B.Sc. PHYSICS

Course Structure and Syllabus

(For the candidates admitted from the academic year 2023-2024 onwards)

CHOICE BASED CREDIT SYSTEM (CBCS)

THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)

(Approved by NAAC, Affiliated to Bharathidasan University)

ELAMBALUR, PERAMBALUR – 621 220

THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)

ELAMBALUR, PERAMBALUR – 621 220

PG & RESEARCH DEPARTMENT OF PHYSICS

VISION

To build a base for pre-eminence and strengthen the augmentation of the institutions as a prime Institution by igniting and promoting impetuosity, interest in the study of Physics.

MISSION

- Fostering curiosity and excitement about the physical world.
- providing an exciting learning opportunity for non-physics and non-science majors that provides basic understanding of physics and problem-solving skill
- To provide high quality physics education and equipping students for higher education.
- Having faculty bring exciting and current research perspectives to the classroom.

PROGRAMME OUTCOMES

- Students are expected to acquire a core knowledge in physics, including the major premises of classical mechanics, quantum mechanics, electromagnetic theory , electronics, optics, special theory of relativity and modern physics
- Students are also expected to develop written and oral communication skills in communicating physics-related topics.
- Learn to minimize contributing variables and recognize the limitations of equipment. Discover of physics concepts in other disciplines such as mathematics, computer science, engineering, and chemistry.
- Develop the following experimental tools: Numerically model simple physical systems using Euler's method, curve fitting, and error analysis.
- Analyze physical problems and develop correct solutions using natural laws.

PROGRAMME SPECIFIC OUTCOMES

- Students should learn how to design and conduct an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes. Not only that they are expected to have an understanding of the analytical methods required to interpret and analyze results and draw conclusions as supported by their data.
- Students will develop the proficiency in the acquisition of data using a variety of laboratory instruments and in the analysis and interpretation of such data.
- Students will learn the applications of numerical techniques for modeling physical systemsfor which analytical methods are inappropriate or of limited utility.
- Students will realize and develop an understanding of the impact of physics and science on society.
- Apply conceptual understanding of the physics to general real-world situations.

Thanthai Hans Roever College (Autonomous), Elambalur, Perambalur - 621 220

B.SC. PHYSICS

CHOICEBASEDCREDITSYSTEM–LEARNINGOUTCOMESBASEDCURRICULUMFRAMEWORK(CBCS- LOCF)

(For the candidates admitted from the academic year 2023 - 2024 onwards)

Semester	Part	Course Code	Title of the Course	Ins. Hours/ Weeks	Credits	Exam Hours	CIA (Max)	ESE (Max)	Total (Max)
1	I	23UT1/H1	Language	6	3	3	25	75	100
1	II	23UE1	English	6	3	3	25	75	100
1	III	23UPH1CC1	Properties of Matter and Sound	6	5	3	25	75	100
1	III	23UPH1CC2P	Core Practical –I	6	5	3	40	60	100
1	III	23UMA1AC1	Mathematics I– Algebra calculus	4	3	3	25	75	100
I	IV	23UPH1SE1	Skill Enhancement Course-1(NME-1)	2	2	3	25	75	100
			Total	**30**	**21**	**-**	**-**	**-**	**600**
2	I	23UT2/H2	Language	6	3	3	25	75	100
2	II	23UE2	English	6	3	3	25	75	100
2	III	23UPH2CC3	Heat, Thermodynamics and Statistical Physics	5	5	3	40	60	100
2	III	23UPH2CC4P	Core Practical –II	5	5	3	25	75	100
2	III	23UMA2AC2	Mathematics II– Analytical Geometry (3D), Trigonometry and Fourier Series	4	3	3	25	75	100
2	IV	23UPH2SE2	Skill Enhancement Course-2(NME-2)	2	2	3	25	75	100
2	IV	23UPH2SE3	Weather forecasting	2	2	3	25	75	100
			Value Added Course*		2*	2	50	50	100*
			Total	**30**	**23**	**-**	**-**	**-**	**700**
3	I	23UT3/H3	Language	6	3	3	25	75	100
3	II	23UE3	English	6	3	3	25	75	100
3	III	23UPH3CC5	Mechanics	4	5	3	25	75	100
3	III	23UPH3CC6P	Core Practical –III	4	4	3	60	40	100
3	III	23UCH3AC3	Allied Course-III Allied Chemistry for Physical Sciences -I	4	3	3	25	75	100
3	III	23UCH4AP1	Allied Practical -I	3	-	-	-	-	-
3	IV	23UPH3SE4	Home Electrical Installation (Entrepreneurial Skill)	2	2	3	25	75	100
3	IV	23UPH3SE5	Office Automation	2	2	3	25	75	100
3	IV	23UGS	Gender Studies	1	1	3	25	75	100
			Value Added Course*		2*	2	50	50	100*
			Total	**30**	**23**	**-**	**-**	**-**	**800**

4	I	23UT4/H4	Language	6	3	3	25	75	100
4	II	23UE4	English	6	3	3	25	75	100
4	III	23UPH4CC7	Electricity, Magnetism and Electromagnetism	4	4	3	25	75	100
4	III	23UPH3CC8P	Core Practical –IV	3	4	3	25	75	100
4	III	23UCH4AC4	Allied Course-IV- Allied Chemistry for Physical Sciences -II	4	3	3	25	75	100
4	III	23UCH4AP1	Allied Practical -II	3	3	3	40	60	100
4	IV	23U4SE6	Soft Skill (Skill Enhancement Course-6)	2	2	3	25	75	100
4	IV	23UES	Environmental Studies	2	2	3	25	75	100
			Value Added Course*		2*	2	50	50	100*
			Total	**30**	**24**	**-**	**-**	**-**	**800**
5	III	23UPH5CC9	Optics and Spectroscopy	6	5	3	25	75	100
5	III	23UPH5CC10	Atomic and Nuclear Physics	6	5	3	25	75	100
5	III	23UPH5CC11P	Core Practical –V	5	4	3	40	60	100
5	III	23UPH5CC12PW	Project with Viva-Voce	3	3	Evaluation 80		Viva 20	100
5	III	23UPH5DE1	Analog Electronics	4	4	3	25	75	100
5	III	23UPH5DE2	Solid State Physics	4	4	3	25	75	100
5	IV	23UVE	Value Education	2	2	3	25	75	100
			Summer Internship*		2*				
			Value Added Course*		2*	2	50	50	100*
			Total	**30**	**27**	**-**	**-**	**-**	**700**
6	III	23UPH6CC13	Relativity and Quantum Mechanics	6	5	3	25	75	100
6	III	23UPH6CC14	Digital Electronics and Microprocessor -8085	6	5	3	25	75	100
6	III	23UPH6CC15P	Core Practical –VI	6	3	3	40	60	100
6	III	23UPH6DE3	Nano Science and Nanotechnology	6	4	3	25	75	100
6	III	23UPH6DE4	Numerical Methods and C Programming	6	4	3	25	75	100
6	V		Extension Activity	-	1	-	-	-	-
			Value Added Course*		2*	2	50	50	100*
			Total	**30**	**22**	**-**	**-**	**-**	**500**
			Grand Total	**180**	**140**				**4100**

* **Extra Credit Courses which will not be included in the total CGPA**

- Summer Internshipafter 4th semester during summer vacation -30 Hours-
  Value added course (Outside Instruction hours: 30 hours)

Course details:	**No. of Courses & Credits**	**Total Credits**
Part I		
Tamil	4 * 3	12
Part II		
English	4 * 3	12
Part III		
Core Course	11 * 5 + 3*4	67
Core Course: Project with Viva-Voce	1 * 3	03
Allied Course	4 * 3	12
Discipline Elective	4 * 4	16
Part IV		
Skill Enhancement Courses	6 * 2	12
Gender Studies	1 * 1	01
Environmental Studies	1 * 2	02
Value Education	1 * 2	02
Part V		
Extension Activity	1 (Credit Only)	1

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]
The passing minimum for Semester Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]
The passing minimum for Semester Examinations shall be 40% out of 60 marks [i.e. 24 marks]

- Project : 100 Marks (The Project will be evaluated by an Internal and an External Examiner)
  Dissertation- 80 Marks
  Viva Voce - 20 Marks

List of Core Courses

CC1 - Properties of Matter and Sound
CC2P- Core Practical -1
CC3 - Heat, Thermodynamics and Statistical Physics
CC4P -Core Practical-2
CC5- Mechanics
CC6P- Core Practical-3
CC7-Electricity, Magnetism and Electromagnetism
CC8P- Core Practical-4
CC9- Optics and Spectroscopy

CC10- Atomic and Nuclear Physics
CC11P- Core Practical -5
CC12- Project Work
CC13- Relativity and Quantum Mechanics.
CC14 – Digital electronics and Microprocessor -8085
CP15P- Core Practical -6

List of Allied Courses:(Offered as allied subject to B.Sc. Mathematics, Chemistry)

AC1- Properties of Matter, Thermal Physics and Optics
AC2- Electricity, Electronics, Atomic and Nuclear Physics
AP1- Allied Physics Practical

(Offered as allied subject to B.Sc. Computer Science)

AC3- Electricity, Digital Electronics
AC4- Analog, Optoelectronics Devices
AP1- Allied Physics Practical

List of Discipline Elective Courses

1. Analog Electronics.
2. Solid State Physics.
3. Nano Science and Nanotechnology.
4. Numerical Methods and C Programming.

Skill Enhancement Courses

SE1 - Physics of Music
SE2- Physics for Everyday Life
SE3 - Weather forecasting
SE4 - Home Electrical Installation
SE5 - Office Automation
SE6– Soft Skill

List of Value-Added Courses

VA1- Safety and Electrical Works
VA2- Basic Instrumentation Skills
VA3- Maintenance of minor equipments
VA4- Wind Energy
VA5- Optical Communication
VA6- Magnetism and Super Conductivity

Question Paper Pattern

UG Programme		
Maximum Marks : 75		**Duration: 3 Hours**
Section - A	**i) a-** (5 Questions for Multiple Choice) One question from each unit	5 x 1 = 5 Marks
	b- (5 Questions for Fill in the Blanks) One question from each unit	5 x 1 = 5 Marks
	ii) (5 short answer questions) One question from each unit	5 x 2 = 10 Marks
Section - B	**5 Questions** (Internal Choice: Either or) One set of questions from each unit	5 x 5 = 25 Marks
Section - C	**3 Questions** (Answer any 3 out of 5 Questions) One question from each unit	3 x10 = 30 Marks

PROPERTIES OF MATTER AND SOUND

Core Course: I
Course Code: 23UPH1CC1
Hours / Week: 6
Credit: 5

Semester: I
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To know the basics of elasticity and its importance in beams, girders.
- To understand the concepts of viscosity, surface tension and the various methods to determine the parameters experimentally.
- To study the concept of simple harmonic motion in sound waves.

COURSE OUTCOMES:

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

- Identify the materials suitable for construction of buildings, based on the moduli of elasticity.
- Understand the concepts of surface tension and its applications.
- Understand the concepts of viscosity and the various methods to determine the parameters experimentally.
- Principles of diffusion and osmosis and the methods for their determination.
- Understand the physics of sound and its applications

UNIT-I ELASTICITY:

Hooke's law – stress-strain diagram – elastic constants –Poisson's ratio – relation between elastic constants and Poisson's ratio – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion– torsional pendulum (with and without masses)

UNIT-II BENDING OF BEAMS:

cantilever– expression for Bending moment – expression for depression at the loaded end of the cantilever– oscillations of a cantilever – expression for time period – experiment to find Young's modulus – non-uniform bending– experiment to determine Young's modulus by Koenig's method – uniform bending – expression for elevation – experiment to determine Young's modulus using microscope

UNIT-III FLUID DYNAMICS:

Surface tension: definition – molecular forces– excess pressure over curved surface – application to spherical and cylindrical drops and bubbles – determination of surface tension by Jaegar's method–variation of surface tension with temperature

Viscosity: definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube – Poiseuille's formula –corrections – terminal velocity and Stoke's formula– variation of viscosity with temperature

UNIT-IV WAVES AND OSCILLATIONS:

Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures- free, damped, forced vibrations –resonance and Sharpness of resonance.

Laws of transverse vibration in strings –sonometer – determination of AC frequency using sonometer–determination of frequency using Melde's string apparatus.

UNIT –V ACOUSTICS OF BUILDINGS AND ULTRASONICS:

Intensity of sound – decibel – loudness of sound –reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings.

Ultrasonic waves: production of ultrasonic waves – Piezoelectric crystal method – magnetostriction effect – application of ultrasonic waves

TEXT BOOKS

1. D.S.Mathur, 2010, Elements of Properties of Matter, S.Chand and Co.
2. BrijLaland N. Subrahmanyam, 2003, Properties of Matter, S.Chand and Co
3. D.R.KhannaandR.S.Bedi, 1969, Textbook of Sound, AtmaRamand sons
4. BrijLal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition,Vikas Publishing House.
5. R.Murugesan,2012, Properties of Matter, S.Chandand Co.

REFERENCEBOOKS

1. C.J. Smith, 1960, General Properties of Matter, Orient Longman Publishers
2. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition,R. Chand and Co.
3. A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.

WEB RESOURCES

1. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
2. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html
3. https://www.youtube.com/watch?v=gT8Nth9NWPM
4. https://www.youtube.com/watch?v=m4u-SuaSu1sandt=3s
5. https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
6. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/
7. http://www.sound-physics.com/
8. http://nptel.ac.in/courses/112104026/

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
I	23UPH1CC1	PROPERTIES OF MATTER AND SOUND	6	5

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓		✓		✓	✓	✓	✓	✓	✓
CO4	✓		✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 44, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

CORE PRACTICAL I

Core Course: II
Course Code: 23UPH1CC2P
Hours / Week: 6
Credit: 5

Semester: I
Maximum Marks: 100
Internal Marks : 40
External Marks : 60

COURSE OUTCOMES:
On the completion of this course the student will be able to

- Carry out the experimental determination of moduli of elasticity, rigidity modulus, coefficients of viscosity, surface tension of liquids, focal length of convex lens
- Analyse the relationship between various types of experiments
- verify the laws of transverse vibrations as well as the laws of propagation of light
- Analyse the relationship between various types of experiments
- Study the elastic behaviour of materials

Properties of Matter

Minimum of Eight Experiments from the list:

1. Determination of rigidity modulus without mass using Torsional pendulum.
2. Determination of rigidity modulus with masses using Torsional pendulum.
3. Determination of moment of inertia of an irregular body.
4. Verification of parallel axes theorem on moment of inertia.
5. Verification of perpendicular axes theorem on moment of inertia.
6. Determination of moment of inertia and g using Bifilar pendulum.
7. Determination of Young's modulus by stretching of wire with known masses.
8. Verification of Hook's law by stretching of wire method.
9. Determination of Young's modulus by uniform bending – load depression graph.
10. Determination of Young's modulus by non-uniform bending – scale and telescope.
11. Determination of Young's modulus by cantilever – load depression graph.
12. Determination of Young's modulus by cantilever – oscillation method
13. Determination of Young's modulus by Koenig's method – (or unknown load)
14. Determination of rigidity modulus by static torsion.
15. Determination of Y, n and K by Searle's double bar method.
16. Determination of surface tension and interfacial surface tension by drop weight method.
17. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
18. Determination of critical pressure for streamline flow.
19. Determination of Poisson's ratio of rubber tube.
20. Determination of viscosity by Poiseullie's flow method.
21. Determination of radius of capillary tube by mercury pellet method.
22. Determination of g using compound pendulum.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	23UPH1CC2P		CORE PRACTICALS – I			6			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓		✓		✓		✓	✓	
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO4	✓	✓		✓	✓	✓		✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches (✓) =42, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

HEAT, THERMODYNAMICS and STATISTICAL PHYSICS

Core Course: III
Course Code: 23UPH2CC3
Hours / Week: 5
Credit: 5

Semester: II
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To study the fundamental laws of thermodynamics and concept of entropy.
- To brief out the ideas of low temperature Physics and Radiation laws.
- To outline the concept of specific heat of liquids by theories

COURSE OUTCOMES:

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

- Learn experimental methods to determine the transmission of heat.
- Understand the laws of thermodynamics and their applications.
- Analyze Maxwell's Thermo dynamical relations and their applications
- Understand the nature of calorimetric by specific heat of solids and law of thermodynamics and entropy
- Understanding the statistical methods

UNIT-I: CALORIMETRY: specific heat capacity – specific heat capacity of gases C_P and C_V – Meyer's relation – Joly's method for determination of C_V – Regnault's method for determination of C_P
Low temperature physics**:** Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect –Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation.

UNIT-II: THERMODYNAMICS-I: zeroth law and first law of thermodynamics – P-V diagram – heat engine –efficiency of heat engine – Carnot's engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines.

UNIT-III: THERMODYNAMICS-II: second law of thermodynamics –entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram –thermos dynamical scale of temperature – Maxwell's thermos dynamical relations –Clasius- Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.

UNIT-IV: HEATTRANSFER: Modes of heat transfer: conduction, convection and radiation. ***Conduction*****:** thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination ofthermal conductivity of a bad conductor by Lee's disc method. ***Radiation*****:** black body radiation (Ferry's method) – distribution of energy in black body radiation – Wien's law and Rayleigh Jean's law –Planck's law of radiation – Stefan's law – deduction of Newton's law of cooling from Stefan's law.

UNIT-V: STATISTICALMECHANICS: definition of phase-space – micro and macro states – ensembles –different types of ensembles – classical and quantum Statistics – Maxwell-Boltzmann statistics – expression for distribution function – Bose-Einstein statistics – expression for distribution function – Fermi-Dirac statistics –expression for distribution function – comparison of three statistics.

TEXT BOOKS:

1. BrijlalandN. Subramaniam, 2000, Heat and Thermodynamics, S.Chandand Co.
2. NarayanamoorthyandKrishnaRao, 1969,Heat,Triveni Publishers, Chennai.
3. V.R.KhannaandR.S.Bedi, 1998 1st Edition, Text book of Sound, Kedharnaath Publish and Co, Meerut
4. Brijlal and N. Subramanyam, 2001, Waves and Oscillations,Vikas Publishing House, New Delhi.
5. Ghosh, 1996, Text Book of Sound, S.ChandandCo.
6. R.MurugeshanandKiruthigaSivaprasath, Thermal Physics,S.Chandand Co.

REFERENCEBOOKS:

1. J.B.RajamandC.L.Arora, 1976, Heat and Thermodynamics, 8th edition, S.Chandand Co. Ltd.
2. D.S.Mathur, Heat and Thermodynamics, Sultan Chand and Sons.
3. Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand and Co.
4. Resnick, HallidayandWalker,2010, Fundamentals of Physics, 6th Edition.
5. Sears, Zemansky, Hugh D. Young,Roger A. Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson.

WEB RESOURCES:

1. https://youtu.be/M_5KYncYNyc
2. https://www.youtube.com/watch?v=4M72kQulGKkandvl=en
3. Lecture 1: Thermodynamics Part 1 | Video Lectures | Statistical Mechanics I: Statistical Mechanics of Particles | Physics | MIT Open Course Ware
4. http://www.freebookcentre.net/Physics/Physics-Books-Online.html

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course				Hours		Credits	
III	23UPH2CC3		HEAT AND THERMODYNAMICS				5		5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓			✓		✓	✓	✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓	✓	✓	
CO5	✓	✓		✓	✓		✓		✓	
Number of Matches(✓) =40 , Relationship: high										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

CORE PRACTICAL II

Core Course: IV
Course Code: 23UPH2CC4P
Hours / Week: 5
Credit: 5

Semester: II
Maximum Marks: 100
Internal Marks : 40
External Marks : 60

COURSE OBJECTIVES:

- Apply their knowledge gained about the concept of heat and sound waves, resonance, calculate frequency of ac mains set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results.

Any **Eight** Experiments

1. Determination of specific heat by cooling – graphical method.
2. Determination of thermal conductivity of good conductor by Searle's method.
3. Determination of thermal conductivity of bad conductor by Lee's disc method.
4. Coefficient of viscosity of highly viscous liquid.
5. Determination of specific heat capacity of solid.
6. Emissive power of a surface – Spherical calorimeter.
7. Spectrometer – Grating - Normal incidence.
8. Determination of Stefan's constant for Black body radiation.
9. Surface tension of a liquid – Capillary rise method
10. Determination of thermal conductivity of rubber tube.
11. Velocity of sound through a wire using Sonometer.
12. Meter Bridge – Specific Resistance of a material of a wire.
13. Determination of frequency of an electrically maintained tuning fork
14. To verify the laws of transverse vibration using sonometer.
15. To verify the laws of transverse vibration using Melde's apparatus.
16. To compare the mass per unit length of two strings using Melde's apparatus.
17. Frequency of AC by using sonometer.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
III	22UPH3CP3		CORE PRACTICALS – III			3			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓			✓	✓	✓	✓	✓		✓
CO5	✓		✓	✓	✓	✓	✓	✓		
Number of Matches(✓) =44 , Relationship:										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
relationship	Very Poor	Poor	Moderate	High	Very High

WEATHER FORECASTING

Core Course: SE3 Semester: II
Course Code: 23UPH2SE3 Maximum Marks: 100
Hours / Week: 2 Internal Marks : 25
Credit: 2 External Marks : 75

Objectives: The aim of this course is not just to impart theoretical knowledge to the students but to enable them to develop an awareness and understanding regarding the causes and effects of different weather phenomenon and basic forecasting techniques.

COURSE OUTCOMES:
On completion of the course, the student will be able to

- Learn the elementary idea of atmosphere.
- Understand the measuring the weather..
- Analyze the weather systems and their applications
- Understand the climate and climate change
- Understanding the basics of weather forcasting

Unit: I Introduction to atmosphere:

Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors: types; atmospheric pressure: its measurement; cyclones and anticyclones: its characteristics.

Unit: II Measuring the weather:

Wind; forces acting to produce wind; wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws

Unit III: Weather systems:

Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: classification; tornadoes; hurricanes.

Unit IV: Climate and Climate Change:

Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate.

Unit V: Basics of weather forecasting:

Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.

Reference books:

1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
2. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
3. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
4. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
5. Why the weather, Charls Franklin Brooks, 1924, Chpraman& Hall, London. 6. Atmosphere and Ocean, John G. Harvey, 1995, The Artemis Press.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
II	23UPH2SE3	WEATHER FORECASTING	4	5

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO2	✓	✓		✓	✓					
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓			✓					
Number of Matches(✓) = 36, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

MECHANICS

Core Course: V
Course Code: 23UPH3CC5
Hours / Week: 4
Credit: 5

Semester: III
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To study and apply the knowledge of gravitation at various situation.
- To understand the concepts of statics, hydrostatics, hydrodynamics and dynamics of charged bodies under various fields and the rigid body dynamics in terms of moment of inertia.
- To understand the concepts of transformations related to relativity theory.

COURSE OUTCOMES:

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

- ✓ understand and define the laws involved in mechanics
- ✓ Study the behaviour of rigid body dynamics
- ✓ Understand the gravitation
- ✓ Learn centre of mass and system of variable mass
- ✓ derive Bernoulli's principle and apply pressure-velocity relation in fluid flow in the field of fluid dynamics

UNIT I: MOTION OF PROJECTILE, IMPULSE, IMPACT

Projectile motion – Ranges of horizontal and inclined projectile motions – Impulse – Impact – Impulsive force – Laws of impact – Impact of a smooth sphere on a smooth horizontal plane – Direct and oblique impacts – Loss in kinetic energy – Motion of two interacting bodies – Reduced mass.

UNIT II: DYNAMICS OF RIGID BODY

Moment of inertia – Theorems of perpendicular and parallel axes – M.I of a circular ring, disc, solid sphere, hollow sphere and cylinder about all axes – Compound pendulum – theory – equivalent simple pendulum – reversibility of centers of oscillation and suspension – determination of g and k

UNIT III: GRAVITATION

Newton's law of gravitation – Kepler's laws of gravitation –Deduction of Newton's law of gravitation from Kepler's Law - G by Boy's method – Mass and density of earth – Acceleration due to gravity – Variation of g with altitude, depth and rotation of earth - Value of g at poles and equator. Gravitational field – Gravitational potential – Gravitational potential due to a point mass - Equipotential surface - spherical shell and Gravitational potential due to a solid sphere (inside and outside) - orbital velocity.

UNIT IV: CENTRAL FORCE MOTION

Angular velocity, angular momentum and K.E of rotation – Torque and angular acceleration – Relation between them – Expression for acceleration of a body rolling down an inclined plane without slipping. Center of mass –velocity and acceleration of centre of mass – determination of motion of individual particle-– system of variable mass. Rocket motion- Satellite.

UNIT V: STATICS AND HYDRODYNAMICS

Friction-laws of friction-angle of friction-cone of Friction-Centre of gravity-solid and hollow tetrahedron-solid and hollow hemisphere –Centre of pressure – vertical rectangular lamina – vertical triangular lamina.

Hydrodynamics - Equation of continuity– Pitot's tube and Venturimeter – Euler's equation of unidirectional flow – Torricelli's theorem – Bernoulli's theorem and its applications.

BOOKS FOR STUDY:

1. Mechanics – Part I and II by Narayanamoorthy, National Publishing Company.
2. Mechanics by D.S.Mathur, S.Chand& Co., 2ndEdition (2001).
3. Mechanics by P. Duraipandian, LaxmiDuraipandian, MuthamizhJayapragasam, S.Chand& Co., New Delhi (1988).
4. Properties of Matter by R.Murugeshan, S. Chand & Co., New Delhi (2001).

BOOKS FOR REFERENCE:

1. Fundamentals of Physics by D. Halliday, R.Rensick and J. Walker, 6th edition, Wiley,NY (2001).

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours			Credits	
III	23UPH3CC5	MECHANICS				4			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO2	✓	✓		✓	✓					
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓			✓					
Number of Matches(✓) = 36, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

CORE PRACTICALS – III

Core Course: VI
Course Code: 23UPH3CC6P
Hours / Week: 4
Credit: 4

Semester: III
Max. Marks : 100
Internal Marks : 40
External Marks : 60

COURSE OBJECTIVES:

- Construct circuits to learn about the concept of electricity, current, resistance in the path of current, different parameters that affect a circuit.
- Set up experiments, observe, analyse and assimilate the concept.

ELECTRICITY (any eight experiments)

1. Calibration of low range voltmeter using potentiometer.
2. Calibration of ammeter using potentiometer.
3. Measurement of low resistances using potentiometer.
4. Determination of field along the axis of a current carrying circular coil.
5. Determination of earth's magnetic field using field along axis of current carrying coil.
6. Determination of specific resistance of the material of the wire using PO box.
7. Determination of resistance and specific resistance using Carey Foster's bridge.
8. Torsional pendulum – η and I .
9. Stoke's method – Viscosity of highly viscous liquid.
10. Determination of e.m.f of thermo couple using potentiometer
11. Static Torsion – Determination of η.
12. Determination of figure of merit of BG or spot galvanometer.
13. Comparison of EMF of two cells using BG.
14. Comparison of capacitance using BG.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits		
II	22UPH2CP2		CORE PRACTICALS – II			3		2		
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓		
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓		✓	✓	✓	✓	✓	✓		
CO5	✓			✓	✓	✓	✓	✓	✓	
Number of Matches (✓) =42 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

HOME ELECTRICAL INSTALLATION

Core Course: SE4 Semester: III
Course Code: 23UPH3SE4 Max. Marks : 100
Hours / Week: 2 Internal Marks : 25
Credit: 2 External Marks : 75

Learning Objective: The students will get knowledge on electrical instruments, installations and domestic wiring techniques with safety precautions and servicing.

COURSE OUTCOMES:

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

- ✓ Understand the simple electrical circuits
- ✓ Study the transmission of electricity
- ✓ Understand the Electrical wring
- ✓ Study the power rating
- ✓ Learn the safety measures

UNIT-I : SIMPLE ELECTRICAL CIRCUITS

Charge, current, potential difference, resistance – simple electrical circuits – DC ammeter, voltmeter, ohmmeter – Ohm's law – difference between DC and AC – advantages of AC over DC – electromagnetic induction - transformers – inductors/chokes – capacitors/condensers – impedance – AC ammeter, voltmeter –symbols and nomenclature

UNIT-II: TRANSMISSION OF ELECTRICITY

Production and transmission of electricity – concept of power grid – Series and parallel connections – technicalities of junctions and loops in circuits –transmission losses (qualitative) – roles of step-up and step-down transformers – quality of connecting wires – characteristicsof single and multicore wires

UNIT-III: ELECTRICAL WIRING

Different types of switches – installation of two-way switch – role of sockets, plugs, sockets - installation of meters – basic switch board – electrical bell – indicator – fixing of tube lights and fans – heavy equipment like AC, fridge, washing machine, oven, geyser, jet pumps – provisions for inverter – gauge specifications of wires for various needs

UNIT-IV: POWER RATING AND POWER DELIVERED

Conversion of electrical energy in to different forms – work done by electrical energy – power rating of electrical appliances – energy consumption – electrical energy unit in kWh – calculation of EB bill – Joule's heating – useful energy and energy loss – single and three phase connections – Measures to save electrical energy – energy audit

UNIT-V: SAFETY MEASURES

Insulation for wires – colour specification for mains, return and earth – Understanding of fuse and circuit breakers – types of fuses: kit-kat, HRC, cartridge, MCB, ELCB – purpose of earth line – lighting arrestors – short circuiting and over loading – electrical safety – tips to avoid electrical shock – first aid for electrical shock – fire safety for electric current

TEXT BOOKS

1. Wiring a House: 5th Edition by Rex Cauldwell, (2014).
2. Black and Decker Advanced Home Wiring, 5th Edition: Backup Power - Panel Upgrades - AFCI Protection - "Smart" Thermostats, by Editors of Cool Springs Press, (2018).
3. Complete Beginners Guide to Rough in Electrical Wiring: by Kevin Ryan (2022).

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
II	22UPH2CP2		CORE PRACTICALS – II			3			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓		
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓		✓	✓	✓	✓	✓	✓		
CO5	✓			✓	✓	✓	✓	✓	✓	
Number of Matches (✓) =42 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

OFFICE AUTOMATION

Skill Based Elective: SE5
Course Code: 23UPH3SE5
Hours / Week: 2
Credit: 2

Semester: III
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

COURSE OUTCOMES

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

- Understand the basic knowledge of Ms. Word
- Develop the skill in Ms. Word
- Understand the basic knowledge of Ms. Excel
- How to create and designing the PowerPoint
- Know the basic skill of Photoshop
-

UNIT I: MS-WORD - I

1. Text Manipulation: Write a paragraph about your institution and Change the font size and type, Spell check, Aligning and justification of Text
2. Bio data: Prepare a Bio-data.
3. Find and Replace: Write a paragraph about yourself and do the following. Find and Replace - Use Numbering Bullets, Footer and Headers.

UNIT II: MS-WORD - II

1. Tables and manipulation: Creation, Insertion, Deletion (Columns and Rows). Create a mark sheet.
2. Mail Merge: Prepare an invitation to invite your friends to your birthday party. Prepare at least five letters.

UNIT III: MS-EXCEL

1. Data sorting-Ascending and Descending (both numbers and alphabets)
2. Mark list preparation for a student
3. Individual Pay Bill reparation.
4. Invoice Report reparation.
5. Drawing Graphs. Take your own table.

UNIT IV: MS-POWERPOINT

1. Create a slide show presentation for a seminar.
2. Preparation of Organization Charts
3. Create a slide show presentation to display percentage of marks in each semester for all students
    1. Use bar chart (X-axis: Semester, Y-axis: %marks).
    2. Use different presentation template different transition effect for each slide.

UNIT V: PHOTOSHOP

Introduction to Photoshop – The File menu - The tools - Drawing lines & shapes - Inserting Picture and shapes - filling colors - Text effects, working with layers, filters.

E-REFERENCES

1. https://ptgmedia.pearsoncmg.com/images/9780735623026/samplepages/9780735623026.pdf
2. https://www.dit.ie/media/ittraining/msoffice/MOAC_Excel_2016_Core.pdf
3. https://ptgmedia.pearsoncmg.com/images/9780735697799/samplepages/9780735697799.pdf

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits		
III	20UPH4SBE1		OFFICE AUTOMATION			2		2		
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO2	✓		✓			✓				
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches() = 40, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM

Core Course: VII | Semester: IV
Course Code: 23UPH4CC7 | MaximumMarks : 100
Hours / Week: 4 | Internal Marks : 25
Credit: 4 | External Marks : 75

Objectives:

- To study the fundamental ideas of electrostatics and current electricity
- To know about the classification of magnetism depending upon their properties
- To understand the concept of series and parallel resonance circuit

COURSE OUTCOMES:

On the completion of the course students will be able to:

- ✓ understand fundamental laws of electricity and magnetism
- ✓ Learn different magnetic materials
- ✓ Understanding the basic measurements
- ✓ Understand the Faradays laws of electromagnetic induction by Rayleigh's method
- ✓ apply the knowledge of electricity and magnetism to technological advances

UNIT I: ELECTROSTATICS AND CONDENSERS

Fundamentals of electrostatics – Electric field– Electric potential - Coulomb's law - Lines of forces - Properties – Gauss theorem - Electric intensity due to a charged sphere and cylinder – Mechanical force on unit area of a charged surface - Principle of a capacitor – Capacity of a spherical capacitor – Energy stored in a charged conductor – Loss of energy due to sharing of charges between two charged conductors.

UNIT II: MAGNETIC PROPERTIES OF MATERIALS

Magnetic field – Magnetic induction – Intensity of Magnetization – Magnetic permeability – Susceptibility – Properties of para, dia, and ferromagnetic materials – Curie point - Curie temperature - Hysteresis – Retentivity – Coercivity – Experiment to draw B-H curve by magnetometer method – Loss of energy per cycle.

UNIT III: ELECTRIC CURRENT AND ELECTRICAL MEASUREMENTS

Biot-Savart's law – Magnetic intensity at a point due to a current carrying straight conductor - Axis of a circular coil and solenoid – Moving coil ballistic galvanometer –Kirchhoff's Law- Damping correction - Ampere's circuital law - Carey Foster's bridge – Specific resistance – Potentiometer – Principle – Ammeter calibration – Calibration of low range and high range voltmeter using potentiometer.

UNIT IV: ELECTROMAGNETIC INDUCTION

Laws of electromagnetic induction – Self and mutual induction – Self-inductance of a solenoid – Mutual inductance of a pair of solenoids – Coefficient of coupling – Experimental determination of self and mutual inductance (Rayleigh's method) - Growth decay of current in circuit containing Land R – Growth and decay of charge in circuit containing C and R – Measurement of High resistance by leakage – Charging and discharging of capacitor through Land R.

UNIT V: AC CIRCUITS

Alternating EMF – Alternating EMF applied to circuits containing L and C, L and R, C and R – Alternating EMF applied to circuits containing L, C and R – Series and Parallel resonance circuits – Sharpness of resonance – Q factor – Power in AC circuits – Power factor – Wattless current – Transformer – Choke- Skin effect.

BOOKS FOR STUDY

1. R. Murugeshan, Electricity and Magnetism (2008) S Chand & Co, New Delhi
2. BrijLal&Subramanyam, Electricity and Magnetism,(2005)
3. RatanPrakashanMandir Publishers, Agra
4. M.Narayanamurthy&N.Nagarathnam, Electricity & Magnetism, NPC pub., Revised edition.

BOOKS FOR REFERENCE

1. Electricity and Magnetism -D.N.Vasudeva (Twelfth revised edition)
2. Electricity and Magnetism - K.K.Tiwari (S.Chand&Co.)
3. Electricity and Magnetism -E.M.Pourcel,Berkley Physics Cource, Vol.2 (McGrraw-Hill)
4. 4. Electricity and Magnetism - Tayal (Himalalaya Publishing Co.)
5. D.Halliday, R.Resnick and J.Walker, Fundamentals of Physics – Electicity and Magnetism (2011), Wiley India,Pvt Ltd
6. David J. Griffith, Introduction to Electrodynamics, (2012) PHI, New Delhi

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
IV	23UPH4CC7	ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM	4	4

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓		✓	✓	✓	✓		✓
CO3	✓		✓			✓		✓	✓	
CO4	✓		✓	✓	✓	✓		✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 35, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

CORE PRACTICALS – IV

Core Practical - VIII
Course Code: 23UPH3CC8P
Hours / Week: 3
Credit: 4

Semester: IV
Maximum Marks: 100
Internal Marks : 40
External Marks :60

COURSE OUTCOMES:

On the completion of this course the student will be able to carry out the

- ✓ experimental determination of specific resistances of electrical conductors
- ✓ determination of magnetic field intensity and the horizontal component of earth's magnetic field
- ✓ find the current and voltage sensitivities of a galvanometer and calibrate a low range voltmeter
- ✓ Analyse the CRO
- ✓ Learn the construction of full wave rectifier

Any **EIGHT** experiments

1. Koenig's method – Uniform bending – Y.
2. Spectrometer i-i' curve.
3. Spectrometer – Small angle prism.
4. Spectrometer – Grating – Normal incidence.
5. Spectrometer – Grating minimum deviation and dispersive power.
6. Spectrometer – Cauchy's constants.
7. Spectrometer – Fraunhofer lines.
8. Spectrometer – Hartmann's Formula.
9. Field along the axis of a coil – determination of M.
10. M and H – Absolute determination using deflection and vibration magnetometer.
11. Potentiometer – EMF of a thermocouple.
12. Potentiometer x of thermistor.
13. Potentiometer - High range voltmeter calibration.
14. Ballistic Galvanometer – Figure of merit.
15. Anderson's bridge – AC self-inductance of a coil.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
IV	23UPH3CC8P	CORE PRACTICALS – IV	3	4

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓		✓	✓	✓	✓	✓	✓		
CO4	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓		✓	✓	✓	✓			
Number of Matches(✓) = 41, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

OPTICS AND SPECTROSCOPY

Core Course: IX
Course Code: 23UPH5CC9
Hours / Week: 6
Credit: 5

Semester: V
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

Objectives:

- To study the dispersive power of light using various lenses
- To identify the transmittance and reflection of light through various medium
- To know about the optical instruments and their resolving power

COURSE OUTCOMES:

On completion of the course the students will have:

- ✓ The knowledge of geometric optics helps in the practical design of many optical systems and instruments including aberrations in lens system.
- ✓ Study the theory and experiment of interference using Newton's rings and Michelson interferometer
- ✓ Study the theory and experimental past of diffraction by Fresnels and Fraunhoffer methods
- ✓ Study the theories for production of polarization of light
- ✓ Understand the theory and application of microwave and infrared spectroscopy

UNIT I: GEOMETRICAL OPTICS

Fermat's principle - Dispersion of light - Dispersive power - Deviation without dispersion - Dispersion without deviation - Constant deviation prism - Constant deviation spectroscope – Aberration - Spherical aberration - Methods of minimizing spherical aberration - Chromatic aberration of a lens – Lateral chromatic aberration.

UNIT II: INTERFERENCE

Colour of thin films - Fresnel's biprism - Fresnel's mirrors and Lloyd's single mirror experiments - Achromatic fringes - Interference in thin films (from reflected and transmitted light) - Fringes in wedge shaped films - Reflective and antireflective coatings - Theory of Newton's rings - Wavelength of monochromatic light using Newton's rings - Michelson's interferometer - Determination of wavelength and refractive index -. Febry-perrot interferometer.

UNIT III: DIFFRACTION

Rectilinear propagation of light - Zone plate - Fresnel diffraction - Diffraction at circular aperture, circular disc and a straight edge - Fraunhofer diffraction - Diffraction at a single and double slit - Missing orders in double slit - Theory of diffraction grating.

UNIT IV: POLARIZATION

Polarization - Double refraction - Nicol prism - Polarizer and Analyzer - Theory of production and detection of elliptically and circularly polarized light – Babinet compensator - Quarter wave plate - Half-wave plate - Optical activity – Laurent's Half shade polarimeter.

UNIT V: SPECTROSCOPY

Microwave spectroscopy - The Rotation of Molecules - Rotational Spectra - The Rigid Diatomic Molecule - IR Spectroscopy - Vibrating Diatomic Molecule as a Harmonic Oscillator - The Anharmonic Oscillator - The Diatomic Vibrating Rotator - The Vibration-Rotation Spectrum of Carbon Monoxide.

BOOK FOR STUDY

1. A text book of Optics – Subramanyam and Brijlal, S. Chand and co.., 25th Edition, New Delhi 2004.
2. Optics and Spectroscopy – R.Murugeshan, S. Chand and co., 6th Edition,New Delhi, 2008.
3. Elements of Spectroscopy – S.L. Gupta, V.Kumar and R.C.SharmaPragatiPrakashan, 13th Edition, Meerut, 1997.
4. Molecular structure and spectroscopy – G.Aruldhass, PHI Pvt Ltd, , II Edition, New Delhi, 2007.

BOOKS FOR REFERENCE:

1. Optics – Sathyaprakash, RatanPrakashanMandhir, VIIth Edition, New Delhi, 1990.
2. Introduction to Molecular Spectroscopy –C.N.Banewell,TMHpublishingco. IV Edition, New Delhi, 2006.
3. AjoyGhatak, *Optics*, (TMH), New Delhi, Fourth edition, 2009.
4. Singh & Agarwal, *Optics and Atomic Physics*, PragatiPrakashan Meerut, Nineth edition, 2002.
5. Fundamentals of Physics, by D.Halliday, R. Resnick and J. Walker, Wiley, 6thEd

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
V	23UPH5CC9	OPTICS AND SPECTROSCOPY	6	5

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓			✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓		✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 45, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

ATOMIC AND NUCLEAR PHYSICS

Core Course: X
Course Code: 23UPH5CC10
Hours / Week: 6
Credit: 5

Semester: V
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVE

- To provide an introductory account about the atomic structure and nuclear reactions.

COURSE OUTCOMES:

On completion of the course the students will have:

- ✓ Learn the band theory of solids
- ✓ Analyze the different spectrograph
- ✓ Adequate knowledge on the fundamental principles governing the structure of the atom and the interactions of particles at high energies.
- ✓ Understand the evolution of spectral lines
- ✓ Understand the properties of x-rays verification

UNIT I: BAND THEORY OF SOLIDS

The free electron theory of metals – expressions for electrical conductivity – thermal conductivity – Wiedman-Franz's law-Hall effect-magneto resistance-determination of electronic charge – Millikan's oil drop method – electron microscope – Band theory of solids – classification of solids on the basis of band theory.

UNIT II: ATOMIC STRUCTURE

Early atomic Spectra-Thomson Model-Alpha particle Scattering-Rutherford 's nuclear model-drawbacks-Bohr atom model –Bohr's interpretation of the Hydrogen spectrum-correction for nuclear motion-evidences in favour of Bohr's theory-Ritz combination principle-correspondence principle-Summerfield's relativistic atom model-drawbacks- the vector atom model – Quantum numbers associated with the vector atom model — the Pauli's exclusion principle – periodic classification of elements

UNIT III: PROPERTIES OF NUCLEI

General properties of nucleus- binding energy – BE/A curve - significance -proton electron theory-proton neutron theory -Nuclear forces –characteristics –Meson theory of nuclear forces – Yukava Potential- Nuclear models.

UNIT IV: RADIO ACTIVITY

Fundamental laws of radio activity –theory of α ,β and Υ decay- properties of alpha, beta and gamma rays - neutrino and its properties-electron capture. - nuclear isomers- Mossabauer effect - applications- Radio carbon dating- radio isotopes – uses.

UNIT V: NUCLEAR REACTIONS

Kinematics of nuclear Reaction-Nuclear fission –Nuclear fusion – Nuclear reactor-uses - atom bomb - hydrogen bomb- fusion reactor –plasma confinement –artificial Transmutation-Q value of nuclear reaction-types of nuclear reaction.

BOOKS FOR STUDY

1. Modern Physics by R. Murugeshan, KiruthigaSivaprasath, S. Chand & Co., NewDelhi(2008).
2. Modern Physics by D.L.Sehgal, K.L.Chopra and N.K.Sehgal. Sultan Chand & Sons Publication, 7th Edition, New Delhi(1991).
3. Atomic Physics by J.B. Rajam, S. Chand & Co., 20thEdition, New Delhi (2004).
4. Atomic and Nuclear Physics by N. Subrahmanyam and BrijLal, S. Chand & Co. 5th Edition, New Delhi(2000).

BOOK FOR REFERENCE

1. Modern Physics by J.H. Hamilton and Yang, McGraw-Hill Publication, (1996).
2. Concepts of Modern Physics by A. Beiser, Tata McGraw-Hill, New Delhi (1997).
3. Fundamentals of Physics by D.Halliday, R.Resnick and J. Walker, Wiley, 6thEdition, New York(2001).
4. Modern Physics by Kenneth S.Krane, John Willey & sons, Canada (1998

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours			Credits	
V	23UPH5CC10	ATOMIC AND NUCLEAR PHYSICS				6			5	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 43, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

CORE PRACTICAL V

Core Practical :XI — Semester: V
Course Code: 23UPH5CC11P — Maximum Marks : 100
Hours / Week: 5 — Internal Marks : 40
Credit: 4 — External Marks : 60

COURSE OUTCOMES:

On the completion of this course the student will be able to carry out the

- ✓ experimental determination of moduli of elasticity,
- ✓ find the current and voltage sensitivities of a spot galvanometer and calibrate a high range voltmeter
- ✓ determination of wavelengths of light ray components
- ✓ experimental determination of refractive index of glass, self incuctance of a coil, magnetic field intensity
- ✓ voltage-current characteristics of diodes and their applications

Any TWELVE Experiments

1. Bi-prism – Determination of λ.
2. Thickness of a thin film of Bi-prism
3. Brewster's law – polarization
4. Double refraction (μ_e and μ_o)
5. Y – by Corlus method.
6. Dispersive power of plane diffraction grating.
7. Diffraction a straight edge.
8. Kundt's tube – Velocity of sound, Adiabatic Young's modulus of the material of the rod.
9. Forbe's method – Thermal conductivity of a metal rod.
10. Spectrometer– Grating - Normal incidence - Wave length of Mercury spectral lines.
11. Spectrometer – Grating - Minimum deviation - Wave length of Mercury spectral lines.
12. Spectrometer – (i-d) curve.
13. Spectrometer – (i-i') curve.
14. Spectrometer – Narrow angled prism.
15. Rydberg's constant
16. e/m Thomson method.
17. Spectral response of photo conductor (LDR).
18. Potentiometer –Resistance and Specific resistance of the coil.
19. Potentiometer – E.M.F of a thermocouple.
20. Carey Foster's bridge - Temperature coefficient of resistance of the coil.
21. Deflection Magnetometer – Determination of Magnetic moment of a bar magnet and B_H using circular coil carrying current.
22. Vibration magnetometer - Determination of B_H using circular coil carrying current– Tan B position.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
V	23UPH5CC11P	CORE PRACTICAL V	5	4

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 43 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

ANALOG ELECTRONICS

Discipline Elective: DE1 | Semester: V
Course Code: 23UPH5DE1 | Maximum Marks: 100
Hours / Week: 4 | Internal Marks : 25
Credit: 4 | External Marks : 75

Objectives:

- To know about the intrinsic and extrinsic semiconductors
- To understand the transistor circuit configuration
- To know about the characteristics of operational amplifiers.

COURSE OUTCOMES:

On completion of the course the students will be able to:

- ✓ understand the fundamental principles of semiconductors including p-n junctions and zener diode
- ✓ Analyse the characteristics of transistor and transistor biasing circuits
- ✓ Analyse the relationship between amplifier and oscillators
- ✓ Learn FET
- ✓ Understand the applications of Op-Amps inverting and non-inverting modes.

UNIT I: SEMICONDUCTORS AND DIODES

Intrinsic and extrinsic semiconductor – PN junction diode – Biasing of PN junction – V-I Characteristics of diode – Rectifiers – Half wave – Full wave and bridge rectifiers – Break down mechanisms – Zener diode:Characteristics – Zener diode as voltage regulator.

UNIT II: TRANSISTORS

Introduction – npn - pnp transistors – Transistor action – Transistor configurations – Common base configuration – CB characteristics – CE characteristics – Relation between α and β – Voltage divider biasing - Transistor as an amplifier – Transistor as a two part network – h parameters.

UNIT III: AMPLIFIERS AND OSCILLATORS

Single stage CE amplifier – Analysis of hybrid equivalent circuit – Power amplifiers – Efficiency of class B power amplifier – Push–pull amplifier - General theory of feedback – Properties of negative feedback – Criterion for oscillations – Hartley oscillator – Colpitt's oscillator.

UNIT IV: SPECIAL SEMICONDUCTOR DEVICES

Field effect transistors – Characteristics of FET – Parameters - JFET- Working and Characteristics of JFET - Difference between JFET and Bipolar Transistor - Working andV-I characteristics of SCR, UJT - UJT as relaxation oscillator.

UNIT V: OPERATIONAL AMPLIFIERS

Differential amplifier - Common mode rejection ratio – Characteristics of an ideal op-amp – Virtual ground – Inverting amplifier – Non inverting amplifier – Applications - Adder – Subtractor – Integrator – Differentiator – Unity gain buffer.Class A and Class B Amplifier.

BOOKS FOR STUDY

1. Hand Book of Electronics by Gupta and Kumar - PragatiPrakashan – Meerut(2002).
2. Principles of Electronics by V.K. Mehta, Rohit Mehta S. Chand &Co.(2006).
3. Electronics by M. Arul Thalapathi, ComptekPublishers(2005).
4. Elements of Electronics by M.K.Bagde and Singh S.P., S. Chand & Co., NewDelhi(1990).
5. Applied Electronics by A. Subramanyam – National Publishing Co.(1997)
6. OP - AMPs and Linear Integrated Circuits by Ramakant A. Gayakwad, PrenticeHall of India(1994).

BOOKS FOR REFERENCE

1. Electronic Devices by Mittal.G.K., G.K. Publishers Pvt. Ltd., (1993).
2. Basic Electronics by B.L. Theraja, S. Chand & Co., (2008).
3. Solid State Electronics by Ambrose and Vincent Devaraj, Meera Publication.
4. Applied Electronics by R.S. Sedha, S. Chand &Co.(1990).

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
V	23UPH5DE1		ANALOG ELECTRONICS			4			4	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓		✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓				✓	✓			
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =42 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

SOLID STATE PHYSICS

Discipline Elective: DE2 Semester: V
Course Code: 23UPH5DE2 Maximum Marks: 100
Hours / Week: 4 Internal Marks : 25
Credit: 4 External Marks : 75

OBJECTIVES:

- To understand about the Fundamentals of Material science
- To know about the properties of materials.

COURSE OUTCOMES:

On completion of the course the students will

CO1: Analyze the ideas of Material science

CO2: Knowledge about Phase diagram and transformation.

CO3: Understanding on the basics of vacuum and oxidation

CO4: Analyze the working of NDT

CO5: Learn Basic ideas about electrical and magnetic properties of materials

UNIT – I : MATERIALS SCIENCE

Classification of materials – Properties of Engineering materials – Materials Structure – Types of Bonds – Bonds Formation – Ionic Bond – Covalent Bond – Metallic Bond – Comparison of Bonds – Secondary Bonds.

UNIT – II : PHASE DIAGRAM AND TRANSFORMATION

Basic terms – Solid Solution – Hume – Rothery's rule – Intermediate Phase – Phase Diagrams – Gibb's Phase Rule – Time – Temperature cooling curves – Construction of Phase Diagrams – The Lever Rule – Equilibrium Binary System – Eutectic System – Mechanism of Phase Transformation.

UNIT – III : VACUUM AND OXIDATION

History of vacuum technology – units of Vaccum – Kinetic aspects of Gases – Application of Vaccum – Gas flow in vaccum systems – production of vaccum – Measurement of vaccum – Thermal conductivity gauges – Penning Gauge – Oxidation – Oxidation Resistant Materials.

UNIT – IV : NON-DESTRUCTIVE TESTING (NDT)

NDT and its advantages – Defects in materials – Selection of the NDT Method – Visual Inspection – Basic Principle – Liquid Penetration Testing – Physical Principle – Magnetic Particle Testing (MPT) – Principle of MPT – Sensitivity – Limitation – Eddy Current Testing (ECT) – Principle – Instrument for ECT – Applications – Limitations – Radiography – Basic Principle – Application – Limitations.

UNIT – V : ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS

Dielectrics – Polarization – Temperature and frequency effects – Electric Breakdown – Ferroelectric materials – Electrostriction – Piezoelectricity – Uses of Dielectrics – Magnetic Properties – Classification – Magnetostriction – Soft and Hard Magnetic Materials.

BOOKS FOR STUDY:

1. Materials Science by G.K.Narula, K.S. Narula, V.K. Gupta, Tata McGraw Hill Publishing, 1994.
2. Materials Science and Engineering by V. Raghavan, Prentice Hall of India, 2004.

BOOKS FOR REFERENCE:

1. Practical Non-Destructive Testing by Baldevraj,T. Jayakumar, M. Thanvasimuthu, Narosa Publishing House, Chennai, 2002.
2. Testing of Metallic Materials by A.V.K. Suryanarayana, B.S. Publications, Giriraj lane, Sultan Bazar, Hyderabad – 95, 2003.

WEB LINK:
https://nptel.ac.in/courses/112108150

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours			Credits	
V	23UPH5DE2	SOLID STATE PHYSICS				4			4	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓			✓	✓			✓	
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓			✓	✓	✓	✓	✓	
Number of Matches(✓) = 42 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

RELATIVITY AND QUANTUM MECHANICS

Core Course: XIII
Course Code: 23UPH6CC13
Hours / Week: 6
Credit: 5

Semester: VI
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To understand about the basics of classical and quantum ideas
- To explain photoelectric effect with experiments
- To differentiate the Hamilton's equation from the Langrage's equation

COURSE OUTCOMES:

On completion of the course the students will be able

- ✓ to gain knowledge in the concepts of special and theory of relativity
- ✓ to evolve ideas about dual nature of matter
- ✓ analyze postulates of quantum mechanics and wave function
- ✓ to recognize basic terms in Quantum Mechanics and different operator mechanism
- ✓ to Apply of Schrödinger's equation to micro system

UNIT I: RELATIVITY

Frames of reference - Galilean transformation - Michelson - Morley experiment -Postulates of special theory of relativity - Lorentz transformation - length Contraction – time dilation - Relativity of simultaneity - addition of velocities - variation of mass with velocity– Mass energy relation - Elementary ideas of general relativity.

UNIT II: WAVE NATURE OF MATTER

Phase and group velocity - wave packet - expression of De Brogile's wave length -Davisson and Germer's experiment - G.P.Thomson's experiment - Heisenberg's uncertainty principle and its consequences.

UNIT III: SCHRODINGER EQUATION

Inadequacy of classical mechanics - Basic postulates of quantum mechanics -Schrodinger equation - Properties of wave function - Probability interpretation of wavefunction - linear operators - self adjoint operators - expectation value - eigenvalues and eigenfunctions - commutativity and compatibility.

UNIT IV: ANGULAR MOMENTUM IN QUANTUM MECHANICS

Orbital angular momentum operators and their commutation relations - separation of three dimensional Schrodinger equationsinto radial and angular parts - Elementary ideas of spin angular momentum of an electron - Pauli matrices.

UNIT V: SOLUTIONS OF SCHRODINGER EQUATION

Free particle solution - Particle in a box - Potential well of finite depth (one dimension) - linear harmonic oscillator - rigid rotator and hydrogen atom.

BOOKS FOR STUDY

1. A Text book of Quantum mechanics by P.M.Mathews and S.Venkatesan, TataMcGraw - Hill, New Delhi(2005).
2. Quantum Mechanics by V.K.Thankappan, New Age International (P) Ltd.Publishers, New Delhi(2003).

3. Quantum mechanics by K.K.Chopra and G.C. Agrawal, Krishna PrakasamMedia(P) Ltd., SMeerut First Edition(1998).
4. Modern Physics by R. Murugeshan and KiruthigaSivaprasath, S. Chand &Co.,(2008).

BOOKS FOR REFERENCE

1. Mechanics and Relativity by BrijlalSubramanyam, S.Chand& Co., New Delhi, (1990).
2. Concepts of modern physics by A.Beiser. Tata McGraw - Hill, 5thedition, NewDelhi(1997).
3. Introduction to quantum mechanics by Pauling and Wilson, McGraw – Hill.
4. Quantum mechanics by A.Ghatak and Loganathan, Macmillan India Pvt. Ltd.

WEB LINK:

https://nptel.ac.in/courses/115106066

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
VI	23UPH6CC13	RELATIVITY AND QUANTUM MECHANICS	6	5

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓		✓	✓	✓	✓	✓		✓	✓
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓		✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =42 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

DIGITAL ELECTRONICS AND MICROPROCESSOR -8085

Core Course: XIV | Semester: VI
Course Code: 23UPH6CC14 | Max. Marks : 100
Hours / Week: 6 | Internal Marks : 25
Credit: 5 | External Marks : 75

Objectives

- To study various number systems, logical circuits and their implementation.
- To study the fundamentals of architecture and instruction set of an 8-bit microprocessor.
- To write Assembly Language Programs for an 8-bit microprocessor INTEL - 8085.

COURSE OUTCOMES:

On completion of the course the students will be able to

- Understand the structure of various number system and basic logic gates.
- Construct sequential circuits and to design counters.
- Understanding techniques of Combinational and arithmetic digital circuits
- Learn the working principle of Sequential circuits
- Learn the basic concepts of Microprocessor and its Programming.

Unit I: Number systems, Logic gates

Different number systems - Binary, Octal and Hexa-decimal - Conversion between the number systems - Different digital codes - ASCII, BCD, gray codes - Basic logic gates: AND, OR and NOT gates - Realization using diodes and transistor - Universal gates: NAND, NOR - Conversion into Basic gates, Special Gates - Ex-OR, Ex-NOR.

Unit II:Boolean algebra and K-maps

Boolean laws - De-Morgan's theorems - Simplification of logical expression using Boolean algebra - Fundamental products - Minterms and Maxterms - Implementation of truth table into an equivalent logic circuit by Boolean algebra and Karnaugh maps – 4 variables.

Unit III: Combinational and arithmetic digital circuits

Basic idea of multiplexers 2:1, 4:1 - Demultiplexers 1:2, 1:4 – Decoders - Encoders - Decimal to BCD conversion - Parity generator and checker: odd & even - Arithmetic circuits: Binary addition, Binary subtraction using 2's complement method, Half adder, Half subtractor, Full adder and Full subtractor - Memories: Read-only memories (ROM), PROM, EPROM and RAM.

Unit IV: Sequential circuits

RS, D, JK and T flip-flops - Level clocked and edge triggered flip-flops - Preset and clear operations - Race-around conditions in JK flip-flops - Master-slave JK flip-flop - Counters: Asynchronous and Synchronous counters - Decade counter, Up-Down counters, Ring counter - Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only upto 4 bits).

Unit V: Microprocessor and its Programming:

Architecture of 8085 - Block diagram, buses, registers, ALU - Interfacing devices - Timing states - Instruction cycle Interrupts and Interrupt control - Machine Language - Assembly Language - Instruction set and format – Data transfer, Arithmetic, Logical, Branching and Machine Control Operations - Microprocessor Programming: Algorithm and flowcharts - Simple programming exercises: Addition - sum of two 8-bit data with & without carry, decimal addition, sum of a string of data, subtraction of two 8-bit data, 8 bit multiplication - using successive addition and 8 bit division - using successive subtraction.

Books for Study

1. A.P. Godse & D.A. Godse, Digital Electronics - A Text Book - 2008 (Unit I to IV).
2. B. Ram, Fundamentals of Microprocessor and Microcomputers, Dhanpat Rai Publications, New Delhi, 2005 (Unit V).

Book for References

1. V. Vijayendran, Digital Fundamentals, S.Viswanathan Printers & Publishers Private Ltd, Chennai, 2004.
   (Unit I to IV)
2. Donald P. Leach & Albert Paul Malvino, Digital principles and Applications, Glencoe, 1993.
(Unit I to V)
3. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Prentice
   Hall, 2002. (Unit V)

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
VI	23UPH6CC14	DIGITAL ELECTRONICS AND MICROPROCESSOR - 8085	6	5

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓		✓	✓		✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =41 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

CORE PRACTICAL VI

Core Practical : XV
Course Code: 23UPH6CC15P
Hours / Week: 6
Credit: 3

Semester: VI
Maximum Marks : 100
Internal Marks : 40
External Marks : 60

COURSE OUTCOMES:

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

- ✓ single stage RC coupled transistor amplifier, analog circuits using multivibrator
- ✓ logic gates and verify their truth tables simple
- ✓ Analyze the theorems
- ✓ simple arithmetic operations using Intel 8085 Microprocessor
- ✓ sorting and block transfer of data, carrying arithmetic operations using microprocessor Intel 8085 and encode binary data in BCD code

Section – A – Electronics

Any **EIGHT** experiments only

1. Regulated power supply using Zener, Percentage of regulation.
2. Single stage – RC coupled amplifier – Transistor.
3. Emitter follower amplifier – Frequency response.
4. Astablemultivibrator.
5. Monostablemultivibrator.
7. Logic gates – AND, OR and NOT gates using discrete components – Truth table.
8. Universal gates NAND/NOR and basic gates from Universal gates.
9. Half Adder and Full Adder using logic gates
10. Half Subtractor and Full Subtractor using logic gates.
11. BCD to 7 segment decoder – 7 segment LED display.
12. Demorgan's theorem and Boolean algebra.
13. Flip flop using gates.
14. Construction of power amplifier.

Section –B – Microprocessor 8085& 'C' Programming

Any **FOUR** experiments only

15. 8-bit addition and 8-bit subtraction.
16. 8-bit multiplication and division.
17. Conversion from decimal to hexadecimal system.
18. Conversion from hexadecimal to decimal system.
19. C Programming for Simpson's rule.
20. C Programming for Trapezoidal rule

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Subject Code		Title of the Course			Hours			Credits	
VI	23UPH6CC15P		CORE PRACTICAL VI			6			3	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =43 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

NANO SCIENCE AND NANO TECHNOLOGY

Discipline Elective: DE3 | Semester: VI
Course Code: 23UPH6DE3 | Maximum Marks : 100
Hours / Week: 6 | Internal Marks : 25
Credit: 4 | External Marks : 75

Objective: This course aims to provide an overall understanding of Nanoscience and Nanotechnology and introduces different types of nanomaterials, their properties, fabrication methods, characterization techniques and a range of applications.

COURSE OUTCOMES:

On completion of the course the students will be able to

- Understand the structure of Nano materials .
- Learn the properties of Nano materials.
- Understanding Vacuum techniques and fabrication methods,
- Learn the characterization techniques.
- Study the applications of Nonmaterial.

UNIT-I: NANOSCIENCE AND NANOTECHNOLOGY:

Nanoscale– nature and nanostructures – nanostructures: 0D, 1D,2D– surface to volume ratio– size effect – excitons – quantum confinement– metal based nanoparticles (metal and metal oxide) – nanocomposites (non-polymer based) – carbon nanostructures – fullerene –SWCNT and MWCNT

UNIT-II: PROPERTIES OF NANOMATERIALS: introduction –mechanical behavior – elastic properties – hardness and strength – ductility and toughness –superplastic behavior – optical properties – surface plasmon resonance – electrical properties – dielectric materials and properties – magnetic properties – super paramagnetism – electrochemical properties – properties of CNTs.

UNIT-III: FABRICATION METHODS AND VACUUM TECHNIQUES: top-down and bottom-up approaches – electrochemical method – chemical and physical vapour depositions (CVD and PVD) – plasma arc discharge – sputtering – thermal evaporation – pulsed laser deposition – ball milling – lithography: photolithography – e-beam lithography – sol-gel methods – synthesis of CNT.

UNIT-IV: CHARACTERIZATION TECHNIQUES: scanning probe microscopy – scanning tunneling microscopy – atomic force microscopy – scanning electron microscopy – transmission electron microscopy –powder XRD method: determination of structure and grain size analysis – UV-visible and photoluminescence spectroscopy.

UNIT-V: APPLICATIONS OF NANOMATERIALS: medicine: drug delivery – photodynamic therapy – molecular motors –energy: fuel cells –rechargeable batteries – super capacitors– photo voltaics. sensors: nano sensors based on optical and physical properties – electrochemical sensors – nano biosensors. Nano electronics: CNTFET – display screens – GMR read/write heads – nano robots –applications of CNTs

TEXT BOOKS

1. K.K.Chattopadhyay and A.N.Banerjee, (2012), Introduction to Nanoscience and Nanotechnology, PHI Learning Pvt. Ltd.,
2. M.A. Shah, Tokeer Ahmad (2010), Principles of Nanoscience and Nanotechnology, Narosa Publishing House Pvt Ltd.
3. Mick Wilson, et al (2005) Nanotechnology, Overseas Press.

REFERENCE BOOKS

1. Richard Booker and Earl Boysen, (2005) Nanotechnology, Wiley Publishing Inc. USA
2. J.H.Fendler (2007) Nano particles and nano structured films; Preparation, Characterization and Applications, John Wiley and Sons
3. B.S.Murty, et al (2012) Textbook of Nanoscience and Nanotechnology, Universities Press.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course	Hours	Credits
VI	23UPH6DE3	NANOSCIENCE AND NANO TECHNOLOGY	6	4

Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓		✓	✓	✓	✓	✓		✓	✓
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓		✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =42 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

NUMERICAL METHODS AND C PROGRAMMING

Discipline Elective: DE4 | Semester: VI
Course Code: 23UPH6DE4 | Maximum Marks : 100
Hours / Week: 6 | Internal Marks : 25
Credit: 4 | External Marks : 75

Learning Objective: To understand the methods in numerical differentiation and integration and to develop the problem-solving skills of the student. To introduce and explain the basic structure, rules of compiling and execution of C programming.

COURSE OUTCOMES

On completion of the course,

- Develop the mathematical skills in the area of errors.
- Understand the numerical techniques to solve the linear equations.
- Understand various methods used to solve the physical problems using C
- Explains Numerical Solution of ordinary differential equation Using C
- Describes the concept of Control Structure.

UNIT-I: NUMERICAL SOLUTIONS: determination of zeros of polynomials – roots of linear and nonlinear algebraic and transcendental equations – bisection and Newton-Raphson methods – convergence and divergence of solutions.

UNIT-II: NUMERICAL DIFFERENTIATION, INTEGRATION AND CURVE FITTING: Newton's forward and backward interpolation – Lagrange's interpolation – Newton-Raphson method to find square root and cube roots – principle of least squares – fitting a straight line and exponential curve – trapezoidal rule – Simpson's 1/3 and 1/8 rule

UNIT-III: ALGORITHM, FLOW CHART AND PROGRAM: development of algorithm – flow chart for solving simple problems– average of set of numbers – greatest, smallest – conversion of Fahrenheit to Celsius and Celsius to Kelvin, miles to kilometer – sorting set of numbers in ascending and descending order – square matrix, addition, subtraction and multiplication of order (2x2) using arrays.

UNIT-IV: INTRODUCTION TO C: importance of C – basic structure of C programming – constants, variables and data types – character set, key words and identifiers – declaration of variables and data types – operators – expressions: arithmetic, relational, logical, assignment – increment and decrement – conditional – comma operators.

UNIT-V: CONTROL STRUCTURE: decision making with if, if-else, nested if – switch –go to – break – continue –while, do while, for statements – arrays, one dimensional and two dimensional – declaring arrays – storing arrays in memory –initializing arrays – simple programs.

TEXT BOOKS

1. Numerical methods, Singaravelu, Meenakshipublication,4th Edn., 1999.
2. Numerical methods P.Kandasamy, K.Thilagavathy, K. Gunavathi, S.Chand, 2016
3. Programming in C, Balagurusamy, TMG, ND, 2012
4. Numerical Analysis,,M.K.Venkatraman, NPH, 2013
5. Numerical Analysis, B.D.Gupta, Konark Publishers, New Delhi, 2013

REFERENCE BOOKS

1. Schaum's outline series, Theory and Problems of programming in C, C.Byronand S. Gottfried, Tata McGraw Hill 2003
2. Numerical methods and C Programming, Veerarajan, 2015.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
VI	23UPH6DE4		NUMERICAL METHODS AND C PROGRAMMING			6			4	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓		✓	✓	✓	✓	✓		✓	✓
CO3	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO4	✓	✓			✓	✓	✓		✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =42 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

ALLIED PHYSICS

ALLIED PHYSICS – I

Allied Course: I
Course Code: 23UPH1AC1
Hours / Week: 3
Credit: 3

Semester: I
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

Course Outcomes:

After successfully completing this course, the student will be able to understand

- The principles of stress and strain set up in materials and to determine the various coefficients of elasticity.
- Flow of liquids due to viscous forces and the laws governing them as well as experimental ways of their determination.
- Transmission of heat due to process of conduction, convection and radiation and various laws involved in heat transformation.
- Various thermodynamic laws and the concept of entropy.
- The phenomenon like interference and diffraction, optical activity of liquids and its uses.

UNIT-I : WAVES, OSCILLATIONS AND ULTRASONICS:

Simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonics

UNIT-II :PROPERTIES OF MATTER:

Elasticity: elastic constants – bending of beam – theory of non- uniform bending – determination of Young's modulus by non-uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum

Viscosity: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method,

Surface tension: definition – molecular theory – droplets formation–shape, size and lifetime – drop weight method – interfacial surface tension.

UNIT-III: HEAT AND THERMODYNAMICS:

Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde's process of liquefaction of air– liquid Oxygen for medical purpose– importance of cry coolers– thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle – efficiency – entropy – change of entropy in reversible and irreversible process.

UNIT-IV : ELECTRICITY AND MAGNETISM:

Potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit – types of switches in household and factories– Smart wifi switches- fuses and circuit breakers in houses

UNIT-V : DIGITAL ELECTRONICS AND DIGITAL INDIA:

Number system- conversion - logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan's theorem – verification.

TEXT BOOKS

1. R.Murugesan (2001), AlliedPhysics,S. ChandandCo,NewDelhi.
2. BrijlalandN.Subramanyam (1994), WavesandOscillations,VikasPublishingHouse,NewDelhi.
3. BrijlalandN.Subramaniam (1994), Properties of Matter,S.ChandandCo.,NewDelhi.
4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8th edition), S.ChandandCo.,New Delhi.
5. R.Murugesan(2005), OpticsandSpectroscopy,S.ChandandCo,NewDelhi.
6. A.Subramaniyam, AppliedElectronics2ndEdn.,NationalPublishingCo.,Chennai.

REFERENCEBOOKS

1. ResnickHallidayandWalker(2018).Fundamental sofPhysics(11thedition),JohnWilleyand Sons, Asia Pvt.Ltd., Singapore.
2. V.R.KhannaandR.S.Bedi (1998), TextbookofSound1stEdn. KedharnaathPublishandCo, Meerut.
3. N.S.KhareandS.S.Srivastava (1983), ElectricityandMagnetism10thEdn.,AtmaRamandSons, New Delhi.
4. D.R.KhannaandH.R. Gulati(1979). Optics,S. Chand andCo.Ltd.,New Delhi.
5. V.K.Metha(2004).Principlesofelectronics6thEdn. S.Chandandcompany.

WEB RESOURCES

1. https://youtu.be/M_5KYncYNyc
2. https://youtu.be/ljJLJgIvaHY
3. https://youtu.be/7mGqd9HQ_AU
4. https://youtu.be/h5jOAw57OXM
5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	23UPH1AC1		ALLIED PHYSICS-I			3			3	
Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓	✓		✓	✓	✓
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓			✓	✓	✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO5	✓		✓	✓	✓	✓		✓	✓	✓
Number of Matches(✓) =38, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

ALLIED PHYSICS – II

Allied Course: III | Semester: I
Course Code: 23UPH2AC2 | Maximum Marks: 100
Hours / Week: 3 | Internal Marks : 25
Credit: 3 | External Marks : 75

OBJECTIVES:

To understand the basic concepts of optics, modern Physics, concepts of relativity and quantum physics, semiconductor physics, and electronics.

Course Outcomes:

After successfully completing this course, the student will be able to understand

- Amount of current that can pass through a conductor using ohms law and its applications,
- Effect of magnetic field due to current and concept of resonant frequency in tuning circuits,
- Atom models and how energy can be released in nuclear fission and fusion processes,
- Construction of a rectifier, amplifiers and oscillator,
- Basic digital electronics principles through logic gates and the laws governing them.

UNIT-I : OPTICS:

Interference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – diffraction of light vs sound – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster's law

UNIT-II : ATOMIC PHYSICS:

Atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect –Zeeman effect (elementary ideas only) – photo electric effect – Einstein's photoelectric equation

UNIT-III: NUCLEAR PHYSICS:

Nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses –controlled and uncontrolled chain reaction – nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor

UNIT-IV : INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES:

Frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation

UNIT-V : SEMICONDUCTOR PHYSICS:

P-N junction diode – forward and reverse biasing – characteristic of diode – zener diode – characteristic of zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment)

TEXT BOOKS

1. R.Murugesan (2005), AlliedPhysics,S.ChandandCo,NewDelhi.
2. K.ThangarajandD.Jayaraman(2004),AlliedPhysics,PopularBookDepot,Chennai
3. BrijlalandN.Subramanyam(2002), TextbookofOptics,S.ChandandCo,NewDelhi.
4. R.Murugesan (2005), ModernPhysics,S.ChandandCo,NewDelhi.
5. A.SubramaniyamAppliedElectronics, 2nd Edn.,NationalPublishingCo.,Chennai.

REFERENCEBOOKS

1. ResnickHallidayandWalker (2018), FundamentalsofPhysics, 11th Edn.,JohnWilleyandSons, Asia Pvt.Ltd.,Singapore.
2. D.R.KhannaandH.R. Gulati (1979).Optics, S.ChandandCo.Ltd.,New Delhi.

3.A.Beiser(1997),ConceptsofModernPhysics,TataMcGrawHillPublication,NewDelhi

4..Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, NewDelhi.

5. V.K.Metha(2004), Principlesofelectronics, 6th Edn. ,S.Chandand Company, New Delhi.

WEB RESOURCES

1. https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318andv=D38BjgUdL5Uandfeature=emb_logo
2. https://www.youtube.com/watch?v=JrRrp5F-Qu4
3. https://www.validyne.com/blog/leak-test-using-pressure-transducers/
4. https://www.atoptics.co.uk/atoptics/blsky.htm -
5. https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	22UPH2AC2		ALLIED PHYSICS – II			4			2	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓		✓	✓	✓	✓		✓
CO3	✓		✓	✓	✓	✓		✓	✓	
CO4	✓	✓		✓		✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =43 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

ALLIED PRACTICAL– I

Allied Course: II | Semester: II
Course Code: 23UPH1AP | Maximum Marks: 100
Hours / Week: 3 | Internal Marks :40
Credit: 3 | External Marks :60

COURSE OBJECTIVES:

Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

Minimum of 12 Experiments from the list:

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever, scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
2. Surface tension and interfacial Surface tension – drop weight method
3. Comparison of viscosities of two liquids – burette method
4. Specific heat capacity of a liquid – half time correction
5. Verification of laws of transverse vibrations using sonometer
6. Calibration of low range voltmeter using potentiometer
7. Determination of thermo emf using potentiometer
8. Verification of truth tables of basic logic gates using ICs
9. Verification of De Morgan's theorems using logic gate ICs.
10. Use of NAND as universal building block.
11. Radius of curvature of lens by forming Newton's rings
12. Thickness of a wire using air wedge
13. Wavelength of mercury lines using spectrometer and grating
14. Refractive index of material of the lens by minimum deviation
15. Refractive index of liquid using liquid prism
16. Determination of AC frequency using sonometer
17. Specific resistance of a wire using PO box
18. Thermal conductivity of poor conductor using Lee's disc
19. Determination of figure of merit table galvanometer
20. Determination of Earth's magnetic field using field along the axis of a coil
21. Characterisation of Zener diode
22. Construction of Zerner/IC regulated power supply
23. Construction of AND, OR, NOT gates using diodes and transistor NOR gate as a universal building block

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course				Hours		Credits	
I	23UPH1AP		ALLIED PRACTICALS -I				3		3	
Course Outcomes (Cos)	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches (✓) =47 , Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

APPLIED PHYSICS

Applied Physics for Computer Science
APPLIED PHYSICS-I

Applied Course: I	Semester: III
Course Code: 23UPH3AC3	Maximum Marks : 100
Hours / Week: 4	Internal Marks : 25
Credit: 4	External Marks : 75

Objectives:

- To have a knowledge about the alternating current and its components
- To know about the number systems and the semiconductor memories
- To acquire knowledge about Boolean algebra, arithmetic and combinational logic circuits.

Course outcomes

After successfully completing this course, the student will be able to understand

- Understand the electric fundamental laws.
- Analyses the characteristics of alternating current and its applications.
- Understand the fundamentals of codes and number system.
- Understand the binary arithmetic, logic and Boolean functions.
- Understand the applications of semiconductor memories.

Unit I: Current Electricity

Ohm's Law - Verification of Ohm's Law - Kirchoff's law - Applications of Kirchhoff's law - Wheatstone's bridge - Meter bridge- Carey Foster's bridge- Potentiometer Measurement of Current and Resistance- Calibration of low range Voltmeter- High range Voltmeter.

Unit II: Alternating Current

AC circuits with double components – Measurement of current and voltage – Power in an AC circuit - Power factor (derivation) - Wattles current – Choke - Series and parallel resonant circuits – Impedance - Q factor - Selectivity and Sharpness of resonance.

Unit III: Number Systems, Codes and Logic gates

Number Systems - Conversions - Binary: Addition, Subtraction, Multiplication, Division-8421 Code - BCD Code - Excess 3 code - gray code - Binary to Gray and Gray to Binary Conversion - ASCII code – Basic and Derivative Gates: AND, OR, NOT, NAND, NOR, EX-OR - NAND & NOR as Universal Gates.

Unit IV: Boolean algebra, Arithmetic and Combinational Logic Circuits

Basic laws of Boolean algebra - De Morgan's theorem - Verification of Boolean expression using Boolean laws - Half-adder - Full adder - Half-Subtractor - Full Subtractor (using basic gates) – Encoder - Decimal to BCD encoder- Decoder - BCD to decimal decoder.

Unit V: Semiconductor Memories

Introduction – ROM using diodes and transistors – ROM in terms of digital circuits – Building memory of larger capacity – PROM – EPROM – EEPROM – ROM as a unit in microcomputers – RAM – Static RAM – Flip Flop as a RAM cell – Memory expansion - Memory Parameters.

BOOKS FOR STUDY:

1. Brijlal& Subramanian, Electricity and Magnetism, RatanPrakashanMandir, 1995. (Unit I &II)
2. Puri V.K., Digital Electronics circuits and systems, Tata McGraw Hill publications, New Delhi, 2011. (Unit III, IV&V)

BOOKS FOR REFERENCE:

1. Narayanamurthi and Nagarathinam, Electricity and Magnetism, The National Publishing Company, Madras, 1994.
2. Jacob Millman, Integrated Electronics, TataMcGraw Hill publications, New Delhi, 2003.
3. Murugeshan.R, Electricity and Magnetism, S. Chand & Company Ltd., 2015.
4. Gothman W.H., Digital Electronics, Prentice Hall of India PVT., New Delhi, 1996.
5. Rajendran.V, Applied Physics, TATA McGraw hill publications, New Delhi, 2002.

Web Link:
https://nptel.ac.in/courses/115104088

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course				Hours		Credits	
I	22UPH3AC4		APPLIED PHYSICS-I				4		4	
Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓	✓		✓	✓	✓
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓			✓	✓	✓		✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO5	✓		✓	✓	✓	✓		✓	✓	✓
Number of Matches(✓) = 38, Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

APPLIED PHYSICS –II

(PRACTICAL)

Allied Course: II
Course Code: 23UPH4AP
Hours / Week: 3
Credit: 3

Semester: IV
Maximum Marks : 100
Internal Marks : 40
External Marks : 60

Course outcomes

After successfully completing this course the student will be able to

- Study the characteristics of diode, transistor and FET.
- Using techniques in electrical circuits.
- Study the logic gates and their truth tables.
- Analyze the theorems.

Any Twelve

1. Study the Characteristics of Semiconductor diode.
2. Study the Characteristics of Zener diode.
3. Study the Characteristics of FET.
4. Analyze the Transistor Characteristics in CE configuration.
5. Analyze Transistor Characteristics in CB Configuration.
6. Determine Specific Resistance using Metre Bridge.
7. Measurement of Current using Potentiometer.
8. Calibration of low range voltmeter using Potentiometer.
9. Construct and Study LCR - Series resonance circuit.
10. Construct and Study LCR - Parallel resonance circuit
11. Study the Mathematical Operator-Addition, Subtraction using OP-Amp.
12. Construct the Logic Gates (AND, OR, NOT) Using discrete components.
13. Study the performance of NAND and NOR as Universal Gates.
14. Verification of De-Morgan's Theorems.
15. Construct and study Half Adder and Half Subtractor using logic gates.
16. Construct and study Full Adder and Full Subtractor using logic gates.

BOOKS FOR REFERENCE:

1. Srinivasan M.N.,Balasubramanian S. &Renganathan R., A Text book of Practical Physics, Sulthan Chand & Sons, New Delhi, 2000.
2. Somasundram S., Practical Physics, Apsara Publications, Tiruchirappalli, 2012.

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits		
I	22UPH4AC5P		APPLIED PHYSICS-II			4		4		
Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 48, Relationship: Very High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

APPLIED PHYSICS-III

Allied Course: III
Course Code: 23UPH4AC4
Hours / Week: 4
Credit: 3

Semester: IV
Maximum Marks : 100
Internal Marks : 25
External Marks : 75

OBJECTIVES:

- To know about the difference between conductors, insulators and semiconductors
- To have a basic idea about the lasers and optoelectronic devices
- To learn about the operational amplifier and transistor

COURSE OUTCOMES:

After successfully completing this course, the student will be able to understand

- Study the characteristics of diodes and FET
- Perform the procedures for the transistor working and biasing circuits.
- Understand the basic principle of laser and types.
- Perform the procedures into applications of Opto electronic devices.
- Study the Op-amps and its applications.

Unit I: Semiconductor Physics

Theory of energy bands in crystals- Distinction between conductors, Insulators and Semiconductors – Intrinsic and Extrinsic semiconductors – Hall effect in semiconductor– Zener diode –Tunnel diode - Backward diode - Breakdown voltage - Avalanche Breakdown.

Unit II: Transistors

Transistors - PNP and NPN transistors - DC Characteristics of CE and CB configuration-Hybrid Parameters-Functions of Transistor as an amplifier and oscillator – FET - N-channel FET - Performance characteristics - FET amplifier

Unit III: Lasers

Laser and Maser - Basic concepts of stimulated emission – Spontaneous emission - Population inversion and Meta stable state-He-Ne laser-Ruby laser - Co_2 -Laser Disadvantages – Applications.

Unit IV: Opto-Electronic Devices

LED Radiation transition - Emission spectra –Luminescent efficiency-Method of Excitation-Visible LED-Materials for LED - LED configuration and performance - Photo conduction –Photo Diode-Photo transistor- Electronic watches- Seven segment display -LCD.

Unit V: Operational Amplifier

The basic operational amplifier– Inverting and non- inverting operational Amplifier – Differential operational amplifier – CMRR-Basic uses of operational amplifier as sign and scale changer and phase shifter - Adder – Subtractor – Comparator - Differentiator.

BOOKS FOR STUDY:

1. Theraja B.L., The fundamentals of solid-state physics, Sultan Chand& Co., Delhi, 2002 (Unit I).
2. Ramaswami.V, Engineering Physics, D.Prentice Hall of India, New Delhi, 1953(Unit III).
3.V.K.Metha,RohitMetha,BasicElectronics,S. Chand& Co., New Delhi,2015 (Unit II, IV &V).

BOOKS FOR REFERENCE:

1. Jacob Millman, Micorelectronics, McGraw Hill publications, New Delhi, 1985.
2. Mithal G.K. and Vanvasi, Pulse and Digital electronics, Khanna publication, New Delhi, 2006.
3. Ramanan,Function Electronics, TMH, New Delhi, 1994.
4. Millman&Halkias, Electronics Devices and Circuits, McGraw-Hill, 1967.

Web Link
https://nptel.ac.in/courses/108108122

Relationship Matrix for course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
I	22UPH4AC6		APPLIED PHYSICS-III			4			4	
Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓		✓	✓	✓	✓		✓
CO3	✓		✓	✓	✓	✓		✓	✓	
CO4	✓	✓		✓		✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) =43 , Relationship: High										

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relation ship	Very Poor	Poor	Moderate	High	Very High

NME COURSE

PHYSICS OF MUSIC

Non-Major Elective: I
Course Code: 22UPH3NME1
Hours / Week: 2
Credit: 2

Semester: III
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

Learning Objective: To apprise and train students on the role of Physics in music and get the knowledge on the musical notes and instruments.

UNIT-I :SCIENTIFIC STUDY OF MUSIC

Vibrations of atoms of matter– vibrations coupling to air – propagation of sound waves in air, other media, fluids & solids – velocity, frequency, wavelength, time period, intensity: definition and unit fs – classification of sound on frequency and velocity– human & animal sound perception– mechanism of ear and hearing – psychoacoustics

UNIT-II : SIMPLE VIBRATING SYSTEMS

Simple harmonic motion – tuning fork– amplitude, phase, energy,energy loss/damping/ dissipation – power – travelling waves and standing waves– laws of vibration in stretched strings– one-dimensional medium – open and closed organ pipes – over tones, harmonics – quality of sound: pitch, timber, loudness – octaves, musical notes

UNIT-III : MUSICAL TONE

Pure/simple tones – sine/cosine waves– well-defined frequencies, wavelengths, amplitudes & phases– partial tones – assembly of pure tones– mix of different frequencies & amplitudes– complex tone – superposition of simple tones – complex waveform– periodic complex waveform – formants – resonances– sound envelope

UNIT-IV :PRODUCTION OF MUSICAL SOUNDS

Human voice, mechanism of vocal sound production – larynx (sound box) – *stringed Instruments*:plucked &bowed, guitar, mandolin, violin, piano, etc. – *wind instruments*: whistles, flute, saxophone, pipe organ, bagpipes ,etc – *percussion instruments*:plates, membranes,drums, cymbals, xylophone etc. – *electronic instruments*: keyboards, electric guitars, rhythm pads, etc. – analog and digital sound synthesizers,–MIDI instrument– computer generated music

UNIT-V : RECORDING OF MUSIC & SOUND

Edison phonograph – cylinder & disk records – magnetic wire and tape recorders – digital recording (e.g. to CD, DVD, etc.)– analog transducers, condenser, dynamic microphones, loudspeaker – complex sound fields – near & far fields of acoustic– spectral analysis techniques – continuous & discrete Fourier transforms, digital signal processing – digital filtering – specifications of recording studios

TEXT BOOKS

1. Physics and Music: The Science of Musical Sound by Harvey White (2014)
2. Good Vibrations – The Physics of Music by Barry Parker, (2009)
3. The History of Musical Instruments byCurt Sachs, (2006)
4. Physics and Music: Essential Connections and Illuminating Excursions byKinko Tsuji and Stefan C. Müller (2021)

PHYSICS FOR EVERYDAY LIFE

Non-Major Elective: II
Course Code: 22UPH4NME2
Hours / Week: 2
Credit: 2

Semester: IV
Maximum Marks: 100
Internal Marks : 25
External Marks : 75

Learning Objective: To know where all physics principles have been put to use in daily life and appreciate the concepts with a better understanding also to know about Indian scientists who have made significant contributions to Physics

UNIT-I :MECHANICAL OBJECTS

spring scales – bouncing balls –roller coasters – bicycles –rockets and space travel.

UNIT-II :OPTICAL INSTRUMENTS AND LASER

Vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – colour photography – holography and laser.

UNIT-III: PHYSICS OF HOME APPLIANCES

Bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners

UNIT-IV : SOLAR ENERGY

Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.

UNIT-V :INDIAN PHYSICIST AND THEIR CONTRIBUTIONS

C.V.Raman, HomiJehangirBhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.

TEXT BOOKS

1. The Physics in our Daily Lives, Umme Ammara, Gugu cool Publishing, Hyderabad, 2019.
2. For the love of physics, Walter Lawin, Free Press, New York, 2011.