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 Systems McGraw 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 - Introduction to Biophysics		
Batch 2022-2023	Semester 5 / 6	Hours/Week 4	Total Hours 60	Credits 5

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)

K1 to K5	CO1	Apply principles of Physics toward evaluation and analyses of biological phenomenon.
	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 - Locomotion in 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 - Diffusion of 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 - phase sensitivity 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

Text Books:

1. P.K.Srivastava, (2015), Elementary Biophysics: An Introduction - Narosa Publishing House, New Delhi.

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 2022-2023	Semester 5 / 6	Hours/Week 4	Total Hours 60	Credits 5

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)

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 between metals, 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 free path - 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

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**

Programme code: 03		B.Sc. Physics		
Title of the Paper		Major Elective Paper - Object Oriented Programming in C++		
Batch 2022-2023	Semester 5 / 6	Hours/Week 4	Total Hours 60	Credits 5

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)

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.

*** Self study**

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

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

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

UPH

Programme code: 03		B.Sc. Physics		
Title of the Paper		Major Elective Paper – Soil Physics		
Batch 2022-2023	Semester 5 / 6	Hours/Week 4	Total Hours 60	Credits 5

Course Objectives

To enable the learners

1. To know about composition of the soil
2. To understand the basic idea of soil and soil water behavior
3. To gain knowledge on soil temperature and soil environment

Course Outcomes (CO)

K1 to K5	CO1	Get knowledge about soil composition
	CO2	Understand the soil behavior
	CO3	Acquire knowledge on soil environment
	CO4	Gain knowledge on soil temperature
	CO5	Understand soil water behavior

Syllabus

UNIT I **12 hrs**

Soil composition

Chemical composition of soils, soil colloids, Structures, Characteristics and identification of clay minerals.

UNIT II **12 hrs**

Soil behavior

Soil compaction processes - soil texture, soil structure – genesis evaluation and management -Puddling and its effect - soil physical behavior.

UNIT III **12 hrs**

Soil environment

Soil physical environment and soil fertility relationship – consistence – swelling – shrinking - dispersion and workability of soils - Alleviation of soil physical constraints for crop production.

UNIT IV **12 hrs**

Soil temperature

Thermal properties - variations and modifications - soil air - characterization and measurement in relation to plant growth.

UNIT V **12 hrs**

Soil water behavior

Infiltration – redistribution - retention and movements - soil water potential - soil water balance - soil water management practices.

*** Self study**

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

Text Books:

1. Rattan Lal , Manoj K. Shukla, (2019), Principles of Soil Physics - CRC Press, India
2. Manoj K. Shukla, (2013), Soil Physics: An Introduction - CRC Press, India
3. Daniel Hillel, (1998), Environmental Soil Physics -Academic Press, UK.

Reference Book:

1. William A. Jury, Robert Hortonm, (2012), Soil Physics - Wiley Publications.

e-Resources:

1. https://youtu.be/ELEl8a0ljYo
2. https://youtu.be/_O15lsKvW
3. https://youtu.be/xTdeEBkXYrM
4. https://youtu.be/MztBQb683_I
5. https://nptel.ac.in/courses/126/105/126105016/

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**

Non - Major Elective Papers

1. Human Rights
2. Women’s Rights
3. Consumer affairs

Sub. Code: 22UHR3N1

Programme Code : 03	B.Sc. Physics		
Part IV – Non-Major Elective - I Human Rights			
Batch 2022-2023	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives

1. To prepare for responsible citizenship with awareness of the relationship between HumanRights, 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 (CO)

K1 - K5	**CO1**	To understand the hidden truth of Human Rights by studying various theories
	CO2	To acquire overall knowledge regarding Human Rights given by United Nation Commission (UNO).
	CO3	To gain knowledge about various organs responsible for Human Rights such as National Human Rights Commission and State Human Right Commission (UNHCR).
	CO4	To get habits of how to treat aged person, others and positive social responsibilities.
	CO5	To treat and confirm, child, refugees and minorities with positive social justice.

Syllabus

UNIT – I

Definition, Meaning, Concept ,Theories and Kinds of Human Rights- Evaluation and Protection of Human Rights in India- Development of Human Rights under the United Nations.

UNIT – II

United Nations Charter and Human Rights - U.N.Commission on Human Rights- Universal Declaration of Human Rights - International Covenant on

- Civil & Political Rights
- Economic, Social and Cultural Rights

UNIT – III

Human Rights and Fundamental Rights (Constitution) - Enactments regarding Human Rights Laws in India - National Human Rights Commission and State Human Rights Commission.

UNIT – IV

Aged persons and their Human Rights - Human Rights of Persons with Disabilities - Tribal Human Rights in India - Three Generation Human Rights -Social Awareness and Responsibilities of Individuals.

UNIT – V

Rights of Women, Child, Refugees and Minorities –Social media and Human Rights -NGO's in protection of Human Rights - Right to Election

Books for Study:

1. Human Rights (2019) Compiled by Kongunadu Arts and Science College, Coimbatore –29.

Book for Reference:

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

Programme Code: 03		B.Sc, Physics		
Title of the Paper		Part IV - Non- Major Elective – II Women's Rights		
Batch 2022-2023	Semester 4	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives

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)

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.

NON-MAJOR ELECTIVE II – WOMEN'S RIGHTS

22UWR4N2

QUESTION PAPER PATTERN
(External only)

Duration: 3 Hours **Max. Marks: 75**

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 III - Consumer Affairs		
Batch 2022-2023	Semester 5	Hours/Week 2	Total Hours 30	Credits 2

Course Objectives

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)

K1 - K5	CO1	Able to know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Applying the role of different agencies in establishing product and service standards.
	CO4	Analyse 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 Consumer Markets, 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

Suggested Readings:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, UniversitiesPress.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications PvtLtd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, RegalPublications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, NewDelhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
7. E-books : www.consumereducation.in
8. Empowering Consumers e-book, www.consumeraffairs.nic.in
9. E-books : www.bis.org
10. The Consumer Protection Act, 2086 and its later versions.

Question paper pattern (External Only)

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. Medical Instrumentation
3. Introduction to Microprocessor

Sub.Code: 22UGC3S1

Programme Code: 03		B.Sc. Physics		
Title of the Paper		SBS I – CYBER SECURITY		
Batch 2022-2023	Semester 3	Hours/Week 2	Total Hours 30	Credits 3

Course Objectives

1. The course introduces the basic concepts of Cyber Security
2. To develop an ability to understand about various modes of Cyber Crimes and Preventive measures
3. To understand about the Cyber Legal laws and Punishments

Course Outcomes (CO)

K1-K5	CO1	To Understand the Concepts of Cybercrime and Cyber Frauds
	CO2	To Know about Cyber Terrorism and its preventive measures
	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.

Sub. Code: 22UGC3S1

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, 1st Edition 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 Centre
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

Sub Code: 22UPH4S2

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Skill Based Subject 2 – Medical Instrumentation		
Batch 2022-2023	Semester 4	Hours/Week 2	Total Hours 30	Credits 3

Course Objectives

To enable the learners to

1. Understand about biomedical recorders and machines
2. Know the concepts of imaging techniques, cardiac and respiratory measurements
3. Know about radiation and electrical safety

Course Outcomes (CO)

K1 to K5	CO1	Gain knowledge about biomedical recorders
	CO2	Gain knowledge about machines
	CO3	Understand the concepts of imaging techniques
	CO4	Understand the concepts of cardiac and respiratory measurements
	CO5	Know about radiation and electrical safety

Syllabus

UNIT I **6 hrs**

Biomedical recorders

Design of medical instruments - Components of biomedical instrument systems - Electrodes and transducers - Recording system – Electrocardiography (ECG) - Electroretinography (ERG) - Electromyography.

UNIT II **6 hrs**

Biomedical Machines

Pacemakers - Pacemaker batteries - **Defibrillators*** - Nerve and muscle stimulators - Heart, lung machine- Kidney machine - Blood flow meter.

UNIT III **6 hrs**

Imaging techniques

Lasers in medicine – Endoscopes - Cryogenic surgery - Nuclear imaging technique - Thermography - Ultrasonic imaging systems - Magnetic resonance – Imaging - Angiography.

UNIT IV **6 hrs**

Cardiac and respiratory measurements

Measurement of blood pressure - Blood flow and cardiac output - Measurements of heart sounds - Respiration rate - Temperature - Plethysmography.

Sub Code: 22UPH4S2

UNIT V **6 hrs**

Radiation and electrical safety

Radiation safety instrumentation: gamma ray spectrometer - physiological effects due to 50 Hz current passage - microshock and macroshock - electrical accidents in hospitals - devices to protect against electrical hazards.

*** Self study**

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

Text Books

1. K.Arumugham, (2017), Biomedical Instrumentation - Anuradha Agencies, Chennai.
2. R.S.Khandpur, (2014), Handbook of Biomedical Instruments - Tata McGraw Hill, India.

Reference Books

1. Leslie Cromwell, Fred.J.Weibell, Erich.A.Pfeiffer, (2011), Biomedical Instrumentation and Measurements - Prentice Hall of India, New Delhi.

e-Resources:

1. https://www.electrical4u.com/electrical-engineering-articles/biomedical-instrumentation/
2. https://www.slideshare.net/jineshkj/electro-cardiogramecg
3. https://my.clevelandclinic.org/health/treatments/17360-permanent-pacemaker
4. https://www.sciencedirect.com/topics/nursing-and-health-professions/nuclear-magnetic-resonance-imaging
5. https://en.wikipedia.org/wiki/Gamma-ray_spectrometer

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: 22UPH6S3

Programme code: 03		B.Sc. Physics		
Title of the Paper		Skill Based Subject 3 - Introduction to Microprocessor		
Batch 2022-2023	Semester 6	Hours/Week 2	Total Hours 30	Credits 3

Course Objectives

To study about the

1. History, origin and development of microprocessor
2. Architecture, instruction set and programming of 8085 microprocessors
3. Interfacing and applications

Course Outcomes (CO)

K1 - K5	CO1	Know about history, origin and development of microprocessor
	CO2	Understand architecture
	CO3	Understand instruction sets
	CO4	Knowledge about programming and interfacing
	CO5	Understand the applications of microprocessor

Syllabus

UNIT I **6 hrs**

Origin and Development

Microprocessor – Origin – History and Development – computer generations – Uses of Microprocessor

UNIT II **6 hrs**

Architecture

Pin diagram of 8085 – Architecture – Instruction Cycle – Timing Diagram - Timing diagram for op. code fetch cycle - memory read – memory write – I/O read- I/O write

UNIT III **6 hrs**

Instruction set

Instruction and data formats - addressing modes - INTEL 8085 instructions

UNIT IV **6 hrs**

Interfacing

Need for interfacing - Basic interfacing concepts - INTEL 8255 programmable peripheral interface.

UNIT V **6 hrs**

Applications

Stack, subroutine - simple programmes – addition – subtraction – multiplication – division - sorting arrays - **finding smallest and biggest number in an array***.

*** Self study**

Sub Code: 22UPH6S3

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

Text Books:

1. B.Ram, (2005), Fundamentals of Microprocessor and Microcomputers - Dhanpat Rai Publications, New Delhi.
2. A.P.Mathur, (2017), Introduction to Microprocessors, Tata McGraw Hill, India.

Reference Books:

1. Ramesh, (2013), Microprocessor Architecture & Applications with 8085- International Publishing India.

e- Resources:

1. https://www.tutorialspoint.com/microprocessor/microprocessor_overview.htm
2. https://www.tutorialspoint.com/microprocessor/microprocessor_8085_architecture.htm
3. https://developer.arm.com/architectures/instruction-sets
4. https://www.tutorialspoint.com/microprocessor/microprocessor_intel_8255a_programmable_peripheral_interface.htm
5. https://www.geeksforgeeks.org/subroutine-subroutine-nesting-and-stack-memory/

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

Sub Code: 22EVS101

Programme Code: 03		B.Sc. Physics		
Title of the paper		Part IV – Environmental Studies		
Batch **2022-2023**	**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)

K1-K5	**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
	CO3	Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones
	CO4	To gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity
	CO5	To 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 – Energy Resources – Land Resources.

Sub Code: 22EVS101

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 – Grassland Ecosystem – 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.

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.

Sub Code: 22EVS101

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

Sub. Code: 22VED201

Programme Code: 03		B.Sc. Physics		
Title of the paper		**Part IV - Moral and Ethics**		
Batch **2022-2023**	**Semester** **2**	**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)

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.

Sub. Code: 22VED201

UNIT IV **8 hrs**

Physical Fitness and Mental Harmony

Simplified Physical Exercise – Hand Exercises – Leg Exercises – Neuro Muscular Breathing Exercises – Eye Exercises – Kabalabathi – Maharasana A & B – Massage - Acupressure – Relaxation – Kayakalpa Yogam - LifeForce – Aim & Objectives – Principle – Methods. Introspection – Analysis of Thoughts – Moralization of Desires – Neutralization of Anger – Eradication of Worries

UNIT V: **8 hrs**

Yoga and Meditation – The Asset of India

Yogasanam – Rules & Regulations – Surya Namaskar – Asanas –Sitting – Stanging – Prone - Supine - Pranayama – Naadi Sudhi – Ujjayi – Seethali – Sithkari - Benefits. Meditation – Thanduvasudhi - Agna – Shanthi – Thuriyam – Benefits.

Text Book:

1. Value Based Education, (2020), Moral and Ethics – Published by Kongunadu Arts and Science College (Autonomous), Coimbatore – 641029, First Edition.

Reference Books:

1. Swami Vivekananda (2010), A Biography, Swami Nikhilananda, Advaita Ashrama, India, 24th Reprint Edition
2. Gandhi, Nehru (2004), Tagore and other eminent personalities of Modern India, Kalpana Rajaram, Spectrum Books Pvt. Ltd., Revised and enlarged Edition
3. Lion M.G. Agrawal (2008), Freedom Fighters of India, Isha Books Publisher, First Edition.
4. Swami Vivekananda (2000), Easy steps to Yoga- A Divine Life Society Publication
5. Yoga Practices - 1 (2017), The World Community Service Centre – Vethathiri Publications, Erode, 6th Edition.
6. Yoga Practices - 2 (2017), The World Community Service Centre – Vethathiri Publications, Erode, 8th Edition.

Extra Departmental Course (EDC)

Physics in Everyday life

Sub. Code: 22UPH5X1

Programme Code: 03		B.Sc. Physics		
Title of the Paper		EDC - Physics in Everyday life		
Batch 2022-2023	Semester 5	Hours/Week 2	Total Hours 30	Credits 3

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)

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	Application 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 waves and 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

Sub. Code: 22UPH5X1

*** Self Study**

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

Text Books:

1. F.W.Sears, M. Zemansky, R.A.Freedman, and H.D.Young, (2004), University Physics - Pearson Education, 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

Add on Courses

1. Job Oriented Course

2. Advanced Learners Course

Programme code: 03		B.Sc. Physics		
Title of the course		JOC - Electrical Appliances: Maintenance and Servicing		
Batch 2022-2023	Semester 3 / 5	Hours/Week 2	Total Hours 30	Extra credits 2

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)

K1 to K5	CO1	Understand the fundamentals of electricity
	CO2	Understand the fundamentals of electrical connections and wiring
	CO3	Understand heating appliances
	CO4	Understand motorized appliances
	CO5	Understand 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.

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**

Programme code: 03		B.Sc. Physics		
Title of the course		ALC - Measurement techniques and Data analysis		
Batch 2022-2023	Semester -	Hours/Week -	Total Hours -	Extra credits 2

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)

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

Syllabus

Unit I

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

Measurement of errors

Accuracy, precision, Significant Figures - types of errors - Statistical Analysis - Probability of errors - limiting error

Unit III

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

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

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
2. Prentice Hall India, New Delhi.
3. C.S. Rangan, G.R. Sharma, (1997), Instrumentation Devices and Systems - Tata McGraw Hill Publications, India.

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.

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

Certificate course in Astrophysics

Scheme of Curriculum
Duration: 6 months

Sub. Code	Subject	Instr. Hours /week	Internal	External	Max marks	Exam. Hrs.
22CAP101	**Theory 1**	**2**	**50**	**50**	**100**	**3**
22CAP102	**Theory 2**	**2**	**50**	**50**	**100**	**3**
22CAP1Z1	**Project and Viva voce**	**-**	**20**	**80**	**100**	**3**
Total marks					**300**	

Question Paper Pattern

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

Section A - Multiple Choice (10× 1 = 10 Marks)
Section B - Either or type (5 × 5 = 25 Marks)
Section C - Any five out of eight (5 × 8 = 40 Marks)

*** For ESE 75 marks converted to 50 marks.**

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

Sub. Code : 22CAP101

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Astronomy and Astrophysics		
Batch 2022-2023	Semester Odd	Hours/Week 2	Total Hours 30	Credits 2

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)

K1 to K5	CO1	Understand the origin of universe.
	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.

Sub. Code: 22CAP101

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

Text Books:

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

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

Sub. Code : 22CAP102

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Stellar Evolution and Astronomical imaging		
Batch 2022-2023	Semester Odd	Hours/Week 2	Total Hours 30	Credits 2

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)

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

Unit I **6hrs**

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 **6hrs**

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 **6hrs**

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 **6hrs**

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.

Sub. Code : 22CAP102

Unit V **6hrs**

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.

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 Thomson Course, 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

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**

UPH

Certificate course in Non-Conventional Energy

Scheme of Curriculum Duration: 6 months

Sub. Code	Subject	Instr. Hours /week	Internal	External	Max marks	Exam. Hrs.
22CNE101	**Theory 1**	**2**	**50**	**50**	**100**	**3**
22CNE102	**Theory 2**	**2**	**50**	**50**	**100**	**3**
22CNE1Z1	**Project and Viva voce**	**-**	**20**	**80**	**100**	**3**
Total marks					**300**	

Question Paper Pattern

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

Section A - Multiple Choice (10× 1 = 10 Marks)
Section B - Either or type (5 × 5 = 25 Marks)
Section C - Any five out of eight (5 × 8 = 40 Marks)

*** For ESE 75 marks converted to 50 marks.**

Project and viva voce: **External Max.Marks: 80**

Project Report Presentation : 60 Marks
Viva voce : 20 Marks

Sub. Code : 22CNE101

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Non-Conventional Energy sources and storage system		
Batch 2022-2023	Semester Odd	Hours/Week 2	Total Hours 30	Credits 2

Course Objectives

To enable the learners to

1. Understand various forms of non-conventional energy sources and ways to harness energy from these energy 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)

K1 to K5	CO1	Know about the need of non-conventional energy
	CO2	Gain knowledge on solar and wind energy
	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 conversion system.

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 -

UPH

Thermonuclear fusion energy - Hydrogen energy - Solar hydrogen.

Sub. Code : 22CNE101

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

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 global warming 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 : 22CNE102

Programme Code: 03		B.Sc Physics		
Title of the Paper		Energy Management and Auditing		
Batch 2022-2023	Semester Odd	Hours/Week 2	Total Hours 30	Credits 2

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)

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.

Sub. Code : 22CNE102

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.

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 Energy Efficiency, 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 Curriculum

Duration: 6 months

Sub. Code	Subject	Instr. Hours /week	Internal	External	Max marks	Exam. Hrs.
22CEI101	Theory 1	2	50	50	100	3
22CEI102	Theory 2	2	50	50	100	3
22CEI1Z1	Project and Viva voce	-	20	80	100	3
Total marks					300	

Question Paper Pattern

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

Section A - Multiple Choice (10× 1 = 10 Marks)
Section B - Either or type (5 × 5 = 25 Marks)
Section C - Any five out of eight (5 × 8 = 40 Marks)

*** For ESE 75 marks converted to 50 marks.**

Project and viva voce: **External Max.Marks: 80**

Project Report Presentation : 60 Marks
Viva voce : 20 Marks

Subject Code : 22CEI101

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Basic Electronic Instrumentation		
Batch 2022-2023	Semester Even	Hours/Week 2	Total Hours 30	Credits 2

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)

K1 to K5	CO1	Understand the concept of analog and digital measurement techniques
	CO2	Gain knowledge on accuracy of measurements and their error analysis
	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.

Sub. Code : 22CEI101

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).

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**

Sub. Code : 22CEI102

Programme Code: 03		B.Sc. Physics		
Title of the Paper		Modern Electronic Instrumentation		
Batch 2022-2023	Semester Even	Hours/Week 2	Total Hours 30	Credits 2

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)

K1 to K5	CO1	Understand the different types of display techniques
	CO2	Gain knowledge on wave form generators
	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 diodes display (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.

Sub. Code : 22CEI102

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.

Book for Study:

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.

Books for Reference:

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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