

# B.Sc. Physics

## Syllabus

### AFFILIATED COLLEGES

Program Code: 22C

2023 – 2024 onwards

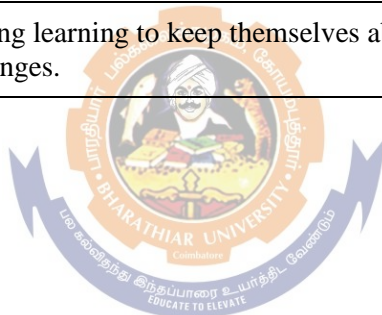


## BHARATHIAR UNIVERSITY

(A State University, Accredited with “A++” Grade by NAAC,  
Ranked 21<sup>st</sup> among Indian Universities by MHRD-NIRF)

Coimbatore - 641 046, Tamil Nadu, India

<b>Program Educational Objectives (PEOs)</b>	
On obtaining an under graduate degree the students will be able to,	
PEO1	Have a strong foundation in basic sciences, mathematics and computational platforms.
PEO2	Acquire professional and ethical attitude, develop communicative skills, team work spirit, multidisciplinary approach, and an ability to relate and solve scientific/technical issues.
PEO3	Enter into higher studies leading to post-graduate and research degrees.
PEO4	Apply and advance the knowledge and skills acquired to become a competent professional in their chosen field.
PEO5	Serve the society with scientific advancement and actively take part in building a knowledge-based society.
PEO6	comprehend, analyze, design and create novel products and solutions for the real-life problems through good scientific and technical knowledge.
PEO7	Become an entrepreneur who can make and sell scientific products in the market.
PEO8	Engross in life-long learning to keep themselves abreast of new developments and to face global challenges.



<b>Program Specific Outcomes (PSOs)</b>	
After the successful completion of the B.Sc Physics program ,the students are expected to,	
PSO1	Realize the role of Physics in day-to-day life.
PSO2	Communicate explicitly and exchange ideas with regard to the impacts of various components of Physics on the environment and society.
PSO3	Expertise in various domains of Physics.
PSO4	Design and develop the skills towards the futuristic needs of the industry/society utilizing both theoretical and practical knowledge acquired in basic Physics.
PSO5	Identify and access the diverse applications of Physics using mathematical concepts enriching career opportunities.



<b>Program Outcomes(POs)</b>	
On successful completion of the B.Sc Physics program ,the students will be able to,	
PO1	Understand the basic concepts and significance of various physical phenomena.
PO2	Transform ideas into action
PO3	Acquire a wide range of problem-solving skills, both analytical and computational and to apply them.
PO4	Develop an independent and self-disciplined specialized learning in tune with the changing socio-technological scenario.
PO5	Get motivated to pursue higher education and research activities in Physics to find professional-level employment.
PO6	Identify, analyze and formulate novel ideas to yield, substantial results in the fields of research utilizing the principles of Physics.
PO7	Develop creative thinking and innovative tools.
PO8	Communicate effectively and acquire employability/self-employment.
PO9	Acquire a broad interdisciplinary knowledge.
PO10	Update themselves in the current developments and discoveries related to Physics.



**BHARATHIAR UNIVERSITY:: COIMBATORE 641046**

**B.Sc PHYSICS Curriculum (Affiliated Colleges)**

(For the students admitted during the academic year 2022– 23)

**Scheme of Examination**

Part	Course Code	Title of the Course	Credits	Hours/week		Maximum Marks		
				Theory	Practical	CIA	CEE	Total
<b>FIRST SEMESTER</b>								
I	11T	Language-I	4	6	-	25	75	100
II	12E	English-I	4	6	-	25	75	100
III	13A	Core I – Mechanics, Properties of Matter and sound	4	6	-	25	75	100
III	-	Core Practical I	-	-	3	-	-	-
III	1AA	Allied Mathematics I * (or)	4	7	-	25	75	100
	1AH	Allied Chemistry I **	3	4	-	20	55	75
III	-	Allied Chemistry Practical **	-	-	3	-	-	-
IV	1FA	Environmental Studies #	2	2	-	-	50	50
<b>Total</b>			<b>18</b>					<b>450</b>
<b>SECOND SEMESTER</b>								
I	21T	Language-II	4	6	-	25	75	100
II	22E	English-II	2	4	-	25	25	50
II	2NM <sup>§</sup>	<b>Effective English: Language Proficiency for Employability</b> <a href="http://kb.naanmudhalvan.in/Bharathiar_University_BU">http://kb.naanmudhalvan.in/Bharathiar_University_BU</a>	2	2	-	25	25	50
III	23A	Core II - Heat and Thermodynamics	4	6		25	75	100
III	23P	Core Practical I	4	-	3	25	75	100
III	2AA	Allied Mathematics II * (or)	4	7	-	25	75	100
III	2AH	Allied Chemistry II **	3	4	-	20	55	75
III	2PH	Allied Chemistry Practical **	2	-	3	20	30	50
IV	2FB	Value Education - Human Rights #	2	2	-	-	50	50
<b>Total</b>			<b>22</b>					<b>550</b>
<b>THIRD SEMESTER</b>								
I	31T	Language-III	4	6	-	25	75	100
II	32E	English-III	4	6	-	25	75	100
III	33A	Core III – Optics	4	4	-	25	75	100
III	-	Core Practical II	-	-	2	-	-	-
III	3AA	Allied Mathematics I * (or)	4	7	-	25	75	100
III	3AH	Allied Chemistry I **	3	4	-	30	45	75
III	-	Allied Chemistry Practical **	-	-	3	-	-	-
IV	3ZA	Skill Based Subject – Instrumentation I	3	3	-	20	55	75
IV	3FC	Tamil @ / Advanced Tamil # (OR) Non-major elective - I (Yoga for Human Excellence)# / Women's Rights #	2	2	-	-	50	50

		Total	20					500
<b>FOURTH SEMESTER</b>								
I	41T	Language-IV	4	6	-	25	75	100
II	42E	English-IV	4	6	-	25	75	100
III	43A	Core IV – Atomic Physics and Spectroscopy	4	4	-	25	75	100
III	43P	<b>Core Practical II</b>	3	-	2	20	55	75
III	4AA or 4AH	Allied Mathematics II * (or) Allied Chemistry II **	4 3	7 4		25 20	75 55	100 75
III	4PH	Allied Chemistry Practical **	2	-	3	20	30	50
IV	4ZB	Skill based subject-Instrumentation-II	2	3	-	20	30	50
IV	4NM <sup>5</sup>	<b>Office Fundamentals: Digital Skills for Employability</b> <a href="http://kb.naanmudhalvan.in/Bharathiar_University_(BU)">http://kb.naanmudhalvan.in/Bharathiar University (BU)</a>	2	-	2	25	25	50
IV	4FE	Tamil @ /Advanced Tamil # (or) Non-Major Elective -II (General Awareness #)	2	-	-	-	50	50
		<b>Total</b>	<b>26</b>					<b>650</b>
<b>FIFTH SEMESTER</b>								
III	53A	Core V – Mathematical Physics	4	4	-	25	75	100
III	53B	Core VI – Electronics	4	4	-	25	75	100
III	53C	Core VII – Solid State Physics	4	4	-	25	75	100
III	53D	Core VIII – Electricity and Magnetism	4	4	-	25	75	100
III	-	Core Practical III - Electronics			2	-	-	-
III	-	Core Practical IV - Digital and Microprocessor			2	-	-	-
III	5EA	Elective – I	4	4	-	25	75	100
III	-	Practical V - C and C++	-	-	3	-	-	-
IV	5ZC	Skill based Subject - Instrumentation III	3	3	-	20	55	75
		<b>Total</b>	<b>23</b>					<b>575</b>
<b>SIXTH SEMESTER</b>								
III	63A	Core IX – Quantum Mechanics and Relativity	4	6	-	25	75	100
III	63B	Core X - Nuclear Physics	4	6	-	25	75	100
III	63P	Core Practical III - Electronics	3	-	2	20	55	75
III	63Q	Core Practical IV - Digital and Microprocessor	3	-	2	20	55	75
III	6EA	Elective – II	4	4	-	25	75	100
III	6EB	Elective – III	4	4	-	25	75	100
III	63R	<b>Practical V - C and C++</b>	3	-	2	20	55	75
IV	6ZP	<b>Skill based Subject Practical –Instrumentation</b>	2	-	2	20	30	50

IV	6NM <sup>5</sup>	Advanced Platform Technology - (Physics, Electronics, Mathematics, Statistics, Data Science) - Govt(auto) & Govt (Non-Auto)  Data Analytics with Advanced Tools - (Physics, Electronics, Mathematics, Statistics, Data Science) - Aided (Non-auto) & SF(Non-Auto)  <a href="http://kb.naanmudhalvan.in/Bharathiar_University_BU">http://kb.naanmudhalvan.in/Bharathiar_University_BU</a>	2	-	2	25	25	50
V	67A	Extension Activities @	2	-	-	-	-	50
<b>Total</b>			<b>31</b>					<b>775</b>
<b>Grand Total</b>			<b>140</b>					<b>3500</b>

**2NM<sup>5</sup>, 4NM<sup>5</sup>, & 6NM<sup>5</sup> - NAAN MUDALVAN COURSES**

\*For subjects without practical

\*\* For subjects with practical

@ No University Examinations. Only Continuous Internal Assessment (CIA)

#No Continuous Internal Assessment (CIA). Only University Examinations

<b>LIST OF ELECTIVE PAPERS</b> (Colleges can choose any one of the papers from each section as electives)		
Elective – I	A	Principles of Programming Concepts and C Programming
	B	Energy Physics
	C	Agricultural Physics
Elective – II	A	Digital and Microprocessor
	B	Optical Fibers and Fiber Optic Communication Systems
	C	Bio-Physics
Elective - III	A	Object Oriented Programming with C++
	B	Geo Physics
	C	Industry Automation & Its Applications ( <b>Industry 4.0</b> )

**LIST OF VALUE-ADDED COURSES (OPTIONAL)**

(Only Internal and no external exam – 100 Marks)

- OPTOELECTRONICS
- NON-DESTRUCTIVE TESTING
- BIOMEDICAL INSTRUMENTATION
- MODERN DISPLAY DEVICES AND STORAGE MATERIALS



***First  
Semester***



**SEMESTER I**

Course code	13A	<b>MECHANICS, PROPERTIES OF MATTER AND SOUND</b>	L	T	P	C
Core/Elective/SBS		<b>CORE PAPER I</b>	6	0	0	4
Pre-requisite	The students are expected to know the fundamental properties of matter and sound		Syllabus Version	2023-24		
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. explore the basic laws governing the behavior of matter in everyday life.						
2. demonstrate practical knowledge and skill in understanding the elastic properties of solids.						
3. identify the behavior of simple harmonic waves						
4. access the importance of Ultrasonics						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, students will be able to:						
1	understand and define the laws involved in mechanics.					K1
2	gain a deeper understanding of mechanics and its fundamental concepts.					K2
3	understand the concept of properties of matter and recognize their applications in various real problems.					K3
4	analyze the universal behavior of wave motion.					K4
5	learning the basic concepts of elasticity, surface tension, Gravitation, viscosity, and sound and evaluating their values for various materials.					K5
6	explore the production and application of ultrasonic wave					K6
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>Unit:1</b>	<b>Conservation Laws</b>				<b>18 hours</b>	
Impulse – Impact – Direct and oblique impact – Final velocity and loss of kinetic energy –Motion of a particle in a vertical circle – friction – Laws of friction – angle of friction – resultant reaction – cone of friction – Equilibrium of a body on a rough inclined plane to the horizontal and when the inclination is greater than the angle of friction.						
<b>Unit:2</b>	<b>Motion of Rigid Body</b>				<b>18 hours</b>	
Moment of inertia – Parallel and perpendicular axes theorem – M.I. of rectangular Lamina and Triangular lamina – M. I of a solid sphere about an axis through its C.G. – Compound pendulum – torque and angular momentum – Relation – Kinetic rotation – conservation of angular momentum.						
<b>Unit:3</b>	<b>Gravitation</b>				<b>18 hours</b>	
Kepler’s Laws of planetary motion – Laws of gravitation – Boy’s method for G –Gravitational potential – Gravitational field at a point due to spherical shell – Variation of ‘g’ with latitude, altitude and depth. <b>Elasticity:</b> Elastic modulus – Poisson’s ratio – relation between them – Expression for bending moment – determination of Young’s modulus by uniform and non-uniform bending – I section girders – Rigidity modulus – Static Torsion – Expression for couple per unit twist – Torsional oscillation.						

<b>Unit:4</b>	<b>Surface Tension</b>	<b>16 hours</b>
Definition and dimension of surface Tension – Excess of Pressure over a curved surface – Variation of S.T. with temperature – Jaeger’s Experiment. <b>Viscosity:</b> Definition – Rotation viscometer- viscosity of gases, Meyer’s Modification of Poiseuille’s formula – Rankine’s method for viscosity of a gas.		
<b>Unit:5</b>	<b>Sound</b>	<b>18 hours</b>
Simple Harmonic vibration – Progressive waves – properties – Composition of two S.H.M. and beats – stationary waves – Properties Melde’s Experiment for the frequency of electrically maintained tuning fork – Transverse and longitudinal modes – Ultrasonics –Properties and application.		
<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>90</b>
<b>Text Book(s)</b>		
1	Properties of Matter and Acoustics, R. Murugesan, 2nd Edition, S.Chand & Co. Ltd. (2017).	
2	Properties of Matter, Brijlal and N.Subrahmanyam, 3rd Edition, S.Chand & Co. (2005).	
<b>Reference Books</b>		
1	Elements of Properties of Matter, D.S. Mathur, 11th Edition, S.Chand & Co., (2010).	
2	A text book of Sound, Brijlal N.Subramaniam, Vikas Publishing House Pvt. Ltd, 2nd edition, (2010).	
3	A Textbook of Sound, M.N.Srinivasan, Himalaya Publishing house, (1991).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.,]</b>		
1	<a href="https://www.physicstutoronline.co.uk/alevelphysicsnotes/">https://www.physicstutoronline.co.uk/alevelphysicsnotes/</a>	
2	<a href="https://latestcontents.com/bsc-physics-mechanics-notes/">https://latestcontents.com/bsc-physics-mechanics-notes/</a>	
3	<a href="http://www.khanacademy.org/science/physics/elasticity/surface_tension">www.khanacademy.org/science/physics/elasticity/surface_tension</a>	
4	<a href="https://sites.google.com/brown.edu/lecture-demonstrations/home?authuser=0">https://sites.google.com/brown.edu/lecture-demonstrations/home?authuser=0</a>	
Course Designed By: <b>Mrs.J.Jayachitra.</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	S	M	M	S	S	S	L	S	S
<b>CO2</b>	S	S	M	M	S	S	S	L	S	S
<b>CO3</b>	S	S	M	L	S	M	L	M	S	M
<b>CO4</b>	S	S	M	M	S	S	S	L	S	M
<b>CO5</b>	S	S	S	S	S	S	S	M	M	S
<b>CO6</b>	M	M	M	L	S	S	M	L	S	S

\*S-Strong; M-Medium; L-Low



***Second  
Semester***

**SEMESTER II**

Course code	23A	HEAT AND THERMODYNAMICS	L	T	P	C
<b>Core/Elective/SBS</b>		<b>CORE PAPER II</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>	The students are expected to know the fundamental concepts of heat and thermodynamics		<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. investigate the role of various laws of heat and thermodynamics in our daily life						
2. substantiate the concepts of heat and thermodynamics experimentally						
3. explore the applications of heat engines						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	realize various principles and laws of heat				K2	
2	derive expressions and find experimental verifications for the laws studied				K3	
3	analyze the applications of heat and thermodynamics in various areas and solve the real-life problems.				K5	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>Unit:1</b>	<b>Calorimetry</b>				<b>17 hours</b>	
Definitions – Newton’s law of cooling – specific heat of a liquid calendar and Barne’s continuous flow method – two specific heats of a gas – specific heat of a gas by Joly’s differential steam calorimeter – Regnault’s method – Dulong and Petit’s law – variation of specific heat and atomic heat with temperature.						
<b>Unit:2</b>	<b>Transmission of Heat</b>				<b>17 hours</b>	
<b>Conduction:</b> Co-efficient of thermal conductivity – Cylindrical flow of heat – Thermal conductivity of rubber – Lee’s disc method for bad conductors. <b>Radiation:</b> Black body – Wein’s displacement law – Raleigh-Jean’s law – Stefan’s law – Experimental Determination of Stefan’s constant – Mathematical derivation of Stefan’s law.						
<b>Unit:3</b>	<b>Kinetic Theory of Gases</b>				<b>18 hours</b>	
Maxwell’s law of distribution of molecular velocities – Experimental verification – equilibrium speed distribution of velocities. Mean free path – transport phenomena – diffusion – viscosity and thermal conduction of gases – Vander walls equation – relation between Vander Wall’s constant and critical constants.						
<b>Unit:4</b>	<b>Laws of Thermodynamics</b>				<b>18 hours</b>	
First law of thermodynamics – Isothermal and Adiabatic process – gas equation during an adiabatic process – Work done in adiabatic expansion of gas – Determination of $\gamma$ by Clement and Desorme’s method – second law of thermodynamics – Carnot’s engine- Working – efficiency – Carnot’s refrigerator – Carnot’s Theorem.						
<b>Unit:5</b>	<b>Concept of Entropy</b>				<b>18 hours</b>	
Entropy – Change in entropy – Change in entropy in a reversible cycle – Principle of increase of entropy – temperature entropy diagram – Entropy of a perfect gas – Thermo dynamic variables – Maxwell’s thermodynamical relations – Applications: Joule Thomson effect – Temperature of inversion - Claussius and Clapeyron’s equation.						

<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>90</b>
<b>Text Book(s)</b>		
1	Thermal Physics, R. Murugesan, S.Chand&Co (2008).	
2	Heat & Thermodynamics, Brijlal & N. Subramaniam, S.Chand&Co (2007)	
3	Heat – M. Narayanamurthi and N. Nagaratnam, National Publishers.	
<b>Reference Books</b>		
1	Heat and Thermodynamics – Zemansky and R.H. Dcltanann, TMH (2017)	
2	Heat and Thermodynamics – D.S. Mathur, S. Chand & Co, Edi (2002).	
3	Heat and Thermodynamics – Agarwal, Singhal, Sathyaprakash, KedarNath Ramnath and Co. (2003).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.askiitians.com/revision-notes/physics/heat-transfer/">https://www.askiitians.com/revision-notes/physics/heat-transfer/</a>	
2	<a href="https://www.askiitians.com/revision-notes/physics/kinetic-theory-of-gases/">https://www.askiitians.com/revision-notes/physics/kinetic-theory-of-gases/</a>	
3	<a href="https://www.askiitians.com/revision-notes/physics/heat-phenomena/">https://www.askiitians.com/revision-notes/physics/heat-phenomena/</a>	
4	<a href="https://www.askiitians.com/revision-notes/physics/thermodynamics/">https://www.askiitians.com/revision-notes/physics/thermodynamics/</a>	
Course Designed By: <b>Dr. P. Sagunthala</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	M	S	S	M	S	S	M	M	M
<b>CO2</b>	S	S	S	S	M	M	M	S	M	S
<b>CO3</b>	M	S	S	S	S	S	S	S	S	S

\*S-Strong; M-Medium; L-Low

**SEMESTER I & II**

Course code	23P	<b>CORE PRACTICAL I</b> (Examination at the end of Second Semester)	L	T	P	C
<b>Core/Elective/SBS</b>		<b>CORE PRACTICAL</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>4</b>
<b>Pre-requisite</b>		Should have the fundamental knowledge of experimental Physics	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>develop the experimental skills in Mechanics and Properties of Matter</li> <li>gain knowledge about the experiments based on Electricity and Magnetism</li> <li>motivate the students to apply the experimental techniques in Optics and Sound.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	analyze the concepts of Viscosity, Surface Tension and Young's Modulus of different substances				K4	
2	explore the knowledge of Spectrometer and other Optical instruments				K5	
3	realize principles and applications of Potentiometer, Sonometer, Magnetometer and PN junction diode.				K4	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>LIST OF EXPERIMENTS</b> (Any twelve experiments)					<b>84 Hours</b>	
<ol style="list-style-type: none"> <li>Acceleration due to gravity - Compound Pendulum</li> <li>Surface tension of a liquid – Drop Weight Method</li> <li>Viscosity by Capillary flow method</li> <li>Comparison of Viscosities – Capillary Flow Method</li> <li>Rigidity modulus – Static Torsion – Scale and Telescope</li> <li>Young's Modulus – Non- Uniform bending – Pin and Microscope</li> <li>Young's Modulus – Uniform bending – Optic lever</li> <li>Young's Modulus – Cantilever – Dynamic method</li> <li>Frequency of A.C. - Sonometer</li> <li>Frequency of Vibrator - Melde's Strings</li> <li>Refractive index of Solid Prism - Spectrometer</li> <li>Determination of wavelength <math>\lambda</math> - Grating – Minimum deviation - Spectrometer</li> <li>Refractive index of Prism - (i-d) Curve - Spectrometer</li> <li>Refractive index of liquid - Hollow prism – Spectrometer</li> <li>Thickness of Wire - Air Wedge</li> <li>Low range voltmeter Calibration - Potentiometer</li> <li>Low range Ammeter Calibration - Potentiometer</li> <li>Velocity of Sound - Resonance Column apparatus</li> <li>Moment of magnet – Tan C Position</li> <li>Characteristics of a Junction Diode</li> </ol>						
<b>Contemporary Issues</b>					<b>6 Hours</b>	
Online workshop, Webinars on Experimental Physics						
<b>Total Practical hours:</b>						<b>90</b>

<b>Reference Books</b>	
1	A textbook of practical Physics, M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, Sultan Chand&Sons(2017)
2	Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007)
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>	
1	<a href="https://nptel.ac.in/course.html/physics/experimental_physics_I,_II_and_III">https://nptel.ac.in/course.html/physics/experimental_physics_I, II and III</a>
2	<a href="https://nptel.ac.in/courses/115/105/115105110/">https://nptel.ac.in/courses/115/105/115105110/</a>
3	<a href="https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLoRX7n8z4tHYK">https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLoRX7n8z4tHYK</a>
Course Designed By: <b>Dr U. Karunanithi</b>	

<b>Mapping with Programme Outcomes</b>										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	M	S	M	L	M	S
CO2	S	S	S	M	M	M	L	M	S	S
CO3	M	M	S	S	L	M	S	S	S	M

\*S-Strong; M-Medium; L-Low





***Third  
Semester***



**SEMESTER III**

Course code	33A	OPTICS	L	T	P	C
<b>Core/Elective/SBS</b>		<b>CORE PAPER III</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>	The students should acquire knowledge basic properties of light. They should be familiar with the behaviour of light in different mediums.		<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>gain knowledge towards geometrical and physical optics</li> <li>provide a good platform in the field of Optics</li> <li>provide basic knowledge on the behavior of light energy and its propagation</li> <li>inspire the concepts of LASER and their applications.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	remember the behavior of light on passing through lens, prism, thin-film and grating					K1
2	understand the phenomena of light like Interference, diffraction, polarization and population inversion					K2
3	analyze and apply the concepts of dispersive power, refractive index, resolving power, double refraction, specific rotation and optical pumping for different materials					K4
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create</b>						
<b>Unit:1</b>	<b>Geometrical Optics</b>				<b>10 hours</b>	
Aberrations - Spherical aberrations in lens - coma - Astigmatism - chromatic aberration - dispersion by a prism - Cauchy's dispersion formula - dispersive power, achromatism in prism - deviation without dispersion - chromatic aberrations in a lens - circle of least confusion - achromatic lens - condition for achromatism of two thin lenses separated by a finite distance.						
<b>Unit:2</b>	<b>Physical Optics - Interference</b>				<b>12 hours</b>	
Fresnel's Biprism – Interference in thin films due to reflected light – Fringes due to wedge-shaped thin film – Newton's rings – Refractive index of the Liquid – Michelson interferometer – Determination of a wavelength of monochromatic light – difference in Wavelength between two neighboring spectral lines – Fabry Perot Interferometer.						
<b>Unit:3</b>	<b>Diffraction</b>				<b>12 hours</b>	
Fresnel's assumptions – rectilinear propagation of light – half-period zone – Zone Plates – Action and Construction – comparison with a convex lens – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction at a Single light – Diffraction grating – Resolving power & Dispersive power of Grating.						
<b>Unit:4</b>	<b>Polarization</b>				<b>12 hours</b>	
Double Refraction – Huygen's explanation --Optic axis in the plane of incidence, inclined and perpendicular to the crystal surface – Production and Detection of Plane, Circularly and Elliptically Polarized light – Optical Activity – Fresnel's explanation – Specific rotation – Half Shade Polarimeter.						

<b>Unit:5</b>	<b>Quantum Optics</b>	<b>12 hours</b>
Light quanta and their origin – Resonance radiation – Metastable states – Population Inverse – Optical pumping – Spontaneous and Stimulated emission – Einstein’s coefficient – Ruby, He- Ne, CO <sub>2</sub> laser – Resonant cavities – elements of non-linear optics – second harmonic generation– threshold condition for laser – Stimulated Raman scattering.		
<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars – webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	A Textbook of Optics, Brijlal & Subramaniam, S. Chand Limited (2001)	
2	Modern Physics, R Murugesan, S. Chand Publishing, 18th Edition (2017)	
<b>Reference Books</b>		
1	Optics and Spectroscopy, R Murugesan, S. Chand Publishing, 5 <sup>th</sup> Edition (2013)	
2	Optoelectronics, Ajoy Kumar Ghatak, K. Thyagarajan, Cambridge University Press (1989).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.youtube.com/watch?v=ML7HcZo6laE">https://www.youtube.com/watch?v=ML7HcZo6laE</a>	
2	<a href="https://www.khanacademy.org/science/physics/light-waves/introduction-to-light-waves/v/polarization-of-light-linear-and-circular">https://www.khanacademy.org/science/physics/light-waves/introduction-to-light-waves/v/polarization-of-light-linear-and-circular</a>	
3	<a href="https://nptel.ac.in/courses/104/104/104104085/">https://nptel.ac.in/courses/104/104/104104085/</a>	
Course Designed By: <b>Dr. K. Selvaraju</b>		

<b>Mapping with Programme Outcomes</b>										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	M	S	M	M	M	S
CO2	S	M	S	M	S	M	M	M	S	S
CO3	M	M	M	S	S	S	S	S	S	S

\*S-Strong; M-Medium; L-Low

**SEMESTER III**

Course code	3ZA	INSTRUMENTATION - I	L	T	P	C
<b>Core/Elective/SBS</b>		<b>SKILL BASED SUBJECT</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Pre-requisite:</b>		Students should know the importance of measurement and accuracy	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. understand the basic principles of measurement devices, their performance under various external conditions and sources of error in measurement.						
2. enable students to select appropriate standards of measurement and methods of calibration.						
3. select an appropriate transducer for basic temperature, pressure and flow measurement.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, students will be able to:						
1	use the concepts of measurement.					K1
2	understand a typical instrument design.					K2
3	apply statistical error analysis for measurement					K3
4	choose a transducer/sensor for typical measurement of temperature, pressure and flow.					K4
5	evaluate the performance and reliability of measurement devices available in the market.					K5
6	design a basic measurement device.					K6
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create</b>						
<b>Unit:1</b>	<b>Basic Concept of Measurement</b>					<b>7 hours</b>
Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices – Calibration. <b>Transducers:</b> Capacitive transducers – Piezoelectric transducers – Photoelectric effect – Photoconductive transducers – Ionization transducers – Hall Effect transducers – Digital displacement transducers.						
<b>Unit:2</b>	<b>Performance Characteristics of an Instrumentation system</b>					<b>9 hours</b>
Introduction – Generalized measurement – Zero order system – first and second order system – Dead time element – Specification and testing of dynamic response.						
<b>Unit:3</b>	<b>Pressure Measurement</b>					<b>9 hours</b>
Mechanical Pressure measurement devices – Bourdon tube Pressure gauge – The Bridgeman Gauge – Dead weight tester – Low-Pressure measurement – The McLeod gauge – Pirani thermal Conducting gauge – The Knudsen gauge.						
<b>Unit:4</b>	<b>Flow Measurement</b>					<b>9 hours</b>
Positive displacement methods – Flow Obstruction methods – Flow measurement by drag effects – Hot wire and Hot film anemometers – Magnetic flow meters						
<b>Unit:5</b>	<b>Measurement of Temperature</b>					<b>9 hours</b>
Temperature scales – The ideal gas thermometer – temperature measurements by mechanical effects - temperature measurements –Thermistors-Thermoelectric effects.						

<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars – webinars		
<b>Total Lecture hours</b>		<b>45</b>
<b>Text Book(s)</b>		
1	Instrumentation Devices and Systems, C.S. Rangan, G. R. Sarma and V. S. Mani, 2 <sup>nd</sup> Edition, Tata McGraw Hill, New Delhi (1983)	
2	Experimental Methods for Engineers, J. P. Holman, 7 <sup>th</sup> Edition, McGraw Hill, New Delhi, (2007)	
<b>Reference Books</b>		
1	H. S. Kalsi, Electronic Instrumentation, 3 <sup>rd</sup> edition, Tata McGraw Hill, New Delhi (2012)	
2	Measurement System Applications and Design, E.O. Doebalin, 5 <sup>th</sup> edition, McGraw Hill International, (2007)	
3	Transducers and Instrumentation, D. V. S. Murthy, 2 <sup>nd</sup> edition, Prentice Hall of India (2010)	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	Static and dynamic measurement <a href="https://youtu.be/DFdTRPUwK_I">https://youtu.be/DFdTRPUwK_I</a>	
2	Pressure measurement <a href="https://youtu.be/sHmjE21Fp9w">https://youtu.be/sHmjE21Fp9w</a>	
3	Temperature measurement Lecture Series on Industrial Automation and Control by Prof. S. Mukhopadhyay, Department of Electrical Engineering, IIT Kharagpur. <a href="https://youtu.be/As5kzxkyT24">https://youtu.be/As5kzxkyT24</a>	
4	NPTEL <a href="https://www.youtube.com/watch?v=3eYmFjHnQjY&amp;list=PLbRMhDVUMngcoKrA4sH-zvbNVSE6lpEio">https://www.youtube.com/watch?v=3eYmFjHnQjY&amp;list=PLbRMhDVUMngcoKrA4sH-zvbNVSE6lpEio</a>	
5	Open courseware- University of Malaysia, Pahang <a href="http://ocw.ump.edu.my/course/view.php?id=272">http://ocw.ump.edu.my/course/view.php?id=272</a>	
Course Designed By: <b>Mrs. J.Jayachitra, Dr.L.Priya</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	M	M	M	S	M	M	L	S	S
<b>CO2</b>	S	S	S	M	M	M	M	L	S	S
<b>CO3</b>	S	S	S	M	S	M	M	M	S	S
<b>CO4</b>	S	S	S	S	S	S	M	M	S	S
<b>CO5</b>	S	M	S	M	M	S	S	M	M	M
<b>CO6</b>	M	S	S	M	M	S	S	S	M	M

\*S-Strong; M-Medium; L-Low



***Fourth  
Semester***

SEMESTER IV

Course code	43A	ATOMIC PHYSICS AND SPECTROSCOPY	L	T	P	C
Core/Elective/SBS		CORE PAPER IV	4	0	0	4
Pre-requisite	The students should have the awareness on the structure of atoms, photoelectric effect and X rays		Syllabus Version		2023-24	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. provide a detailed study of atom</li> <li>2. learn the impact of magnetic fields on spectra</li> <li>3. study the concept of photoelectric cells</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	analyze various types of spectrographs to study about positive rays				K4	
2	explain magneto optical properties of materials				K5	
3	find applications of photoelectrical cells and X Rays				K3	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>Unit:1</b>	<b>Positive Rays</b>				<b>11 hours</b>	
Positive rays – Discovery – Properties – Positive ray analysis – Thomson’s Parabola method – action of Electric and Magnetic fields – Determination of $e/m$ – determination of mass – discovery of stable isotopes– Limitations – Dempster’s mass spectrograph –Aston’s mass spectrograph- mass defect and packing fraction – polarization of X –rays – scattering of X- rays (Thomson’s formula).						
<b>Unit:2</b>	<b>Structure of the Atom</b>				<b>12 hours</b>	
The Bohr atom model – Critical Potentials – Method of excitation of atoms – Experimental determination of critical potentials by Davison and Goucher’s method - Sommerfield’s relativistic model– Vector atom model – Quantum numbers associated with Vector atom model – coupling schemes (LS, JJ coupling) – Pauli’s exclusion principle – Periodic classification of elements.						
<b>Unit:3</b>	<b>Magneto Optical Properties of Spectrum</b>				<b>12 hours</b>	
Magnetic dipole moment due to orbital motion of the electron – Magnetic dipole moment due to spin – The Stern and Gerlach experiment – Optical spectra – Fine Structure of the sodium D line – Zeeman effect – Experiments – Lorentz classical theory – Expression for the Zeeman shift – Larmor’s theorem – Quantum mechanical explanation of the normal Zeeman effect – Anomalous Zeeman effect – Paschen – Back effect – Stark effect.						
<b>Unit:4</b>	<b>Photoelectric Effect</b>				<b>11 hours</b>	
Introduction – Richardson and Compton experiment – Relation between Photoelectric current and retarding potentials – Relation between velocity of Photoelectrons and the frequency of light – Laws of Photoelectric emission – Failure of electromagnetic theory – Einstein’s Photoelectric equation – Experimental verification – Millikan’s Experiments – Photoelectric cells – Photo emissive cell – Photo Voltaic cell – Photoconductive cell – Applications of Photoelectric cells.						

<b>Unit:5</b>	<b>X-Ray Spectra</b>	<b>12 hours</b>
X-ray – Coolidge tube – Properties – X-ray Spectra – Continuous and characteristics X-ray spectrum – Mosley’s law (Statement, Explanation and Importance) – Compton effect – Expression for change of wavelength - X-ray diffraction-Bragg’s law- Bragg’s spectrometer- Powder crystal method – <b>Quantum theory</b> : The distribution of energy in the spectrum of a black body – its results - Planck’s hypothesis – derivation of Planck’s law of radiation.		
<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Modern Physics, Murugesan R. and Kiruthiga Sivaprasath. S. Chand and Company, 18 <sup>th</sup> edition (2016).	
<b>Reference Books</b>		
1	Modern Physics, Sehgal D.L. Chopra K.L. and Sehgal N.K. Sultan Chand & Sons, 9 <sup>th</sup> edition, (2004)	
2	Atomic Physics, Rajam J B, S. Chand and Company Ltd, New Delhi, 20 <sup>th</sup> edition (2009).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.askiitians.com/revision-notes/physics/atomic-physics/">https://www.askiitians.com/revision-notes/physics/atomic-physics/</a>	
2	<a href="https://nptel.ac.in/courses/115/101/115101003/">https://nptel.ac.in/courses/115/101/115101003/</a>	
3	<a href="https://www2.physics.ox.ac.uk/sites/default/files/2011-10-19/atomic_physics_lectures_1_8_09_pdf_pdf_18283.pdf">https://www2.physics.ox.ac.uk/sites/default/files/2011-10-19/atomic_physics_lectures_1_8_09_pdf_pdf_18283.pdf</a>	
Course Designed By: <b>Dr. N. Sasi</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	M	M	M	S	M	M	M	M	S
<b>CO2</b>	S	M	S	S	M	M	S	M	M	M
<b>CO3</b>	M	S	S	S	S	S	S	S	S	S

\*S-Strong; M-Medium; L-Low



**SEMESTER III & IV**

Course code	43P	<b>CORE PRACTICAL II</b> (Examination at the end of Fourth Semester)	L	T	P	C
<b>Core/Elective/SBS</b>		<b>CORE PRACTICAL</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>3</b>
<b>Pre-requisite</b>		Should have the fundamental knowledge of Physics	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
4. develop the experimental skills in Mechanics and Properties of Matter						
5. gain knowledge about the experiments based on Electricity and Magnetism						
6. motivate the students to apply the experimental techniques in Optics.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	apply the concepts of Specific heat capacity and Young's Modulus of different substances				K3	
2	acquire the knowledge of Physical optics using Spectrometer				K4	
3	evaluate principles and applications of Potentiometer, Magnetometer and BG.				K5	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>LIST OF EXPERIMENTS</b> (Any twelve experiments)					<b>56 hours</b>	
1. Rigidity Modulus – Torsional Pendulum – With & Without symmetrical masses 2. Specific heat capacity – Newton's Law of cooling – Spherical Calorimeter 3. Determination of wavelength $\lambda$ - Grating – Normal Incidence - Spectrometer 4. Refractive index of Prism - ( $i - i'$ ) curve - Spectrometer 5. Determination of Cauchy's constants - Spectrometer 6. Dispersive Power of Prism - Spectrometer 7. Refractive index of a lens - Newton's rings 8. Comparison of magnetic moments – Deflection magnetometer – Tan A position 9. Magnetic field intensity - Field along the axis of a circular coil 10. Young's Modulus – Cantilever – Depression – Pin and Microscope 11. Young's Modulus – Koenig's Method – Non-Uniform bending 12. Young's Modulus – Koenig's Method – Uniform bending 13. Specific resistance of a wire - Potentiometer 14. EMF of a thermocouple - Potentiometer 15. Calibration High range voltmeter - Potentiometer 16. Temperature Coefficient of Resistance - Thermistor - Carey Foster's Bridge 17. Characteristics of Zener diode 18. Figure of Merit – Charge sensitivity - Ballistic Galvanometer 19. Comparison of Mutual Inductance - BG 20. Determination of High Resistance by leakage- BG						
<b>Contemporary Issues</b>					<b>4 hours</b>	
Online workshop, Webinars on Experimental Physics						
<b>Total Practical Hours:</b>					<b>60</b>	



<b>Reference Books</b>	
1	A text book of practical Physics, M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, Sultan Chand&Sons(2017)
2	Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007)
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>	
1	<a href="https://nptel.ac.in/course.html/physics/experimental_physics_I,_II_and_III">https://nptel.ac.in/course.html/physics/experimental_physics_I, II and III</a>
2	<a href="https://nptel.ac.in/courses/115/105/115105110/">https://nptel.ac.in/courses/115/105/115105110/</a>
3	<a href="https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLoRX7n8z4tHYK">https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLoRX7n8z4tHYK</a>
Course Designed By: <b>Dr. U. Karunanithi</b>	

<b>Mapping with Programme Outcomes</b>										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	M	S	M	M	M	S
CO2	S	M	S	M	S	S	M	L	M	S
CO3	M	S	S	S	L	M	S	S	S	M

\*S-Strong; M-Medium; L-Low



SEMESTER IV

Course code	4ZB	INSTRUMENTATION II	L	T	P	C
Core/Elective/SBS		SKILL BASED SUBJECT	3	0	0	2
Pre-requisite	Students should know the importance of measurements in large scale		Syllabus Version		2023-24	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. make the students understand the principles of measurements in industry conditions</li> <li>2. make students understand the process of vibration sensing</li> <li>3. select appropriate air pollution and sampling techniques</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	use thermal and nuclear radiation detectors					K1
2	understand the high-temperature process in transient and industrial conditions					K2
3	use adequate equipment to determine the state of pollution in the environment					K3
4	design and use simple instrumentation for measurement of mechanical properties					K4
5	understand the living conditions in industrial areas					K5
6	apply modeling concepts for the prediction and determination of random vibrations					K6
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>Unit:1</b>	<b>Temperature Measurement by Radiation</b>				<b>9 hours</b>	
Effects of heat transfer and temperature measurements – Transient response of thermal systems – Thermocouple compensation – Temperature measurement flow in high-speed flow. <b>Thermal and transport property Measurement:</b> Thermal conductivity measurements – Thermal conductivity of liquids and gases – measurement of Viscosity–Gas diffusion – Calorimetry.						
<b>Unit:2</b>	<b>Force, Torque and Strain Measurements</b>				<b>9 hours</b>	
Introduction – Mass balance measurements – Elastic elements for force measurements – Torque Measurement – Stress and Strain measurements – Electrical resistance – strain gauges.						
<b>Unit:3</b>	<b>Vibration</b>				<b>9 hours</b>	
Random Vibration – Shock – Analysing vibration sensing devices – Generalized second order system – Absolute displacement – Absolute velocity and acceleration vibrating sensing devices – Velocity transducer –bonded strain gauge accelerometers–Piezoelectric accelerometers- Digital accelerometer.						
<b>Unit:4</b>	<b>Thermal and Nuclear Radiation Measurements</b>				<b>9 hours</b>	
Introduction – Detection of thermal radiation – Measurement of emissivity – Reflectivity and Transmittivity measurements – Solar radiation measurements – Detection of Nuclear radiation – The Geiger Muller counter– Scintillation counter.						
<b>Unit:5</b>	<b>Air Pollution Sampling and Measurements</b>				<b>7 hours</b>	
Introduction – Units of pollution measurements – Air pollution standards – General air sampling – Train gas sampling techniques – Particulate sampling techniques – Sulphur dioxide measurements.						

<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars – webinars		
<b>Total Lecture hours</b>		<b>45</b>
<b>Text Book(s)</b>		
1	Instrumentation Devices and Systems, C.S. Rangan, G. R. Sarma and V. S. Mani, 2 <sup>nd</sup> Edition, Tata McGRaw Hill, New Delhi (1983)	
2	Experimental Methods for Engineers, J. P. Holman, 7 <sup>th</sup> Edition, McGRaw Hill, New Delhi (2007)	
<b>Reference Books</b>		
1	Measurement System Applications and Design, E.O. Doebalin, 5 <sup>th</sup> edition, McGraw Hill International (2007)	
2	Transducers and Instrumentation, D. V. S. Murthy, 2 <sup>nd</sup> edition, Prentice Hall of India (2010)	
3	Mechanical and Industrial Measurement, R. K. Jain, Khanna Applications (2013)	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	Thermal radiation detector <a href="https://www.youtube.com/watch?v=QiOfz1-7uw">https://www.youtube.com/watch?v=QiOfz1-7uw</a>	
2	Nuclear Security and Safeguards Education Portal- youtube channel- <a href="https://youtu.be/Me7XA2vv4F4">https://youtu.be/Me7XA2vv4F4</a>	
3	Nuclear Detector <a href="https://chem.libretexts.org/Bookshelves/General_Chemistry/Book%3A_ChemPRIME_(Moore_et_al.)/19%3A_Nuclear_Chemistry/19.10%3A_Instruments_for_Radiation_Detection#:~:text=Perhaps%20the%20most%20common%20instrument,to%20discover%20the%20atomic%20nucleus).">https://chem.libretexts.org/Bookshelves/General_Chemistry/Book%3A_ChemPRIME_(Moore_et_al.)/19%3A_Nuclear_Chemistry/19.10%3A_Instruments_for_Radiation_Detection#:~:text=Perhaps%20the%20most%20common%20instrument,to%20discover%20the%20atomic%20nucleus).</a>	
4	Air pollution <a href="http://web.iyte.edu.tr/~serifeyalcin/lectures/chem201/cn_8.pdf">http://web.iyte.edu.tr/~serifeyalcin/lectures/chem201/cn_8.pdf</a>	
Course Designed By: <b>Mrs. J.Jayachitra, Dr.L.Priya</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	L	L	M	M	M	M	L	M	S
<b>CO2</b>	S	S	L	M	S	S	L	L	L	M
<b>CO3</b>	S	S	S	S	S	S	S	M	S	S
<b>CO4</b>	S	S	M	M	M	S	S	M	L	S
<b>CO5</b>	S	S	S	L	M	S	M	M	S	S
<b>CO6</b>	S	S	S	S	S	S	S	M	S	S

\*S-Strong; M-Medium; L-Low



***Fifth  
Semester***

**SEMESTER V**

Course code	53A	MATHEMATICAL PHYSICS	L	T	P	C
<b>Core/Elective/SBS</b>		<b>CORE PAPER V</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>		Should have the basic knowledge of Mathematics and Mechanics	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. enable the students to acquire the problem-solving ability						
2. apply the equations for the situation of different physical problems.						
3. motivate the students to apply the mathematical principles in their day-to-day life.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	derive Lagrange's and Hamilton's equations					K2
2	apply Lagrange's and Hamilton's equations to physical problems					K3
3	analyze gamma and beta functions and their applications					K3
4	solve problems on Matrices and apply them to relevant problems					K4
5	apply Stoke's and Gauss theorems to suitable physical problems					K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>						
<b>Unit:1</b>	<b>Classical Mechanics - I</b>					<b>12 -- hours</b>
Constraints and Degrees of Freedom – Generalized coordinates – Generalized displacement – Velocity – Acceleration – Momentum – Force – Potential Energy – D'Alembert's Principle – Lagrangian equation from D'Alembert's principle – Application of Lagrange's equation of motion to Linear Harmonic Oscillator, Simple Pendulum and Compound Pendulum.						
<b>Unit:2</b>	<b>Classical Mechanics – II</b>					<b>12 hours</b>
Phase Space – Hamiltonian function – Hamiltonian Principle – Hamilton's canonical equations of motion- Physical significance of H – Applications of Hamiltonian equations of motion to Simple Pendulum, Compound Pendulum and Linear Harmonic Oscillator.						
<b>Unit:3</b>	<b>Special Functions</b>					<b>12 hours</b>
Definition – The Beta function – Gamma function – Evaluation of Beta function – Other forms of Beta function – Evaluation of Gamma function – Other forms of Gamma function – Relation between Beta and Gamma functions – Problems.						
<b>Unit:4</b>	<b>Matrices</b>					<b>10 hours</b>
Introduction – special types of Matrices – Transpose of a Matrix – The Conjugate of a Matrix – Conjugate Transpose of a Matrix – Symmetric and Anti-symmetric – Hermitian and skew Hermitian – Orthogonal and Unitary Matrices – Properties – Characteristic equation – Roots and characteristic vector – Diagonalization of matrices – Cayley-Hamilton theorem –Problems						
<b>Unit:5</b>	<b>Vector Calculus</b>					<b>12 hours</b>
$\nabla$ Operator – Divergence – Second derivative of Vector functions or fields – The Laplacian Operator – Curl of a Vector – Line Integral – Line Integral of a Vector field around an infinitesimal rectangle – Curl of Conservative field – Surface Integral – Volume Integral (without problem) – Gauss's Divergence theorem and it's proof - Simple problems – Stoke's theorem and its proof - Simple problems.						

<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture Hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Mathematical Physics, B.D. Gupta-Vikas Publishing House, 4th Edition (2006)	
2	Classical Mechanics, S.L.Gupta, V. Kumar&H.V.Sharma, PragatiPrakashan (2017)	
<b>Reference Books</b>		
1	Mathematical Physics, Sathya Prakash, Sultan Chand, 6 <sup>th</sup> edition (2014)	
2	Mathematical Physics Rajput, Pragathi Prakasan Pub., (2017)	
3	Mathematical Physics, H.K. Dass, S. Chand & Co., Eighth edition (2018)	
4	Classical Mechanics, J.C.Upadhyaya, Himalaya Publishing House(2012)	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/course.html/Physics/Introduction%20to%20classical%20mechanics">https://nptel.ac.in/course.html/Physics/Introduction to classical mechanics</a>	
2	<a href="https://nptel.ac.in/course.html/Physics/Integrals%20and%20vector%20calculus">https://nptel.ac.in/course.html/Physics/Integrals and vector calculus</a>	
3	<a href="https://nptel.ac.in/course.html/Physics/Matrix%20analysis%20and%20with%20applications">https://nptel.ac.in/course.html/Physics/Matrix analysis and with applications</a>	
Course Designed By: <b>Dr. U. Karunanithi</b>		

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	M	S	M	M	S	M	M
CO2	S	S	M	S	M	S	L	M	S	M
CO3	S	M	M	S	S	M	L	M	S	S
CO4	S	S	L	M	S	M	M	M	S	S
CO5	S	S	M	L	M	S	S	M	M	S

\*S-Strong; M-Medium; L-Low

**SEMESTER V**

Course code	53B	ELECTRONICS	L	T	P	C
<b>Core/Elective/SBS</b>		<b>CORE PAPER VI</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>		Should have the basic knowledge of Semiconducting devices	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. acquire knowledge and apply it to various electronic instruments.						
2. gain knowledge about the development of electronic instruments.						
3. motivate the students to apply the principles of electronics in their day-to-day life.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	differentiate between different types of amplifiers and their applications				K2	
2	design different types of oscillators				K3	
3	apply switching ideas to various devices				K3	
4	analyzing the power electronic devices and their uses				K4	
5	design operational amplifier circuits and to analyze their properties				K5	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> – Create;						
<b>Unit:1</b>		<b>Amplifiers</b>				<b>12 hours</b>
<b>Voltage and power amplifiers:</b> Classification of amplifiers – Transistor amplifiers in cascade– Power amplifiers – Class A power amplifier – Push Pull connection – push-pull class B Power amplifier – Characteristics of an amplifier. <b>Feedback amplifiers:</b> feedback and related terms- block diagram of a feedback amplifier- Transfer gain of an amplifier with feedback- Emitter follower circuit.						
<b>Unit:2</b>		<b>Oscillators</b>				<b>11 hours</b>
Introduction - Types of oscillators - Fundamental principle of oscillator - Concept of feedback oscillator -Tuned collector oscillator - Analysis - Hartley oscillators – Analysis – Colpitt’s oscillator – Analysis - Phase shift oscillator-Analysis - Wien bridge oscillator - Analysis - Crystal oscillator – Analysis.						
<b>Unit:3</b>		<b>Solid state switching circuits</b>				<b>12 hours</b>
Introduction - switching circuit- electronic switches - important terms - switching action of a transistor – multivibrators – types of multivibrators –transistor astable multivibrator – transistor monostable multivibrator - Differentiating circuit - Integrating circuit - Clipping circuits – Clamping Circuits - basic idea of a clamper- Positive clamper – negative clamper.						
<b>Unit:4</b>		<b>Power Electronics</b>				<b>12 hours</b>
Introduction - power electronics - The Triac – Construction - Operations – Characteristics - Applications. The Diac – Operations – Applications of Diac – Lamp dimmer – heat controller. Unijunction transistor – Construction – Operations - equivalent circuit of UJT –Characteristics of UJT - advantages of UJT – applications of UJT – UJT relaxations Oscillator - UJT over voltage detector.						

<b>Unit:5</b>	<b>Operational Amplifier</b>	<b>11 hours</b>
Differential amplifier – Basic circuit – Operation – CMRR -Operational amplifier – Characteristics – Circuit symbol - Frequency response - Slew rate – Applications - Inverting amplifier - Non inverting amplifier - Adder - Subtractor - Integrator- Differentiator.		
<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Foundations of Electronics, D Chattopadhyaya & P C Rakshit, New Age International Publishers, Second Edition (2005)	
2	Principles of Electronics, V K Mehta, Rohit Mehta, S. Chand Company, Eleventh revised Edition (2015)	
<b>Reference Books</b>		
1	A textbook of Applied Electronics, R S Sedha, S. Chand Company, First Edition (2010)	
2	Integrated Electronics, Jacob Millman and Christos C. Halkias, Tata McGraw Hill Publishing Company, Second edition (2015)	
3	Electronic devices and Circuits, S. Salivahanan and N. Sureshkumar, Tata McGraw Hill Publishing Company, Fourth edition (2016)	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/course.html/Electronics/Basic_electrnics">https://nptel.ac.in/course.html/Electronics/Basic_electrnics</a>	
2	<a href="https://www.askiitians.com/revision-notes/physics/solid-and-electronic-device/">https://www.askiitians.com/revision-notes/physics/solid-and-electronic-device/</a>	
3	<a href="https://nptel.ac.in/course.html/electronics/operational_amplifier">https://nptel.ac.in/course.html/electronics/operational_amplifier</a>	
Course Designed By: <b>Dr. U. Karunanithi</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	M	L	M	S	M	L	S	M	M
<b>CO3</b>	S	S	M	S	M	S	M	L	S	M
<b>CO3</b>	S	M	M	S	S	M	L	M	S	S
<b>CO4</b>	S	S	L	M	S	M	M	M	S	S
<b>CO5</b>	S	S	M	L	M	S	S	M	M	S

\*S-Strong; M-Medium; L-Low



**SEMESTER V**

Course code	53C	SOLID STATE PHYSICS	L	T	P	C
<b>Core/Elective/SBS</b>		<b>CORE PAPER VII</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>	The students should know the fundamentals on kinds of bonds and classification of solids		<b>Syllabus Version</b>	<b>2023-24</b>		
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. learn about the crystal structure and properties of solids.						
2. know about bond theory and optical properties of solids.						
3. gain knowledge on magnetic, electric and dielectric materials and their application.						
4. understand the superconducting process for the fabrication of new devices.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	choose the right material for a given application based on Fermi level concept				K3	
2	analyze the magnetic materials for utilization in varied fields.				K4	
3	design new components or devices using dielectrics and superconductors.				K6	
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>						
<b>Unit:1</b>	<b>Crystallography</b>				<b>12 hours</b>	
Distinction between crystalline and amorphous solids – Different features of the crystal – Crystal lattice – Basis – Crystal structure – Unit cell – Number of lattice points per unit cell- Bravais lattices – Miller indices – Elements of Symmetry – Structure of KCl and NaCl crystal – Atomic Packing – Atomic radius –Lattice constant and density- Crystal structure (sc; hcp; fcc; bcc.)						
<b>Unit:2</b>	<b>Bond Theory of Solids</b>				<b>10 hours</b>	
Classification of solids – Basics of Bond theory – Optical properties of solids – Specific heat capacity of solids – Dulong and Pettit’s law – Einstein’s theory of specific heat of solids – Fermi levels.						
<b>Unit:3</b>	<b>Magnetic Properties of Materials</b>				<b>12 hours</b>	
Introduction – Langevin’s theory of diamagnetism –Langevin’s theory of Paramagnetism – Ferromagnetism – Weiss theory of Ferromagnetism –Nuclear magnetic resonance – Ferroelectricity – Ferroelectric crystals – Quantum theory of paramagnetism – Cooling by adiabatic demagnetization of a paramagnetic salt.						
<b>Unit:4</b>	<b>Free Electron Theory</b>				<b>12 hours</b>	
Free electron theory – Drude Lorentz theory – Explanation of Ohm’s law – Electrical conductivity – Thermal conductivity – Wide-Mann and Franz ratio – Sommerfield model – Schotcky effect – Hall effect – Hall voltage and Hall coefficient – Mobility and Hall angle – Importance of Hall effect – Experimental determination of Hall coefficient.						
<b>Unit:5</b>	<b>Dielectrics and Super Conductivity</b>				<b>12 hours</b>	
Dielectrics- Dielectric constant and displacement vector- Clausius Mossotti relation- Atomic or molecular polarizability – Types of polarizability -Superconductivity – Phenomena – magnetic properties – Superconductor – Meissner effect – Experimental facts – Isotopes effect – Thermodynamic effect.						

<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Solid State Physics Gupta and Kumar, K. Nath & Co. (2018)	
2	Modern Physics R Murugesan , S Chand Publishing; Eighteenth edition (2016)	
<b>Reference Books</b>		
1	Introduction to Solid State Physics Charles Kittel, Wiley (2019)	
2	Solid State Physics A J Dekker, Macmillan (2011)	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://youtu.be/RImqF8z91fU">https://youtu.be/RImqF8z91fU</a>	
2	<a href="https://nptel.ac.in/courses/115/105/115105099/">https://nptel.ac.in/courses/115/105/115105099/</a>	
Course Designed By: <b>Mr. J.William Charles</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	S	M	S	S	S	M	M	S	M
<b>CO2</b>	M	M	S	S	M	S	S	M	M	S
<b>CO3</b>	M	S	S	S	S	S	S	S	S	S

\*S-Strong; M-Medium; L-Low



SEMESTER V

Course code	53D	ELECTRICITY AND MAGNETISM	L	T	P	C
Core/Elective/SBS		CORE PAPER VIII	4	0	0	4
Pre-requisite	The students are supposed to have the basic knowledge of electricity and magnetism		Syllabus Version		2023-24	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. make the students familiar with the laws of electricity and magnetism and their verifications</li> <li>2. understand the properties of electric and magnetic materials</li> <li>3. acquire experimental skills to construct technically useful devices.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	define and derive the laws of electricity and magnetism				K2	
2	update the knowledge of properties and magnetism				K3	
3	expertise the skills to manufacture devices				K5	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>Unit:1</b>	<b>Gauss Theorem and its Applications</b>				<b>12 hours</b>	
Gauss theorem – applications of Gauss theorem: Electric intensity at a point due to a charged sphere – Electric intensity at a point near an infinite charged conductor - Electric intensity at a point between two parallel plane charged conductors - Electric intensity at a point outside two parallel plane charged conductors - Energy stored per unit volume of an electric field. <b>Capacitors:</b> Introduction – principle of a capacitor – capacitance of a spherical capacitor – outer sphere earthed – inner sphere earthed – cylindrical capacitor – capacity of a parallel plate capacitor – effect of a dielectric – capacitors in series and parallel – Guard-Ring condenser – mica capacitor – uses of capacitors.						
<b>Unit:2</b>	<b>Magnetic Properties of Materials</b>				<b>12 hours</b>	
Electron theory of magnetism; dia, para, ferromagnetism and their properties magnetic field B; magnetization M; magnetic field intensity H; magnetic susceptibility and magnetic permeability; magnetic materials and magnetization; magnetic hysteresis – area of the hysteresis loop; determination of susceptibility: Guoy's method – magnetic circuits –comparison of electrical circuit with magnetic circuit.						
<b>Unit:3</b>	<b>Thermo Electricity</b>				<b>11 hours</b>	
Seebeck effect – Laws of thermo e.m.f – Peltier effect; Peltier Co- efficient – determination of Peltier co-efficient – thermodynamical consideration of Peltier effect – Thomson effect – Thomson Coefficient – e.m.f generated in a thermocouple taking both Peltier effect and Thomson effect in the metals – Thermoelectric power – Application of thermodynamics to Thermocouple – Thermoelectric diagrams and their uses.						
<b>Unit:4</b>	<b>Helmholtz Equation of Varying Current</b>				<b>11 hours</b>	
Growth and decay of current in an inductive – resistive circuit – charging and discharging of a capacitor through a resistance – growth of charge in a circuit with inductance, capacitance and resistance (LCR) - torque on a current loop in a magnetic field – Theory of Ballistic Galvanometer – correction for damping – current and voltage sensitivities.						

<b>Unit:5</b>	<b>Dynamics of Charged Particles</b>	<b>12 hours</b>
Motion of a charged particle in a uniform electric field – longitudinal – transverse – motion of charged particle in alternating electric field – motion of charged particle in uniform constant magnetic field – Motion of charged particle in crossed electric and magnetic field. <b>Electromagnetic Induction:</b> A conducting rod moving through a uniform magnetic field – inductance in series – inductance in parallel – self-inductance of co-axial cylinders – self-inductance of toroidal coil of rectangular cross-section – self-inductance of toroidal coil of circular cross section.		
<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Electricity and Magnetism, Brijlal and Subramaniam, Educational and University Publishers (1984)	
2	Electricity and Magnetism, R. Murugesan, S.Chand&Co (2017)	
<b>Reference Books</b>		
1	Electricity and Magnetism, D.N. Vasudeva, S.Chand&Co, twelfth edition (2007)	
2	Electricity and Magnetism, Nagarathanam and Lakshminarayanan,	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.askiitians.com/revision-notes/physics/current-electricity.html">https://www.askiitians.com/revision-notes/physics/current-electricity.html</a>	
2	<a href="https://www.askiitians.com/revision-notes/physics/electromagnetic-induction-and-alternating-current/">https://www.askiitians.com/revision-notes/physics/electromagnetic-induction-and-alternating-current/</a>	
Course Designed By: <b>Dr. P. Sagunthala and Dr. K.A.Vijayalakshmi</b>		

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	M	S	S	M	M	S
CO2	S	M	M	M	S	M	M	S	S	M
CO3	S	S	S	S	S	S	S	S	S	S

\*S-Strong; M-Medium; L-Low

**SEMESTER V**

Course code	5ZC	INSTRUMENTATION III	L	T	P	C
Core/Elective/SBS		<b>SKILL BASED SUBJECT</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
Pre-requisite	The students should be able to distinguish between analog and digital measurement and their importance		<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. give an insight into the working of digital and analog techniques used in measurement devices.</li> <li>2. enable the students to use electronic testing instruments.</li> <li>3. introduce medical instrumentation.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	understand the principles of biomedical instruments.				K1	
2	enable the students to understand the working of basic electromagnetic and electronic instruments.				K2	
3	appropriately chose electronic components.				K3	
4	carry out minimal testing and maintenance of lab equipment.				K4	
5	troubleshoot simple electronic circuits using multimeters and oscilloscopes.				K5	
6	interpret results of Biomedical measurement.				K6	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>Unit:1</b>	<b>Data Acquisition and Conversion</b>				<b>7 hours</b>	
Introduction – Signal conditioning of the inputs – Single channel data acquisition systems – Data conversion – Digital to Analog converter – Analog to Digital converter.						
<b>Unit:2</b>	<b>Basic meter movements</b>				<b>9 hours</b>	
Permanent magnetic moving coil movements – Practical PMMC movements – Moving ion type instrument – Concentric vane repulsion type (Moving ion type) – Display devices: LED – LCD.						
<b>Unit:3</b>	<b>Digital Instruments</b>				<b>9 hours</b>	
Introduction – Digital Multimeter – Digital panel meters – Digital frequency meters – Digital Measurement of time – Universal counter – Digital measurement of frequency – Digital Tachometer.						
<b>Unit:4</b>	<b>Oscilloscope</b>				<b>9 hours</b>	
Introduction – Basic principles – CRT features – Basic principles of signal displays – Block Diagram of oscilloscope – Simple CRO – Vertical amplifier – Horizontal deflecting system – Delay line in triggered sweep – CRT connection.						
<b>Unit:5</b>	<b>Biomedical Instrumentation</b>				<b>9 hours</b>	
Basics of Biomedical Instrumentation system – Blood flow measurement – magnetic blood flow rate – Ultrasonic meter – ECG-EEG-EMG –X-ray Imaging and CT scan- MRI scan.						
<b>Unit:6</b>	<b>Contemporary Issues</b>				<b>2 hours</b>	
Expert lectures, online seminars – webinars						
<b>Total Lecture hours</b>						<b>45</b>

<b>Text Book(s)</b>	
1	Instrumentation Devices and Systems, C.S. Rangan, G. R. Sarma and V. S. Mani, 2 <sup>nd</sup> Edition, Tata McGRaw Hill, New Delhi (1983)
2	Electronic Instrumentation, H. S. Kalsi, 3 <sup>rd</sup> edition, Tata McGraw Hill, New Delhi (2012)
3	Electronics in Medicine and Biomedical Instrumentation, N. K. Jog, 2 <sup>nd</sup> Edition, Prentice Hall India, New Delhi (2013)
<b>Reference Books</b>	
1	Measurement System Applications and Design, E.O. Doebalin, 5 <sup>th</sup> edition, McGraw Hill International (2007)
2	Transducers and Instrumentation, D. V. S. Murthy, 2 <sup>nd</sup> edition, Prentice Hall of India (2010)
3	Biomedical Instrumentation and Measurements, Leslie Crombwell, Fred.J.Weibell, Trich.A.Pfeiffer, Prentice Hall of India (1997).
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>	
1	PMMC <a href="https://youtu.be/n1MinLtvnPY">https://youtu.be/n1MinLtvnPY</a>
2	NPTEL Play list <a href="https://www.youtube.com/watch?v=3eYmFjHnQjY&amp;list=PL227ZNwByTITGq1atJsFst_qnEptI870Q">https://www.youtube.com/watch?v=3eYmFjHnQjY&amp;list=PL227ZNwByTITGq1atJsFst_qnEptI870Q</a>
3	Biomedical instrumentation- npTEL -youtube channel <a href="https://www.youtube.com/watch?v=f949gpKdCI4&amp;list=PLCDqPRbvMIPcT0pnGB-15ftPSGCMOuDv0">https://www.youtube.com/watch?v=f949gpKdCI4&amp;list=PLCDqPRbvMIPcT0pnGB-15ftPSGCMOuDv0</a>
Course Designed By: Mrs J.Jayachitra, Dr.L.Priya	

<b>Mapping with Programme Outcomes</b>										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	L	M	S	M	M	M	S	S
CO2	S	S	L	S	S	S	S	M	M	M
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	M	S	S	M	M	S	M
CO5	S	S	M	M	M	L	M	M	L	M
CO6	S	L	L	M	S	M	L	M	S	S

\*S-Strong; M-Medium; L-Low



***Sixth  
Semester***



SEMESTER – VI

Course code	63A	QUANTUM MECHANICS AND RELATIVITY	L	T	P	C
Core/Elective/SBS		CORE PAPER IX	6	0	0	4
Pre-requisite	The students are expected to have a knowledge of particle nature and wave nature of matter		Syllabus Version		2023-24	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. understand the wave property of matter</li> <li>2. acquire knowledge of uncertainty principle and its applications</li> <li>3. apply the concept of relativity to solve various physical problems</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	acquire the knowledge of wave nature of matter and its experimental verification				K2	
2	understand Heisenberg uncertainty principle and apply it to verify problems in atomic and nuclear Physics				K3	
3	Identify the reason behind various physical problems using relativity and solve them				K5	
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>						
<b>Unit:1</b>	<b>Wave Properties of Matter</b>				<b>17 hours</b>	
Introduction – de Broglie wavelength – Phase velocity – Expression for Phase velocity – Group velocity – Analytical treatment – Expression for group velocity – Relation between group velocity ( $v_g$ ) and phase velocity ( $v_p$ ) – Velocity of de Broglie wave – (i)Phase velocity ( $v_p$ ) – (ii)Group velocity ( $v_g$ ). Verification of de Broglie relation – Davisson and Germer’s experiments – G P Thomson’s experiment.						
<b>Unit:2</b>	<b>Uncertainty Principle</b>				<b>17 hours</b>	
Introduction – Uncertainty Principle – Elementary proof between – Displacement and Momentum – Energy and Time – Physical Significance of Heisenberg’s Uncertainty Principle – Illustration – Diffraction of electrons through a slit – Gamma ray microscope thought experiment – Applications – Non-existence of free electrons in the nucleus – Size and Energy in the ground state of Hydrogen atom.						
<b>Unit:3</b>	<b>Schrödinger’s Wave Equation</b>				<b>18 hours</b>	
Introduction – Wave function for a free particle – Schrödinger’s one-dimensional wave equation – Time-dependent and Time independent – Limitations of wave function – Normalization of wave function – Operators – Eigen function – Eigen Value – Eigen equation – Operator for Momentum, Kinetic Energy and Total Energy – Postulates of Quantum Mechanics – Orthogonality of Energy Eigen function – Proof – Ehrenfest’s theorem – Statement and proof.						
<b>Unit:4</b>	<b>Spherical Symmetrical systems</b>				<b>18 hours</b>	
Three dimensional Schrödinger’s wave equation –Hydrogen atom – Wave equation for the Motion of an electron – Separation of variables – Azimuthal wave equation and its solution – Radial wave equation and its solutions – Polar wave equation and its solution – Ground size of the Hydrogen atom.						



<b>Unit:5</b>	<b>Relativity</b>	<b>18 hours</b>
Galilean Transformation equation – Ether Hypothesis – Michelson-Morley experiment – Explanation of the Negative results – special theory of Relativity – Lorentz transformation equation – Length contraction – Time dilation – Addition of Velocities – Variation of Mass with velocity – Mass energy equivalence.		
<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>90</b>
<b>Text Book(s)</b>		
1	Elements of Quantum Mechanics, Kamal Singh, S.P Singh, S. Chand & Co. (2005)	
2	Quantum Mechanics, S.P Singh, M. K Bagde, S. Chand & Co., second edition (2004).	
3	Modern Physics, R Murugesan, S .Chand & Co. (2016)	
<b>Reference Books</b>		
1	Quantum Mechanics, Sathya Prakash, C.K.Singh, Kedar Nath Ram Nath&Co.(1997)	
2	Quantum Mechanics, Schiff, Tata McGraw-Hill, second edition, (1968).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.youtube.com/playlist?list=PLbMVogVj5nJTDmHThY9xu2Tvg0u1RPuxO">https://www.youtube.com/playlist?list=PLbMVogVj5nJTDmHThY9xu2Tvg0u1RPuxO</a>	
2	<a href="https://medium.com/predict/what-is-quantum-mechanics-what-is-theory-of-relativity-fd8e87eb9c79">https://medium.com/predict/what-is-quantum-mechanics-what-is-theory-of-relativity-fd8e87eb9c79</a>	
3	<a href="https://www.askiitians.com/revision-notes/physics/special-theory-of-relativity/">https://www.askiitians.com/revision-notes/physics/special-theory-of-relativity/</a>	
Course Designed By: <b>Dr P. Sagunthala</b>		

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	S	M	M	M
CO2	S	S	S	M	S	S	M	M	S	S
CO3	M	S	S	S	S	S	S	S	S	S

\*S-Strong; M-Medium; L-Low

**SEMESTER VI**

Course code	63B	NUCLEAR PHYSICS	L	T	P	C
Core/Elective/SBS		CORE PAPER X	6	0	0	4
Pre-requisite		The students should have knowledge of the basic constituents of atoms. They should be familiar with the structure of atoms and nucleus.	Syllabus Version		2023-24	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. acquire the knowledge to understand about nucleus and nucleus structure.</li> <li>2. familiarize with different types of radiation detectors and particle accelerators</li> <li>3. study the radioactivity phenomenon of nucleus</li> <li>4. motivate the students to analyze the energy released by the nucleus during the fission and fusion process</li> <li>5. acquire the basic knowledge of cosmic rays and elementary particles.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	understand the General properties of Nucleus					K2
2	analyze the construction and working of radiation detectors					K4
3	device instruments utilizing the behavior of nuclear particles					K6
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> – Create						
<b>Unit:1</b>		<b>Introduction to the Nucleus</b>			<b>16 hours</b>	
General properties of Nucleus (Size, Mass, Density, Charge, Spin, Angular momentum, Magnetic dipole moment) – Binding energy – BE/A and stability of Nucleus – Packing fraction – Nuclear stability – Nuclear forces – Definition – Properties – Meson theory – Model of Nuclear Structure – The Liquid Drop model – Semi-Empirical mass formula – The Shell model – Evidence for Shell model –The collective model.						
<b>Unit:2</b>		<b>Detector and Particle Accelerators</b>			<b>18 hours</b>	
Interaction between the energetic particles and matter – Heavy charged particles – Electrons – Gamma ray-Ionization chamber – Solid State detector – GM counter – Wilson Cloud chamber – Nuclear emission – Linear accelerators – Cyclotron – Betatron.						
<b>Unit:3</b>		<b>Radioactivity</b>			<b>18 hours</b>	
Natural Radioactivity – Alpha, Beta and Gamma rays – Properties – Determination of e/m of Alpha particle – Determination of Charge of Alpha particle – Determination of e/m of Beta particle – determination of Wavelength of Gamma rays (Dumond Spectrometer) – Origin of Gamma rays – Laws of Radioactivity – Soddy-Fajan’s displacement law – Law of Radioactive disintegration – Half life period – Mean life period (Definitions, Expression) – Units of Radioactivity – Artificial Radioactivity – Preparation of radio elements – Application of radio isotopes.						
<b>Unit:4</b>		<b>Nuclear Fission and Fusion Reactions</b>			<b>18 hours</b>	
Nuclear fission – Energy released in Fission – Bohr and Wheeler’s theory of Nuclear fission – Chain reaction – Multiplication factor – Critical size – Natural Uranium and chain reactions – Atom Bomb – Nuclear reactor – Nuclear fusion – Source of Stellar energy – Carbon Nitrogen cycle – Proton-Proton cycle – Hydrogen bomb – Controlled thermonuclear reactions.						

<b>Unit:5</b>	<b>Cosmic Rays and Elementary Particles</b>	<b>18 hours</b>
Cosmic rays – Origin of cosmic rays – Latitude effect – Azimuthal effect – Attitude effect – Seasonal, Diagonal changes – Primary and Secondary Cosmic rays – cascade theory of shower – Pair production and Annihilation – Van Allen Belts – Elementary particles – Introduction – particles and antiparticles – Antimatter – The fundamental interactions – The Quark model.		
<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars – webinars		
<b>Total Lecture hours</b>		<b>90</b>
<b>Text Book(s)</b>		
1	Modern Physics, R Murugesan, S. Chand Publishing, 18th Edition (2017).	
2	Nuclear Physics, D C Tayal, Publisher Himalaya Publishing House (2009).	
<b>Reference Books</b>		
1	Concept of Modern Physics, Arthur Beiser, McGraw-Hill, (2007).	
2	Introduction to Modern Physics, F K Richtmyer Etal, McGraw-Hill; 6th edition (1969).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/courses/115/104/115104043/">https://nptel.ac.in/courses/115/104/115104043/</a>	
2	<a href="https://nptel.ac.in/courses/115/103/115103101/">https://nptel.ac.in/courses/115/103/115103101/</a>	
3	<a href="https://www.youtube.com/watch?v=xrk7Mt2fx6Y">https://www.youtube.com/watch?v=xrk7Mt2fx6Y</a>	
Course Designed By: <b>Dr. K. Selvaraju</b>		

<b>Mapping with Programme Outcomes</b>										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	M	M	M	S	M	M
CO2	M	S	S	M	L	M	S	M	S	S
CO3	S	M	S	S	S	S	S	S	S	S

\*S-Strong; M-Medium; L-Low

**SEMESTER V&VI**

Course code	63P	<b>CORE PRACTICAL III ELECTRONICS</b> (Examination at the end of Sixth Semester)	L	T	P	C
<b>Core/Elective/SBS</b>		<b>CORE PRACTICAL</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>3</b>
<b>Pre-requisite</b>		Should have the fundamental knowledge of Basic Electronics	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. transform the principles of Basic Electronics into Experimental techniques						
2. gain knowledge about different electronic gadgets.						
3. motivate the students to apply the principles of electronics in their day-to-day life.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	design different types of Power supplies, Amplifiers and Oscillators				K4	
2	to analyze the characteristics of various Electronic devices like BJT, UJT, LDR, and Solar cell				K4	
3	acquire the knowledge of the characteristics of an operational amplifier				K5	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>LIST OF EXPERIMENTS</b> (Any twelve experiments)					<b>56 hours</b>	
<ol style="list-style-type: none"> <li>1. Logic Gates using diodes and transistor.</li> <li>2. Bridge rectifier with Zener voltage regulator</li> <li>3. Regulated Power Supply - IC</li> <li>4. Dual Power Supply</li> <li>5. Voltage Doubler</li> <li>6. Characteristics of Transistor - CE mode</li> <li>7. Differentiating and Integrating Circuits.</li> <li>8. Clipping and Clamping Circuits</li> <li>9. Single-stage Transistor Amplifier- R.C. Coupled</li> <li>10. Emitter Follower</li> <li>11. Series and Parallel resonance circuits</li> <li>12. Hartley Oscillator – Solid State</li> <li>13. Colpitt's Oscillator – Solid State</li> <li>14. Square wave generator using IC 555 Timer</li> <li>15. Astable Multivibrator</li> <li>16. Study of Solar Cell</li> <li>17. Study of LDR</li> <li>18. Characteristics of UJT</li> <li>19. Inverting and Non inverting amplifiers - Op-amp (IC 741)</li> <li>20. Adder and Subtractor circuits - Op-amp (IC 741)</li> </ol>						
<b>Contemporary Issues</b>					<b>4 hours</b>	
Online workshop, Webinars on Experimental Electronics						
<b>Total Practical Hours:</b>					<b>60</b>	

<b>Reference Books</b>	
1	Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007)
2	A text book of practical Physics, M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, Sultan Chand&Sons(2017)
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>	
1	<a href="https://www.slideshare.net/mobile/sunilrathore77398/basicanalogelectronics">https://www.slideshare.net/mobile/sunilrathore77398/basicanalogelectronics</a>
2	<a href="https://www.slideshare.net/mobile/PatruniChidanandaSas/basics-of-electronics-53962342">https://www.slideshare.net/mobile/PatruniChidanandaSas/basics-of-electronics-53962342</a>
Course Designed By: <b>Dr. U. Karunanithi</b>	

<b>Mapping with Programme Outcomes</b>										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	M	L	M	S	M
CO2	S	S	M	S	S	L	M	S	S	S
CO3	M	M	S	S	L	M	S	S	S	M

\*S-Strong; M-Medium; L-Low



**SEMESTER V&VI**

<b>Course code</b>	<b>63Q</b>	<b>DIGITAL AND MICROPROCESSOR</b> (Examination at the end of sixth semester)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Core/Elective/SBS</b>	<b>CORE PRACTICAL IV</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>3</b>
<b>Pre-requisite</b>	Should have the fundamental knowledge of Digital Electronics and Microprocessors		<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. understand the principles and applications of Digital Electronics</li> <li>2. gain knowledge about the development of the Microprocessors.</li> <li>3. motivate the students to apply the principles of Digital Electronics in their day-to-day life.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	analyze the different types of digital circuits and their applications				K4	
2	realize the applications of registers in computers				K5	
3	update the knowledge of Microprocessor programming				K6	
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>						
<b>LIST OF EXPERIMENTS</b> (Any twelve experiments by choosing <b>at least five</b> from each division)					<b>56 hours</b>	
<b>I. DIGITAL ELECTRONICS</b>						
<ol style="list-style-type: none"> <li>1. Verification of truth tables of logic gates using IC's: OR, AND, NOT, XOR, NOR and NAND.</li> <li>2. NAND as a universal building block- AND, OR, NOT and Ex-OR</li> <li>3. NOR as a universal building block- AND, OR, NOT and Ex-NOR</li> <li>4. Verification of De Morgan's theorem.</li> <li>5. Boolean Algebra – problem solving</li> <li>6. Study of RS Flip-Flop.</li> <li>7. Half adder and Half Subtractor</li> <li>8. Full adder</li> <li>9. Full Subtractor.</li> <li>10. 4 Bit – Binary Adder/ Subtractor using 7483</li> </ol>						
<b>II. MICROPROCESSORS</b>						
<ol style="list-style-type: none"> <li>11. 8085 ALP for 8 bit Addition and Subtraction</li> <li>12. 8085 ALP for 8 bit addition with carry and subtraction with borrow</li> <li>13. 8085 ALP for 8 Bit Multiplication</li> <li>14. 8085 ALP for 8 Bit Division</li> <li>15. 8085 ALP for One's Complement, Masking off most significant 4 bits and setting bits.</li> <li>16. 8085 ALP for Two's compliment Addition and Subtraction</li> <li>17. 8085 ALP for finding the biggest number element in the array and Sum of the elements in the array.</li> <li>18. 8085 ALP for arranging Ascending and Descending order of the given set of numbers</li> <li>19. 8085 ALP for conversion of Hexadecimal into Decimal number.</li> <li>20. 8085 ALP for conversion of Hexadecimal into Binary number.</li> </ol>						
<b>Contemporary Issues</b>					<b>4 hours</b>	
Online workshop, Webinars on Experimental Digital Electronics and Microprocessors						
<b>Total Practical Hours:</b>						<b>60</b>

<b>Reference Books</b>	
1	Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007)
2	A text book of practical Physics, M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, Sultan Chand&Sons(2017)
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>	
1	<a href="http://www.sircrrengg.ac.in/images/Others/CSE/MP-LAB-MANUAL.pdf">http://www.sircrrengg.ac.in/images/Others/CSE/MP-LAB-MANUAL.pdf</a>
2	<a href="https://www.youtube.com/playlist?list=PL_pGb42kre_QXwuaizYb21tSYpoHyXsCQ">https://www.youtube.com/playlist?list=PL_pGb42kre_QXwuaizYb21tSYpoHyXsCQ</a>
Course Designed By: <b>Dr. U. Karunanithi</b>	

<b>Mapping with Programme Outcomes</b>										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	L	S	M	S	M
CO2	S	M	M	S	S	L	S	M	S	S
CO3	S	M	S	M	L	M	M	S	S	M

\*S-Strong; M-Medium; L-Low





**SEMESTER V&VI**

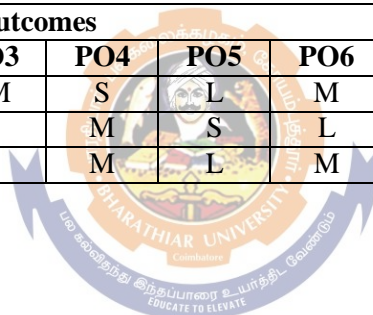
Course code	63R	C AND C++ PROGRAMMING (Examination at the end of sixth semester)	L	T	P	C
Core/Elective/SBS		PRACTICAL V	0	0	2	3
Pre-requisite		Should have the fundamental knowledge of C and C++ Programming	Syllabus Version		2023-24	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. Develop Programming concepts in C and C++						
2. Apply Programming concepts of C and C++ to various programs						
3. Write C and C++ programs for Physics oriented problems.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Write and execute programs in C and C++				K3	
2	Analyze the programming concepts for Physics problems				K4	
3	Evaluate the solutions for different Mathematical problems				K5	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>LIST OF EXPERIMENTS</b> (Any twelve experiments by choosing <b>at least five</b> from each division)					<b>84 hours</b>	
<b>I. PROGRAMMING IN C</b>						
1. Write a C program to convert an integer in the range 1 to 100 into words.						
2. Write a C program that uses functions to compare two strings input by the user. The program should state whether the first string is less than, equal or greater than the second string.						
3. Write a C program to compare two files printing the character position where they are equal and where they differ.						
4. Write a C program for Matrix addition						
5. Write a C program for Matrix multiplication.						
6. Write a C program to convert Celsius Temperature into Fahrenheit Temperature.						
7. Write a C program to find resultant value of the three resistances $R_1$ , $R_2$ and $R_3$ connected in (i) series and (ii) parallel.						
8. Write a C program to calculate the refractive index of the material of the prism.						
9. Write a C program to measure the resonant frequency of the LCR series circuit.						
10. Write a C program to calculate De Broglie wavelength of a material for the given value of momentum p.						
<b>PROGRAMMING IN C++</b>						
11. Write a C++ program to read any two numbers through the keyboard and to perform simple arithmetic operations (Use Do While loop).						
12. Write a C++ program to display the name of the day in a week, depending upon the number entered through the keyboard using Switch – case statement.						
13. Write a C++ program to perform Matrix addition.						
14. Write a C++ program for matrix multiplication.						
15. Write a C++ program to find the inverse of a matrix.						
16. Write a C++ program to find the modulus of the given number.						
17. Write a C++ program to compare two files printing the character position where they are equal and where they differ.						



18. Write a C++ program to find the resultant value of three capacitances $C_1$ , $C_2$ and $C_3$ connected in (i) series and (ii) parallel.	
19. Write a C++ program to measure the resonant frequency of the LCR parallel circuit.	
20. Write a C++ program to estimate the half-life period of a radioactive substance for the given value of decay constant $\lambda$ .	
<b>Contemporary Issues</b>	
<b>6 hours</b>	
Online workshop, Webinars on C and C++ programming	
<b>Total Practical Hours: 90</b>	
<b>Reference Books</b>	
1	Programming in ANSI C by E. Balagurusamy, Tata McGraw Hill, sixth Edition(2012)
2	Object Oriented Programming with C++ by E. Balagurusamy, Tata McGraw Hill, Sixth Edition (2013)
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>	
1	<a href="https://nptel.ac.in/course.html/computerscience_and_engineering//C,_C++_programming">https://nptel.ac.in/course.html/computerscience_and_engineering//C, C++ programming</a>
2	<a href="https://www.geeksforgeeks.org/introduction-to-c-programming-language/">https://www.geeksforgeeks.org/introduction-to-c-programming-language/</a>
Course Designed By: <b>Dr. U. Karunanithi</b>	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	L	M	S	M	S	M
CO2	M	S	S	M	S	L	S	M	S	S
CO3	S	M	S	M	L	M	M	S	S	M

\*S-Strong; M-Medium; L-Low



**SEMESTER VI**

Course code	6ZP	INSTRUMENTATION PRACTICALS	L	T	P	C
<b>Core/Elective/SBS</b>		<b>SKILL BASED SUBJECT</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>2</b>
<b>Pre-requisite</b>		Should have the fundamental knowledge in Instrumentation	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. acquire the knowledge in working with different laboratory instruments.						
2. service laboratory instruments like spectrometer, telescope etc.,						
3. examine some of the simple household appliances like iron box, mixie etc. and rectify the problems.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	service and rectify the defects in laboratory instruments					K5
2	service and rectify the defects in simple house hold devices.					K5
3	device new instruments applying the knowledge of instrumentation.					K6
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>LIST OF EXPERIMENTS</b> (Any twelve experiments)						<b>42 hours</b>
<ol style="list-style-type: none"> <li>1. Construction and Service of Power supply - 2, 4, 6 Volts</li> <li>2. Regulated power supply construction and service – (+5V &amp; - 12V)</li> <li>3. Dual power supply construction and service - (- 12V) – 0 - (+12V)</li> <li>4. Regulated power supply construction and service – (+ 12V &amp; - 5V)</li> <li>5. Servicing - Microscope</li> <li>6. Servicing - Telescope</li> <li>7. Servicing - Spectrometer</li> <li>8. Servicing - Galvanometer,</li> <li>9. Servicing - Voltmeter</li> <li>10. Servicing - Ammeter.</li> <li>11. Servicing - UPS</li> <li>12. Servicing – Stop clock and Stopwatch</li> <li>13. Servicing – Physical Balance</li> <li>14. Servicing – Mixie</li> <li>15. Servicing – Resistance box and Capacitance box</li> <li>16. Servicing – Signal Generators</li> <li>17. Fixing and servicing a B.G.</li> <li>18. Cutting, drilling, polishing and trimming.</li> <li>19. Servicing – Iron Box</li> <li>20. Conversion of Galvanometer to an ammeter and voltmeter</li> </ol>						
<b>Contemporary Issues</b>						<b>3 hours</b>
Expert lectures, online seminars - webinars						
<b>Total Practical Hours:</b>						<b>45</b>

Reference Books	
1	Laboratory Instrumentation, Mary C. Haven, Gregory A. Tetrault, Jerald R. Schenken, John Wiley & Sons,(1994).
2	Principles and Applications of Laboratory Instrumentation, <a href="#">Sheshadri Narayanan</a> , ASCP Press, (1989).
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	<a href="https://www.macallister.com/parts-service/maintenance-tips/">https://www.macallister.com/parts-service/maintenance-tips/</a>
2	<a href="https://www.youtube.com/playlist?list=PLOU3kcAncZZtRFMLCFMyxEp_JYZIOLkbM">https://www.youtube.com/playlist?list=PLOU3kcAncZZtRFMLCFMyxEp_JYZIOLkbM</a>
3	<a href="https://www.slideshare.net/mobile/selvaprakash549/maintenance-and-repair-strategies">https://www.slideshare.net/mobile/selvaprakash549/maintenance-and-repair-strategies</a>
Course Designed By: <b>Dr. U. Karunanithi</b>	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	M	S	M	L	M
CO2	M	S	M	S	S	L	M	S	M	S
CO3	S	M	S	M	L	M	M	S	S	M

\*S-Strong; M-Medium; L-Low





***Elective  
Course***

**LIST OF ELECTIVE PAPERS SEMESTER V**

Course code	5EA	PRINCIPLES OF PROGRAMMING CONCEPTS AND C PROGRAMMING	L	T	P	C
<b>Core/Elective/SBS</b>	<b>ELECTIVE PAPER – I A</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>	The students are expected to procure foundational knowledge on programming concepts and C programming		<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. develop logics which will aid in developing programs and applications</li> <li>2. solve problems using functional and object-oriented paradigm</li> <li>3. use ideas from various paradigms when programming in a language of different paradigm</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	design features of programming languages, and justify their own design decisions				K2	
2	critically evaluate what paradigm and language are best suited for a new problem				K5	
3	use C programming to solve Physics problems.				K6	
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>						
<b>Unit:1</b>	<b>Constants, Variables and Data types</b>				<b>10 hours</b>	
Introduction – character sets – constants – keywords – identifiers – variables – data types – declaration of variables – assigning values to variables – defining symbolic constants.						
<b>Unit:2</b>	<b>Operators and Expressions</b>				<b>12 hours</b>	
Arithmetic operators – relational operators – logical operators – assignment operators – increment and decrement operators – conditional operators – special operators – arithmetic expression – evaluation of expressions. – Precedence of arithmetic operators – type conversion in expression – operator precedence and associativity – mathematical functions.						
<b>Unit:3</b>	<b>Input and Output Operations</b>				<b>12 hours</b>	
Reading and writing character – formatted input and output – decision making: IF statement: Simple IF, IF... ELSE, Nesting of IF... ELSE and ELSE IF Ladder – Switch Statement – ?: operator – go to statement – while, do – while statement – For loop.						
<b>Unit:4</b>	<b>Arrays</b>				<b>12 hours</b>	
Introduction – One dimensional array – declaration of array – Initiating on two and multidimensional arrays – declaring and initializing string variables – reading strings from terminal – writing strings on the screen.						
<b>Unit:5</b>	<b>User Defined Functions</b>				<b>12 hours</b>	
Need for user defined functions – A multifunction program – The form of C Functions - RETURN values and their Types - Calling a function - Call by Value - Call by Reference- Recursive functions.						

<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Programming in ANSI C, E. Balagurusamy, TMH (2008)	
2	The C Programming Language, Brian Kernighan, Dennis Ritchie, Prentice Hall, (1978)	
<b>Reference Books</b>		
1	Programming in C by Ashok N. Kamthane First Indian Print, Pearson (2004).	
2	Computing Fundamentals and C Programming, E. Balagurusamy, TMH(2011)	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.programiz.com/c-programming">https://www.programiz.com/c-programming</a>	
2	<a href="https://www.geeksforgeeks.org/c-language-set-1-introduction/">https://www.geeksforgeeks.org/c-language-set-1-introduction/</a>	
3	<a href="https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/">https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/</a>	
Course Designed By: <b>Dr P. Sagunthala and Dr. V. Kalaiselvi</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	M	S	M	S	M	S	M	S	S
<b>CO2</b>	M	S	M	M	M	M	S	S	M	S
<b>CO3</b>	S	S	S	S	M	S	M	M	S	S

\*S-Strong; M-Medium; L-Low



**SEMESTER V**

Course code	SEA	ENERGY PHYSICS	L	T	P	C
<b>Core/Elective/SBS</b>		<b>ELECTIVE PAPER - I B</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>	The students should know the fundamental principle of motor and classification of energy		<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. learn about the production of electricity.						
2. know about fiber-optical communication system.						
3. gain knowledge on atomic, molecular energy and thermal energy.						
4. understand the non-conventional energy resources and utilization.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	understand the heating effect of current and application of it.				K2	
2	select the correct material for making a waveguide based on basic optical laws.				K3	
3	understand Maxwell's law of equipartition of energy.				K2	
4	analyze the distribution of energy in the thermal spectrum.				K4	
5	Calculate effective utilization of solar radiation, power in the wind and tidal energy				K5	
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>						
<b>Unit:1</b>	<b>Electrical Energy</b>				<b>12 hours</b>	
Principle of production of A.C. – A.C generators – D.C generators –D.C Motors. Heat developed in current carrying conductor – Application of heating effect – Electric heater or stove – Electric radiation and Electric Iron – Electric welding and electric furnace – Carbon arc – Electric Lamp – Efficiency of a Lamp – Measurement of Electric Power.						
<b>Unit:2</b>	<b>Optical Energy</b>				<b>12 hours</b>	
Characteristics of Light – Light sources – LED, LASER – optical fibre – Light propagation through optical fibres: Basic optical laws used in optical fibres – Optical parameters of optical fibres: Acceptance angle and Numerical aperture – Types of optical fibres: Based on material, Number of modes and refractive index profile – Fibre optical communication system – Block Diagram – Source – Transmitter – Optical fibre – Receiver.						
<b>Unit:3</b>	<b>Atomic And Molecular Energy</b>				<b>12 hours</b>	
Degrees of freedom – Number of Degrees of Freedom of Mono, Di and Tri Atomic system – Maxwell's Law of equipartition of Energy – Molar Specific heat capacity at constant volume and constant pressure – Total Internal Energy and Ratio of Heat capacities in monoatomic gas, Diatomic gas, Non-Linear and Linear type of Tri-atomic gas molecular system. Gas and Vapour Distinction – Measurement of saturated and unsaturated vapour Pressure: Regnault's statistical method – Their characteristics – Graphical Illustration of Gas laws.						
<b>Unit:4</b>	<b>Thermal Energy</b>				<b>12 hours</b>	
Definition of Total thermal Energy density - Spectral Energy density – Spectral Emissive power – Emissivity – Emissive power – Absorptive power – Reflective power – Kirchoff's Law of radiation and its proof – verification of Kirchoff's Results: Ritche's Experiment. Distribution of Energy in the						

thermal spectrum – Lummer and Pringsheim Experiment and its Results – Wien's Displacement Law and Radiation Law – Rayleigh Jean's Law Planck's Radiation Law – Deduction of Wien's Law and Rayleigh – Jean's Law from Planck's law. Solar constant – Temperature of sun – Disappearing filament optical Pyrometer - <b>Pyrheliometers</b> : Angstrom Pyroheliometer – Water flow Pyroheliometer.		
<b>Unit:5</b>	<b>Nonconventional Energy</b>	<b>10 hours</b>
<b>Solar Energy</b> : Solar radiation – Solar radiation outside the earth's atmosphere Solar radiation at the earth's surface – Solar Thermal Energy – Solar Thermal devices and systems: Solar water heater – Subcomponents of solar water heater – Solar Cooker and its merits and demerits. <b>Wind Energy</b> : Power in the wind – Types of wind energy systems –Horizontal axis wind Turbine – Vertical axis wind Turbine. <b>Ocean Energy</b> : Tidal Energy – Ocean Thermal Energy Conversion (OTEC) – Closed Cycle OTEC system – Open Cycle OTEC System.		
<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Renewable Energy Environment and Development - Maheshwar Dayal. Konark Publishers, (1989)	
2	Engineering Physics - I- G. Senthil Kumar, VRB Publishers, (2011)	
<b>Reference Books</b>		
1	Solar Energy Utilization - G.D. Rai Khhanna Publishers, (1995)	
2	Engineering Physics - II- M. Arumugham, Anuradha Publishers (2010)	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.askiitians.com/revision-notes/physics/heat-phenomena/">https://www.askiitians.com/revision-notes/physics/heat-phenomena/</a>	
2	<a href="https://www.askiitians.com/revision-notes/physics/thermodynamics/">https://www.askiitians.com/revision-notes/physics/thermodynamics/</a>	
Course Designed By: <b>Mr. J. Williams Charles</b>		

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	M	S	M	M	S	M
CO2	M	S	S	S	M	S	S	M	S	M
CO3	S	M	M	S	S	M	M	S	M	S
CO4	S	S	M	M	M	M	M	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S

\*S-Strong; M-Medium; L-Low



**SEMESTER V**

Course code	5EA	AGRICULTURAL PHYSICS	L	T	P	C
Core/Elective/SBS		Elective Paper I C	4	0	0	4
Pre-requisite	Students should possess the fundamental knowledge of agronomy which is described using physical sciences.		Syllabus Version		2023-24	
<b>4Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. have knowledge of physical phenomena in agricultural environment.</li> <li>2. evoke logical thinking in the field of farming.</li> <li>3. improve practical knowledge of the student.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	understand the role of physics in daily life.				K2	
2	introduce technological applications into agriculture.				K3	
3	explore the physical properties of soil and water.				K4	
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>						
<b>Unit:1</b>	<b>Soil Physics</b>				<b>12 hours</b>	
Mechanical composition of soil – physical properties of soil, pore space, bulk density, particle density – classification – significance of clays – plasticity, shrinkage, flocculation and deflocculation – Soil structure – soil colour – Thermal properties of soil and soil temperatures – types of soil water – its retention, movement – viscosity, swelling – soil moisture losses – Elementary ideas of soil water conservation.						
<b>Unit:2</b>	<b>Water Physics</b>				<b>10 hours</b>	
Water qualities – Rainfall – Ground water – surface water pollution – instrumentation and sampling – water quality monitoring						
<b>Unit:3</b>	<b>Electric Power</b>				<b>12 hours</b>	
Principle of production of A.C. – Average value of A.C. voltage or current – R.M.S. value of alternating voltage or current – power consumed in A.C. Circuits – kilo watt hour – A.C. generator – Three-phase A.C. – Distribution of three phase A.C. Three-phase power system – The choke- The transformer – Transmission of electric power over long distances.						
<b>Unit:4</b>	<b>Hygrometry and Pumps</b>				<b>12 hours</b>	
Absolute Humidity – Relative Humidity – Dew point, Daniell's Hygrometer, Regnault's hygrometer. Advantages of Regnault's hygrometer – wet and Dry and Bulb hygrometer. Water pumps – common pump – force pump – Fire engine, inflator (or) compression pump – pressure after n strokes – Exhaust pump (or) common air pump.						
<b>Unit:5</b>	<b>Solar Collector and Applications</b>				<b>12 hours</b>	
Solar Air heaters- Application of solar air heaters. Solar Drying with various driers – Heating and Drying of Agricultural products – Theory of solar drying – moisture content and its measurement – solar ponds – Application of solar ponds – Solar pumping – Solar pump system components – Turbine driven pump – Application of solar energy to agricultural crops.						

<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	The Nature and Properties of Soil, H.O. Buckman, Brady, Macmillan, (1967).	
2	Soil Physics, H. Kohnke, McGraw-Hill, (1968).	
3	Systematic Hydrology, John C. Rodda, Richard A. Downing, Frank M. Law, Newnes-Butterworths, (1976).	
<b>Reference Books</b>		
1	Electricity and Magnetism, R. Murugesan, S.Chand, (2017).	
2	Hydrostatics, A. S. Ramsey, Cambridge University Press, (2017).	
3	Solar energy Utilization, G.D. Rai, Khanna Publisers, (1987).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/soil-physics">https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/soil-physics</a>	
2	<a href="https://www.sciencedirect.com/science/article/pii/S1631071304002780">https://www.sciencedirect.com/science/article/pii/S1631071304002780</a>	
3	<a href="https://www.sciencedirect.com/topics/engineering/solar-energy-application">https://www.sciencedirect.com/topics/engineering/solar-energy-application</a>	
Course Designed By: <b>Dr P. Sagunthala</b>		

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	S	M	S	M
CO2	M	S	S	S	S	S	M	S	M	M
CO3	M	S	S	M	S	M	S	S	S	S

\*S-Strong; M-Medium; L-Low

## SEMESTER VI

Course code	6EA	DIGITAL AND MICROPROCESSOR	L	T	P	C
<b>Core/Elective/SBS</b>	<b>ELECTIVE II A</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>	The students should have a basic understanding in functioning of digital circuits and microprocessors		<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>enable the students to make use of digital devices and microprocessors</li> <li>learn the concepts of logic circuits and construct the logic circuit for any Boolean equation</li> <li>acquire basic knowledge of binary addition</li> <li>understand the action of flip flops.</li> <li>learn basic programming with microprocessor 8085.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	draw and construct the logic circuit for any Boolean equation.					K2
2	apply the Karnaugh Map to simplify Boolean equation and draw a simplified circuit					K3
3	understand the function of data processing and arithmetic circuits					K4
4	understand the Mnemonics and Opcodes in the Microprocessor					K4
5	develop programming skills using the basic concepts.					K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create</b>						
<b>Unit:1</b>	<b>Logic Circuits</b>				<b>12 hours</b>	
Boolean algebra – NOT operation – OR operation – AND operation – Boolean equations with Logic circuits – Boolean laws & Theorems – Basic laws – De Morgan's theorems – Duality theorems – Sum of Product method – Truth table to Karnaugh Map – Pairs, Quads and Octets – Karnaugh simplification – Product of Sum method.						
<b>Unit:2</b>	<b>Data Processing Circuits</b>				<b>12 hours</b>	
Multiplexer – Demultiplexer – 1 to 16 decoders – BCD to Decimal decoders - Seven segment decoder – Encoders - Parity generator – checkers – Read Only Memory – Programmable arraylogic. <b>Number systems and codes:</b> Binary to Decimal conversion – Decimal to Binary conversion – Octal numbers – Hexadecimal numbers – The ASCII code – The Excess 3 code – The Gray code.						
<b>Unit:3</b>	<b>Arithmetic Circuits</b>				<b>12 hours</b>	
Binary addition - Binary Subtraction – Unsigned Binary numbers – sign-magnitude numbers – 2's complement representation – 2's complement Arithmetic – Arithmetic building blocks – The Adder – Subtractor. <b>Flip – Flops:</b> RS flip flop – Clocked RS flip flop – D flip flop – Edge triggered D flip flop – JK flip flop – JK Master Slave flip flop – Schmitt trigger						
<b>Unit:4</b>	<b>Microprocessor and Data Representation</b>				<b>12 hours</b>	
Basic concepts – what is Microprocessor, 4, 8, 16, 32 – Organization of Microprocessor – Microprocessor Programming – Instruction – Machine and Mnemonic codes – Machine and Assembly Language Programming – High-level Language programming – Representation of						

Integers – Positive integers – Maximum Integer – Negative Number representation – Minimum Integer - Representation of Real numbers – Conversion of Real numbers.		
<b>Unit:5</b>	<b>Programming a Microprocessor</b>	<b>10 hours</b>
Organization of 8085 – Data and Address buses addressing – The I/O devices – Register in 8085 – Instruction types – Classification of Instruction – Addressing modes – Programming the 8085 – The Programming concepts– Simple programs with 8085 – addition, subtraction, multiplication, and division.		
<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Book(s) for Study</b>		
1	Digital Principles and Applications – Albert Paul Malvino& Donald P Leach,TMH, Fourth Edition (2006)	
2	Introduction to Microprocessors, Aditya P Mathur TMH, 6 <sup>th</sup> Edition (2006)	
<b>Book(s) for Reference</b>		
1	Integrated Electronics – Millmann& Halkias, TMH, (2017)	
2	Microprocessors Architecture Applications and Programming, R.S.Goenkar, Penaram International(1999)	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.tutorialspoint.com/microprocessor/microprocessor_overview.html">https://www.tutorialspoint.com/microprocessor/microprocessor_overview.html</a>	
2	<a href="https://www.geeksforgeeks.org/introduction-of-microprocessor/">https://www.geeksforgeeks.org/introduction-of-microprocessor/</a>	
<b>Course Designed By: Dr L.Chandra Naagarajan</b>		

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	L	S	M	L	S
CO2	M	S	S	S	S	S	M	S	S	L
CO3	S	M	S	M	L	M	S	S	M	S
CO4	L	L	M	L	M	S	S	L	S	M
CO5	M	S	M	S	S	M	L	S	S	S

\*S-Strong; M-Medium; L-Low

**SEMESTER VI**

Course code	6EA	OPTICAL FIBRES AND FIBRE OPTIC COMMUNICATION SYSTEMS	L	T	P	C
<b>Core/Elective/SBS</b>		<b>ELECTIVE II B</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>		The students must know the basic optical laws and properties of optical fibre.	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. learn about the propagation of light waves in an optical fibre.						
2. know about fibre fabrication and cables.						
3. gain knowledge on fibre losses and dispersion.						
4. understand the structures of light sources for optical fibre optic communication.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	understand the fibre classification.					K2
2	test the cables during installation of cable based on cable selection criteria.					K3
3	analyze the attenuation and dispersion in an optical fibre.					K4
4	calculate the efficiency, modulation bandwidth and spectral emission of light sources.					K5
5	use the knowledge to make varied links and networking.					K6
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>Unit:1</b>	<b>Fibre Classification</b>				<b>12 hours</b>	
Propagation of light waves in an optical fibre – Acceptance angle and Acceptance cone of a fibre – Numerical Aperture (NA) – NA of a graded Index Fibre – Mode of propagation. Fibres – classification – stepped index fibre – stepped index monomode fibre – Graded index multimode fibre – Comparison of step and graded index fibres.						
<b>Unit:2</b>	<b>Fibre Fabrication and Cables</b>				<b>12 hours</b>	
Classification of Techniques – External chemical vapour deposition – Characteristics – Internal chemical vapour deposition (1 <sup>st</sup> method only) – Characteristics – Phasil system Fibre cable construction – losses incurred during installation of cable – Testing of cables – cable selection criteria.						
<b>Unit:3</b>	<b>Fibre Losses and Dispersion in Optics</b>				<b>12 hours</b>	
Attenuation in optic fibre – Rayleigh Scattering losses – Absorption losses – Bending losses – Radiation induced losses – Inherent defect losses – Core and Cladding losses. Dispersion in an Optical Fibre – Inter-modal dispersion – Material Chromatic Dispersion – Dispersion Power penalty – Total Dispersion delay.						
<b>Unit:4</b>	<b>Light Sources For Optical Fibres</b>				<b>10 hours</b>	
LED – The process involved in LEDs – Structures of LED – Fibre – LED Coupling – Modulation bandwidth and Spectral Emission of LEDs.						
<b>Unit:5</b>	<b>Applications</b>				<b>12 hours</b>	
Introduction – Video Link Satellite Link – Computer Link – Nuclear Reaction Link – Community Antenna Television – Switched Star CATV – Networking						

<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Optical Fibres and Fibre Optic Communication Systems, Subir Kumar Sarkar, S. Chand Limited, (2007)	
2	Fiber Optics Communication, D.C.Agarwal, S.Chand (2010)	
3	Optical fiber Communication, Keiser, McGraw Hill (2010)	
<b>Reference Books</b>		
1	Optical Fibres and Fibre Optic Communication Systems, R.K.Puri and V.K.Babbar, S. Chand & CO	
2	Introduction to Fiber Optics, Ajoy Ghatak, K. Thyagarajan, Cambridge (2009)	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/courses/115/107/115107095/">https://nptel.ac.in/courses/115/107/115107095/</a>	
2	<a href="https://www.youtube.com/playlist?list=PLq-Gm0yRYwTgr7v3HhdrI_Kcc38369fw-">https://www.youtube.com/playlist?list=PLq-Gm0yRYwTgr7v3HhdrI_Kcc38369fw-</a>	
Course Designed By: <b>Mr. J. William Charles</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	M	M	S	M	S	M	M	S	S
<b>CO2</b>	M	S	M	M	S	S	S	M	M	M
<b>CO3</b>	S	M	S	S	M	M	M	M	S	M
<b>CO4</b>	S	S	M	M	S	S	S	S	S	S
<b>CO5</b>	S	S	S	M	M	S	S	S	S	S

\*S-Strong; M-Medium; L-Low



SEMESTER VI

Course code	6EA	BIO PHYSICS	L	T	P	C
Core/Elective/SBS		ELECTIVE PAPER – II C	4	0	0	4
Pre-requisite	The students are expected to have basic knowledge in the area of biophysics.		Syllabus Version		2023-24	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. deal with how physics applies to the processes of biology.</li> <li>2. discover how to modify micro-organisms for producing biofuel.</li> <li>3. replace bio-electricity in the place of coal and petroleum products for producing electricity.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	understand interactions between various systems of cells.				K2	
2	provide life-saving treatment methods like radiation therapy.				K4	
3	find powerful vaccines against infectious diseases.				K6	
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>						
<b>Unit:1</b>	<b>Structure of Biomolecules</b>				<b>12 hours</b>	
Introduction - Atomic structure - Hydrogen atom - Bonds between atoms and molecules - secondary or weak bonds - Bond energy - Disulphate bonds – Peptide bond - Structure of Proteins - Molecular weight determination - Kinetic methods - Static methods - Structure of nucleic acids - DNA - RNA.						
<b>Unit:2</b>	<b>Kinetics of Molecules I</b>				<b>10 hours</b>	
<b>Diffusion:</b> Factors affecting diffusion - Simple diffusion – Fick’s law of diffusion - Diffusion of electrolytes - Biological significance of diffusion. <b>Osmosis:</b> Osmosis - Osmotic pressure - Laws of osmosis - osmometry - osmotic pressure of electrolytes. <b>Filtration:</b> Filtration - Passage of fluid through blood vessels - Formation of Urine- Principle of dialysis in artificial kidney - kinds of dialysis.						
<b>Unit:3</b>	<b>Kinetics of Molecules II</b>				<b>12 hours</b>	
<b>Adsorption:</b> Adsorption - Factors affecting adsorption - Adsorption of ions by Solids and Liquids - adsorption of Gases by solids - Biological significance of adsorption. <b>Hydrotrophy:</b> Hydrotrophy - Biological importance of hydrotrophy. <b>Precipitation:</b> Precipitation - Biological significance. <b>Colloids:</b> Types of colloids - characteristics of colloids - stability of colloids - Gel - Emulsions - Techniques for the separation of colloids - Biological importance of colloids – Gibb’s Donnan Equilibrium.						
<b>Unit:4</b>	<b>Optical Techniques in Biological Studies</b>				<b>12 hours</b>	
Characteristics of light- compound microscope - Ultraviolet microscope - Electron microscope Transmission electron microscope - Scanning Electron microscope - Monochromator - Light sensitive detectors- Spectrophotometer - Atomic absorption flame photometer - Electromagnetic radiation Spectroscopy - Ultraviolet, visible, infrared and fluorescent spectroscopy - Atomic absorption and emission spectroscopy - mass spectroscopy - Raman spectroscopy – X-ray diffraction crystallography.						

<b>Unit:5</b>	<b>Bioelectricity and Radiation Biology</b>	<b>12 hours</b>
Membrane potential - Resting membrane potential - Action potential and nerve impulse conduction Rate of nerve impulse conduction- Recording of nerve impulses by C.R.O - Resting membrane potential -J Injury potential- Monophasic and diphasic action potentials - Radioactivity - Natural radioactivity Artificial or induced radioactivity - Radioactive disintegration - units of Radioactivity.		
<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Biophysics: Principles and Techniques, M.A. Subramanian, MJP Publishers, (2015).	
2	Principles of biophysics, Dr S. Palanichamy, Dr.M. Shanmugavelu, Palani Paramount Publications, (1996).	
<b>Reference Books</b>		
1	Biophysics, S. Thiravia Raj, Saras Publication, (2009).	
2	Basic Biophysics for Biologist, M. Daniel, Agro-Bios, (1998).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.sciencedirect.com/topics/earth-and-planetary-sciences/biophysics">https://www.sciencedirect.com/topics/earth-and-planetary-sciences/biophysics</a>	
2	<a href="https://onlinecourses.nptel.ac.in/noc20_ph02/preview">https://onlinecourses.nptel.ac.in/noc20_ph02/preview</a>	
Course Designed By: <b>Dr. P. Sagunthala</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	M	M	M	S	M	M	M	S	M
<b>CO2</b>	M	S	S	M	S	S	S	M	S	S
<b>CO3</b>	M	S	S	S	S	S	M	S	S	S

\*S-Strong; M-Medium; L-Low



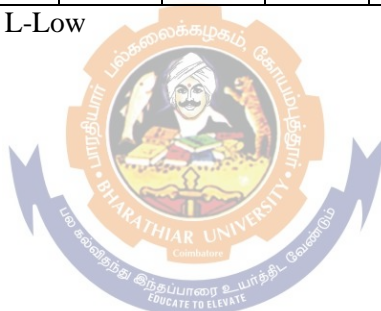
**SEMESTER VI**

Course code	6EB	Object Oriented Programming with C++	L	T	P	C
<b>Core/Elective/SBS</b>		<b>ELECTIVE III A</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>	The students are expected to possess fundamental knowledge in object-oriented programming with C++		<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. understand how C++ improves C with object-oriented features.						
2. learn how to write inline functions for efficiency and performance.						
3. learn the syntax and semantics of the C++ programming language.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	understand the concept of data abstraction and encapsulation				K2	
2	learn how to design C++ classes for code reuse.				K6	
3	learn how to use exception handling in C++ programs.				K3	
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>						
<b>Unit:1</b>	<b>Tokens, Expressions and Control Structures</b>				<b>12 hours</b>	
Structure of C++ Program – Tokens – Keywords – Identifiers and constant basic data types – user-defined data types – derived data types – symbolic constants – type compatibility – declaration of variables – dynamical initialization of variables – reference variables – operator in C++ - scope resolution operators.						
<b>Unit:2</b>	<b>Functions in C++</b>				<b>12 hours</b>	
The main function – function prototyping – call by reference – inline functions-Function overloading – Math library functions – specifying a class – defining member functions– C++ program with class – making an outside function Inline- Nesting of member functions – Static Data members – Static member functions – Friendly functions.						
<b>Unit:3</b>	<b>Constructors</b>				<b>12 hours</b>	
Constructors – Parameterized constructors – Multiple constructors in a class - Constructors with Default Arguments – copy constructor – Dynamic Constructors						
<b>Unit:4</b>	<b>Destructors</b>				<b>12 hours</b>	
Destructors - Defining Operator Overloading – Overloading unary operators – Overloading Binary operators – Rules for overloading operators.						
<b>Unit:5</b>	<b>Inheritance</b>				<b>10 hours</b>	
Inheritance - Defining derived classes – single Inheritance - Multilevel inheritance – Multiple Inheritance - Hierarchical Inheritance						
<b>Unit:6</b>	<b>Contemporary Issues</b>				<b>2 hours</b>	
Expert lectures, online seminars - webinars						
<b>Total Lecture hours</b>					<b>60</b>	

Text Book(s)	
1	Object Oriented Programming with C++, E. Balagurusamy, TMH Publications (2019).
2	Programming with C++, John R. Hubbard, TMH Publications, (2002).
Reference Books	
1	The C++ Programming Language, Bjarne Stroustrup, Addison – Wesley, (1985).
2	Programming: Principles and Practice Using C++, Bjarne Stroustrup, Addison- Wesley Professional, (2008)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	<a href="https://www.programiz.com/c-programming">https://www.programiz.com/c-programming</a>
2	<a href="https://www.geeksforgeeks.org/c-language-set-1-introduction/">https://www.geeksforgeeks.org/c-language-set-1-introduction/</a>
3	<a href="https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/">https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/</a>
Course Designed By: <b>Dr P. Sagunthala and Dr. V. Kalaiselvi</b>	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	M	M	S	M	M	M
CO2	S	S	S	S	S	M	S	M	M	M
CO3	M	S	S	S	S	S	S	S	S	M

\*S-Strong; M-Medium; L-Low



SEMESTER VI

Course code	6EB	GEOPHYSICS	L	T	P	C
Core/Elective/SBS		ELECTIVE PAPER – III B	4	0	0	4
Pre-requisite	Students are expected to have fundamental knowledge in the field of natural science concerned with the physical properties of Earth.		Syllabus Version		2023-24	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. study the physical properties of earth and how it works.						
2. study various features of earth using gravity, magnetic, electrical and seismic methods.						
3. understand all physical parameters of the geothermal field.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	study the genesis and the propagation of seismic waves in geological materials.				K2	
2	apply different techniques to solve complex problems and evaluate large areas of subsurface rapidly.				K5	
3	do modeling and calculations using computers.				K6	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>Unit:1</b>	<b>Seismology</b>				<b>10 hours</b>	
Introduction – Seismology –P waves, S waves, their velocities - Time distance curves and the location of epicenters - Effect of boundaries - Major discontinuities and resulting phase of seismic waves - Derivation of properties from the velocities.						
<b>Unit:2</b>	<b>Surface Waves and Seismometry</b>				<b>12 hours</b>	
<b>Surface waves:</b> Rayleigh waves and Love waves - Study of earth by surface waves. <b>Seismometry:</b> Horizontal seismograph and seismography equation – Strain seismograph.						
<b>Unit:3</b>	<b>Earthquakes and Gravity</b>				<b>12 hours</b>	
<b>Earthquakes:</b> Focus, magnitude, frequency - Detection and prediction. <b>Gravity:</b> The potential (Laplace's equation and Poisson's equation) - Absolute and relative measurements of gravity - Hammond Faller method - Worden gravimeter.						
<b>Unit:4</b>	<b>Geomagnetism and Internal Structure of the Earth</b>				<b>12 hours</b>	
<b>Geomagnetism:</b> Fundamental equations - Measurements: method of Gauss, saturation induction magnetometers, proton precession magnetometers, alkali vapour magnetometers - Theories of earth's magnetism - Causes of the main field -Dynamo theories. <b>Internal structure of the earth:</b> The core variation of mechanical properties with depth - Materials and equation of state of the interior of the earth.						
<b>Unit:5</b>	<b>Geochronology and Geothermal Physics</b>				<b>12 hours</b>	
<b>Geochronology:</b> Radioactivity of the earth - Radioactive dating of rocks and minerals Geological time scale - The age of the earth. <b>Geothermal physics:</b> Flow of heat to the surface of the earth - Sources of heat within the earth - Process of heat transport – Internal temperature of the earth.						

<b>Unit:6</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Introduction To Geophysics Mantle Core And Crust, G. D. Garland, Philadelphia, W.B.Saunders, (1971).	
2	Physics of the Earth and Planets, A. H. Cook, McMillan, (1973).	
<b>Reference Books</b>		
1	Fundamentals of Geophysics, <u>William Lowrie</u> , <u>Andreas Fichtner</u> , Cambridge University Press, (1997).	
2	Exploration Geophysics, <u>Mamdouh R. Gadallah</u> , <u>Ray Fisher</u> , Springer Science & Business Media, (2008).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/content/storage2/courses/105101083/download/lec5.pdf">https://nptel.ac.in/content/storage2/courses/105101083/download/lec5.pdf</a>	
2	<a href="https://www.youtube.com/playlist?list=PLfk0Dfh13pBPXtgn8BT-dpkfaWMRusJwI">https://www.youtube.com/playlist?list=PLfk0Dfh13pBPXtgn8BT-dpkfaWMRusJwI</a>	
Course Designed By: <b>Dr. P. Sagunthala</b>		

<b>Mapping with Programme Outcomes</b>										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	M	S	M	M	S	M
CO2	M	S	M	S	S	M	M	S	M	S
CO3	M	S	S	M	S	S	S	S	M	S

\*S-Strong; M-Medium; L-Low

SEMESTER VI

Course code	6EB	INDUSTRY AUTOMATION & ITS APPLICATIONS (INDUSTRY 4.0)	L	T	P	C
Core/Elective/SBS	Elective Paper III C		4	0	0	4
Pre-requisite	The students are expected to know the fundamental concepts about windows, internet and their application.		Syllabus Version		2023-24	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. explore the idea of office maintenance using computers.</li> <li>2. discuss and develop practical skills in using internet and Google apps.</li> <li>3. identify the internet of things and get awareness regarding hacking.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, students will be able to:						
1	understand the basics of windows and internet of things.				K1	
2	be aware of ethical Hacking.				K2	
3	practice Google apps and recognize their applications in day-to-day life				K4	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>Unit:1</b>	<b>Windows</b>				<b>12 hours</b>	
<b>UNIT-I:</b> Definition of Operating System, Functions of OS, and types of OS. Desktop icons and their functions: My computer, My documents, My Network Place, Recycle Bin, Files, Folder, Local Disk Drive, CD/DVD Drive, Pen Drive, SD Card. <b>Basics of Networks:</b> LAN, WAN, MAN, Wireless, Home Networks, Connection-oriented and connectionless services, DNS – E-mail.						
<b>Unit:2</b>	<b>Ethical Hacking</b>				<b>12 hours</b>	
Introduction to Ethical Hacking – Hacker and Cracker. Fundamentals of Computer Fraud - Footprinting and scanning – Malware Threats: Viruses and Worms, Trojans, Spyware, Malware Counter measures. <b>Connectivity Ports:</b> PS/2 keyboard and mouse port, USB OTG, Ethernet port, serial port, parallel port, HDMI port, VGA port, display port, USB A-Type, USB B-Type, USB C-Type, Type A Mini and micro port, Type B Micro.						
<b>Unit:3</b>	<b>Internet of Things</b>				<b>12 hours</b>	
Introduction, Definition & characteristics of IOT, IOT in everyday life, Internet of everything. <b>IOT Applications:</b> Satellite system, Smart signals in cities and location sharing, smart satellites and radar, IOT in education. Development of India in IOT: Solar Plant System, ATM chip card system, IOT in health care industry, IOT in Wireless Devices. <b>Challenges in IOT:</b> Big Data Management, Connectivity challenges						
<b>Unit:4</b>	<b>Google Apps for Education</b>				<b>12 hours</b>	
Basics of Google Docs, Google Sheets, Google Slides, Google Drive.						
<b>Unit:5</b>	<b>Google Applications</b>				<b>10 hours</b>	
Basics of Google Play store, Google Calendar, Google Contacts, and Google Meet. <b>Social Media Applications:</b> WhatsApp, Telegram, Facebook, Twitter, YouTube, Instagram.						
<b>Unit:6</b>	<b>Contemporary Issues</b>				<b>2 hours</b>	
Expert lectures, online seminars - webinars						
<b>Total Lecture hours</b>					<b>60</b>	

<b>Text Book(s)</b>	
1	Quick Course in Microsoft Office- Joyce Cox & Polly Urban, GOLGOTIA Publications. .
2	Internet of Things-A hands on Approach, Arshdeep Bahga, Vijay Madiseti, Universities press
3	Ethical Hacking: A Beginners Guide to Learning the World of Ethical Hacking, Lakshay Eshan, Shockwave Publishing (2018)
4	The Google Apps Guidebook: Lesson, Activities and Projects Created by Students for Teachers Paperback, Kern Kelley, Tech Sherpas, (August 2, 2016)
<b>Reference Books</b>	
1	PC Software for Windows Made Simple, R.K. Taxali, Tata McGrawHill Publishing Company, (1998).
2	Internet of Things, Srinivasa K.G., Siddesh G.M., Hanumantha Raju R., Cengage Learning India Pvt. Ltd (2018)
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>	
1	Google Docs: <a href="https://www.youtube.com/watch?v=xJiUTXGv3PE&amp;vl=en">https://www.youtube.com/watch?v=xJiUTXGv3PE&amp;vl=en</a>
2	Google Sheet : <a href="https://www.youtube.com/watch?v=FlkZ1sPmKNw">https://www.youtube.com/watch?v=FlkZ1sPmKNw</a>
3	Google Calendar and Google Meet : <a href="https://youtu.be/PKuBtQuFa-8">https://youtu.be/PKuBtQuFa-8</a>
4	IOT : <a href="https://www.youtube.com/watch?v=UrwbeOllc68">https://www.youtube.com/watch?v=UrwbeOllc68</a>
Course Designed By: <b>Dr. S. Prasath</b> , Coordinator, E-learning cell, Nandha Arts & Science College, Erode	

<b>Mapping with Programme Outcomes</b>										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	S	S	L	S	S
CO2	S	S	M	M	S	S	S	L	S	S
CO3	S	S	M	L	S	M	L	M	S	M

\*S-Strong; M-Medium; L-Low



***Value  
Added  
Course***

VALUE ADDED COURSE I

Value added course	OPTOELECTRONICS	L	T	P	C
		30	0	0	4
<b>Pre-requisite</b>	Students are expected to possess some basic knowledge in the field of Semiconductor technology.	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>					
The main objectives of this course are to:					
1. understand the optical process in a semiconductor.					
2. understand the basic optoelectronics devices-LED, OLED, photodetector and photovoltaic devices.					
3. be familiar with recent trends in optoelectronics.					
<b>Expected Course Outcomes:</b>					
On the successful completion of the course, student will be able to:					
1	describe basic laws and phenomena that define behaviour of optoelectronic devices.				K1
2	describe the development and application of optoelectronic systems				K2
3	interpret the acquired data and measured results.				K4
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>					
<b>Module:1</b>		<b>2 hours</b>			
Electron - hole pair formation and recombination, absorption in semiconductor direct and indirect bandgap semiconductors.					
<b>Module:2</b>		<b>2 hours</b>			
Effect of electric field on absorption, Franz-Keldysh effect in semiconductors.					
<b>Module:3</b>		<b>2 hours</b>			
Light Emitting Diodes — Materials for light emitting diodes, Principle of action of LED, expression for light power in terms of photon energy, homo structured LED and Hetero junction LED, drawbacks of homo structured LED.					
<b>Module:4</b>		<b>2 hours</b>			
Types of LED structures—planar, dome type, surface emitter, edge emitter, super luminescent structure.					
<b>Module:5</b>		<b>2 hours</b>			
Performance characteristics of LED—Optical output power-current characteristics, forward current voltage characteristics.					
<b>Module:6</b>		<b>2 hours</b>			
Performance characteristics of LED—Optical output power-current characteristics, forward current voltage characteristics, Modulation bandwidth, power bandwidth product, Lifetime, Rise time/fall time, reliability,					
<b>Module:7</b>		<b>2 hours</b>			
Internal quantum efficiency, advantages / disadvantages of using LED. Numerical problems					
<b>Module:8</b>		<b>2 hours</b>			
Organic light emitting diodes (OLED), The principle of OLED, characterization, structure, efficiency, multilayer OLED.					



<b>Module:9</b>	<b>2 hours</b>
Important parameters of photodetectors, Detector responsivity, spectral response range, response time, quantum efficiency, capacitance, noise characteristics.	
<b>Module:10</b>	<b>2 hours</b>
Absorption of radiation—absorption coefficient, mention of expression for photocurrent, long wavelength cut off, direct and indirect absorption T.	
<b>Module:11</b>	<b>2 hours</b>
Types of photodiodes—Junction photodiodes, pin diode, avalanche photodiodes, CCD photodetectors; Comparison of different detectors, Photomultiplier tubes.	
<b>Module:12</b>	<b>2 hours</b>
Phototransistors—characteristics. Photoconductive detectors—expression for photoconductive gain. Numerical problems.	
<b>Module:13</b>	<b>2 hours</b>
Solar cell—IV characteristics, efficiency, materials	
<b>Module:14</b>	<b>2 hours</b>
Organic photovoltaic diodes (OPVD)—fundamental process, exciton absorption, exciton dissociation	
<b>Module:15</b>	<b>2 hours</b>
Charge transport, charge collection, characterization. numerical problems	
<b>Total Lecture hours</b>	<b>30</b>
<b>Text Book(s)</b>	
1	Fibre Optics Communications, Harold Kolimberis, Prentice Hall, (2004).
2	Optical Fibre Communications, Keiser G, McGraw Hill, (2000).
<b>Reference Books</b>	
1	Fibre Optic Communication, Agarwal D C, Wheeler Publications, (1996).
2	Optical Communication, Katiyar S, S K Kataria and Sons, (2010).
3	Optoelectronics and Photonics: Principles and Practices, Kasap S O, Pearson, (2013).
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>	
1	<a href="https://nptel.ac.in/courses/115/102/115102026/">https://nptel.ac.in/courses/115/102/115102026/</a>
2	<a href="https://moodle.usth.edu.vn/course/view.php?id=362#section-1">https://moodle.usth.edu.vn/course/view.php?id=362#section-1</a>
3	<a href="https://www.classcentral.com/course/swayam-semiconductor-optoelectronics-10043">https://www.classcentral.com/course/swayam-semiconductor-optoelectronics-10043</a>
Course designed by: <b>Dr. S. Krishnaveni</b>	

**VALUE ADDED COURSE II**

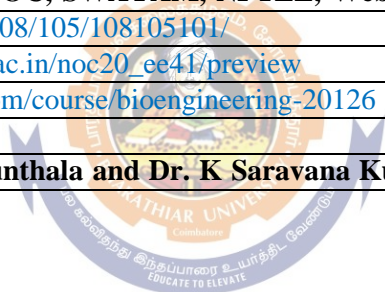
Value added course	NON – DESTRUCTIVE TESTING	L	T	P	C
		30	0	0	4
<b>Pre-requisite</b>	Students should be aware of some fundamental principles of non – destructive testing and thermography.	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>					
The main objectives of this course are to:					
<ol style="list-style-type: none"> <li>1. learn the fundamentals of NDT and its applications which will be used for solving problems in industries to produce flawless components.</li> <li>2. acquire knowledge about different types of Non-Destructive testing methods and apply those principles to identify defects in various products produced in industries.</li> <li>3. study and understand various Non-Destructive evaluations, testing methods, theories and their industrial applications.</li> </ol>					
<b>Expected Course Outcomes:</b>					
On the successful completion of the course, student will be able to:					
1	understand the magnetic testing methods and interpretation of results and applications.				K2
2	understand the application of Thermography, eddy current testing method, ultrasonic and acoustic emission testing.				K3
3	understand the instrumentation of various Radiography and testing techniques such as Fluoroscopy, Xerography, Computed Radiography and Computed Tomography.				K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6– Create</b>					
<b>Module:1</b>		<b>2 hours</b>			
Introduction of materials testing -Classification of materials tests – Overview of non-destructive testing methods.					
<b>Module:2</b>		<b>2hours</b>			
Various NDT methods- selection of NDT methods-Visual Inspection.					
<b>Module:3</b>		<b>2hours</b>			
Introduction-principle-types of visual testing- Experiments used in visual inspection -Applications.					
<b>Module:4</b>		<b>2 hours</b>			
Liquid Penetrant Testing – Principles - Testing Process - penetrant materials – Developers.					
<b>Module:5</b>		<b>2 hours</b>			
Penetrant testing methods- Interpretation of results- Applications.					
<b>Module:6</b>		<b>2 hours</b>			
Magnetic Particle Testing- Magnetic testing methods-Interpretation and evaluation of test indications. - Application of Magnetic particle Inspection.					
<b>Module:7</b>		<b>2 hours</b>			
Thermography principles- Contact and non-contact inspection methods-Techniques for applying liquid crystals-Advantages and limitation.					

<b>Module:8</b>		<b>2 hours</b>
Infrared radiation and infrared detectors-Generation of eddy currents, Properties of eddy currents		
<b>Module:9</b>		<b>2 hours</b>
Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.		
<b>Module:10</b>		<b>2 hours</b>
Ultrasonic and acoustic emission testing - Basics of ultrasonic waves- Principle- Equipment for ultrasonic testing- Testing methods.		
<b>Module:11</b>		<b>2 hours</b>
Ultrasonic transducers- Mode of displays- Application.		
<b>Module:12</b>		<b>2 hours</b>
Introduction- Basic principle- Instrumentation of acoustic emission testing- Modes- Four channel data acquisition- Applications.		
<b>Module:13</b>		<b>2 hours</b>
Radiography testing - Principle-Equipment of Radiography Testing-film and filmless techniques- types and use of filters and screens.		
<b>Module:14</b>		<b>2 hours</b>
Characteristics of films -graininess, density, speed, contrast-characteristic curves- Radiographic techniques.		
<b>Module:15</b>		<b>2 hours</b>
Fluoroscopy- Xerography-Computed Radiography- Computed Tomography.		
<b>Total Lecture hours</b>		<b>30</b>
<b>Text Book(s)</b>		
1	Practical Non-Destructive Testing, Baldev Raj, T.Jayakumar, M.Thavasimuthu, Narosa Publishing House, (2014).	
2	Non-Destructive Testing Techniques, Ravi Prakash, New Age International Publishers, (2010).	
<b>Reference Books</b>		
1	Handbook of Non-destructive evaluation, Charles, J. Hellier, McGraw Hill Professional, (2001).	
2	Introduction to Non-destructive testing: a training guide, Paul E Mix, Wiley, 2nd Edition New Jersey, (2005).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/courses/113/106/113106070/">https://nptel.ac.in/courses/113/106/113106070/</a>	
Course designed by: <b>Dr. D.M.Suresh and Dr. K Saravana Kumar</b>		

VALUE ADDED COURSE III

Value added course	BIOMEDICAL INSTRUMENTATION	L	T	P	C
		30	0	0	4
<b>Pre-requisite</b>	Students are expected to have some basic knowledge in the field of physiology, operations and instruments used in medical field.	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>					
The main objectives of this course are to:					
<ol style="list-style-type: none"> <li>1. understand the working principles of Biomedical Instruments.</li> <li>2. find applications of various biomedical instruments.</li> <li>3. impart the knowledge of electronics on various biomedical instruments.</li> </ol>					
<b>Expected Course Outcomes:</b>					
On the successful completion of the course, student will be able to:					
1	study the safety instrumentation against radiation, physiological effects due to current passage and electrical accidents in the hospitals.				K1
2	analyze the theory of Bio-telemetry, its problems and uses.				K4
3	evaluate the advances in biomedical instrumentation such as lasers in medicine, endoscope, CT scan, ultrasonic imaging, MRI and biofeedback instrumentation				K5
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create</b>					
<b>Module:1</b>		<b>2 hours</b>			
<b>Physiological Assist Devices:</b> -Introduction – pacemakers – pacemaker batteries.					
<b>Module:2</b>		<b>2 hours</b>			
Artificial heart valves – nerve and muscle stimulators.					
<b>Module:3</b>		<b>2 hours</b>			
Heart-lung machine – kidney machine.					
<b>Module:4</b>		<b>2 hours</b>			
<b>Operation theatre equipment:</b> Introduction – surgical diathermy – ventilators – anesthesia machine.					
<b>Module:5</b>		<b>2 hours</b>			
Cardiac output measurements – pulmonary function analyzers – gas analyzers.					
<b>Module:6</b>		<b>2 hours</b>			
Blood gas analyzers – oxymeters – elements of intensive care monitoring.					
<b>Module:7</b>		<b>2 hours</b>			
<b>Bio-Telemetry:</b> Elements of bio-telemetry system.					
<b>Module:8</b>		<b>2 hours</b>			
Design of a bio-telemetry system – radio telemetry system.					
<b>Module:9</b>		<b>2 hours</b>			
Problems in implant telemetry – uses of bio-telemetry.					
<b>Module:10</b>		<b>2 hours</b>			
<b>Safety instrumentation</b> Introduction – radiation safety instrumentation.					
<b>Module:11</b>		<b>2 hours</b>			
Physiological effects due to 50 Hz current passage – electrical accidents in hospitals.					

<b>Module:12</b>		<b>2 hours</b>
Devices to protect against electrical hazards – hospital architecture.		
<b>Module:13</b>		<b>2 hours</b>
<b>Advances in bio-medical instrumentation:</b> Introduction – computers in medicine – lasers in medicine.		
<b>Module:14</b>		<b>2 hours</b>
Endoscopes – cryogenic surgery – CT scan – ultrasonic imaging.		
<b>Module:15</b>		<b>2 hours</b>
MRI – biofeedback instrumentation – biomaterials.		
<b>Total Lecture hours</b>		<b>30</b>
<b>Text Book(s)</b>		
1	Biomedical instrumentation, M. Arumugam, AnuradhaPublicatios, (2009).	
2	Introduction to biomedical electronics, Joseph Dubovy, Tata McGraw Hill Company (1978).	
<b>Reference Books</b>		
1	Biomedical Instrumentation and Measurements, Leslie Cromwell, Fred J. Weibell And Erich A. Pfeiffer, Measurements Prentice Hall of India (1997).	
2	Handbook of biomedical instruments, Khandpur. R.S, Tata McGraw Hill Company (2003).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://nptel.ac.in/courses/108/105/108105101/">https://nptel.ac.in/courses/108/105/108105101/</a>	
2	<a href="https://onlinecourses.nptel.ac.in/noc20_ee41/preview">https://onlinecourses.nptel.ac.in/noc20_ee41/preview</a>	
3	<a href="https://www.classcentral.com/course/bioengineering-20126">https://www.classcentral.com/course/bioengineering-20126</a>	
Course designed by: <b>Dr. P. Sagunthala and Dr. K Saravana Kumar</b>		



**VALUE ADDED COURSE IV**

Value added course	MODERN DISPLAY DEVICES AND STORAGE MATERIALS	L	T	P	C
		30	0	0	4
<b>Pre-requisite</b>	Students are expected to know some basic concepts of display devices, storage materials and their usage.	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>					
The main objectives of this course are to:					
<ol style="list-style-type: none"> <li>1. acquire knowledge about different types of electronic devices and some storage materials.</li> <li>2. understand the selection process which will be used in industries.</li> <li>3. create various electronic and optoelectronic devices using suitable materials.</li> </ol>					
<b>Expected Course Outcomes:</b>					
On the successful completion of the course, student will be able to:					
1	evaluate display performances which are necessary to appropriately select an LCD in clinical situations.				K1
2	present information in visual or tactile form.				K2
3	apply these concepts for electronic visual displays.				K4
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create					
<b>Module:1</b>		<b>2 hours</b>			
<b>Selection of materials for different devices:</b> Selection Criteria- Operating Parameters- Manufacturing Process-Functional Requirements-Cost consideration.					
<b>Module:2</b>		<b>2 hours</b>			
Engineering Requirements-Types of Materials-Examples of selection criteria.					
<b>Module:3</b>		<b>2 hours</b>			
<b>Modern Engineering materials:</b> Metallic Glasses-Structure-Preparation-Properties-Applications.					
<b>Module:4</b>		<b>2 hours</b>			
Shape memory alloys- Introduction-Structural Changes-General Characteristics-Characterization Techniques-Commercial SMAs-Applications.					
<b>Module:5</b>		<b>2 hours</b>			
IC Packaging Materials. Introduction-IC packing-Package type-Package materials.					
<b>Module:6</b>		<b>2 hours</b>			
<b>Display Devices:</b> Introduction-Electroluminescence process- LED materials.					
<b>Module:7</b>		<b>2 hours</b>			
Fabrication of LED - Applications - Active and passive display devices.					
<b>Module:8</b>		<b>2 hours</b>			
Liquid crystals-Types -General features of liquid crystals-liquid crystal display systems-TN-LED (twisted nematic liquid crystal display) - merits and Demerits.					
<b>Module:9</b>		<b>2 hours</b>			
<b>Magnetic Data Storage Devices:</b> Basics of magnetic materials and their parameters - Memory concepts					
<b>Module:10</b>		<b>2 hours</b>			
Magnetic surface storage devices-magnetic Disc Memories					

<b>Module:11</b>		<b>2 hours</b>
Flexible disc storage systems-Floppy disks- Magnetic Tapes and drives-Magnetic Bubble materials		
<b>Module:12</b>		<b>2 hours</b>
Rare earth garnets-Magnetic Bubble memories - Charge Couple devices – Applications.		
<b>Module:13</b>		<b>2 hours</b>
<b>Optical Data Storage Devices:</b> Principle-Disc data storage- Structure and operating principle of CD-ROM.		
<b>Module:14</b>		<b>2 hours</b>
Magneto-optical storage system (recording and reading) - Data storage and retrieval methods.		
<b>Module:15</b>		<b>2 hours</b>
Holography data storage-principle-storing and retrieving digital data-Applications of Holography.		
<b>Total Lecture hours</b>		<b>30</b>
<b>Text Book(s)</b>		
1	Semiconductor Physics and Optoelectronics, V.Rajendran, J.Hemalatha, M.Stalin Mano Gibson, Vikas Publishing House PVT Ltd, (2003).	
2	A Text book of Material Science, K.G.Aswani, S. Chand & Company ltd, (2001).	
<b>Reference Books</b>		
1	Material science, O.P.Khanna, Dhanpat Rai Publications, (2004).	
2	Semiconductor Physics and Optoelectronics, M.Arumugam, Anuradha Agencies,(2003).	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.slideshare.net/mobile/thesaifeye/material-handling-storage-system">https://www.slideshare.net/mobile/thesaifeye/material-handling-storage-system</a>	
2	<a href="https://www.slideshare.net/mobile/jerinmartin/display-devices-44886026">https://www.slideshare.net/mobile/jerinmartin/display-devices-44886026</a>	
Course designed by: <b>Dr. D.M.Suresh and Dr. K Saravana kumar</b>		



***Allied  
Courses***



**ALLIED PHYSICS PAPERS FOR B. Sc.,  
MATHS / CHEMISTRY 2021-2022 BATCH  
AND ONWARDS**

**SEMESTER I /III**

Course code	1AF/ 3AF	ALLIED PHYSICS-I	L	T	P	C
<b>Allied Paper</b>			<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>		The students are expected to know the fundamental of properties of matter, heat and electricity.	<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. understand the behaviour of matter in everyday life.						
2. acquire the skill of solving related problems.						
3. gain knowledge in properties of matter, electricity and magnetism.						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	understand the laws involved in gravitation and elasticity.				K2	
2	update the knowledge on heat and thermodynamics, sound and spectroscopy.				K3	
3	realize the concept of properties of matter and recognize their applications in various real problems.				K4	
<b>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyse; K5 - Evaluate; K6 - Create</b>						
<b>Unit: I</b>	<b>Properties of Matter</b>				<b>12 hours</b>	
<b>Gravitation:</b> Newton's law of Gravitation - Determination of G by Boy's method - mass and density of earth – acceleration due to gravity- Determination of g by compound pendulum. <b>Elasticity:</b> Basic concepts – bending of beams – depression of cantilever- Determination of Y by uniform and non-uniform bending methods – Torsion in a wire – Determination of rigidity modulus by torsion pendulum.						
<b>Unit: II</b>	<b>Heat, Thermodynamics and Sound</b>				<b>12 hours</b>	
Vanderwaal's equation of state-critical constants of a gas-derivation of critical constants in terms of Vanderwaal's constants – Joule-Thomson effect – Porous plug experiment –liquefaction of helium – K-Onnes method – properties of liquid Helium I and II. <b>Sound:</b> Ultrasonics – Introduction - Properties - Production – Piezoelectric method - applications.						
<b>Unit: III</b>	<b>Atomic Physics</b>				<b>12hours</b>	
<b>X-Rays:</b> Introduction – Properties – Principle – Production – Coolidge tube – Bragg's law – derivation — Powder crystal method – Moseley's law and its importance – Compton scattering – Applications.						
<b>Unit: IV</b>	<b>Electricity</b>				<b>12 hours</b>	
Ballistic Galvanometer – principle – construction – theory – figure of merit — current and voltage of sensitiveness – Conversion of galvanometer into ammeter and voltmeter – measurement of Thermo EMF and resistance by potentiometer – Electromagnetic induction – Transformers: Theory, energy loss and applications.						
<b>Unit: V</b>	<b>Magnetism</b>				<b>10 hours</b>	
Magnetic properties of materials: Magnetic induction B – Magnetisation M – Magnetising field H – Relation between – B, H and M – Magnetic susceptibility – Magnetic permeability – Properties of dia, para and ferromagnetic materials – Curie temperature – Energy loss due to hysteresis – importance of hysteresis curves – magnetic circuit.						

<b>Unit: VI</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars - webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Properties of Matter and Acoustics, R. Murugesan, 2nd Edition, S. Chand & Co., Ltd. Reprint (2017).	
2	Modern Physics, R. Murugesan, Kiruthiga Sivaprasath, Twelfth Revised Edition, S. Chand & Co. Ltd. Reprint (2006).	
3	Heat and Thermodynamics, Brijlal N.subramaniam, S. Chand & Co. Ltd, Reprint (2006).	
4	Electricity and Magnetism, R. Murugesan ,Revised edition, S. Chand & Co., Reprint (2014)	
<b>Reference Books</b>		
1	Heat Thermodynamics and Statistical Physics, Brijlal N. Subramaniam, P.S.Hemme, S. Chand & Co., Revised edition (2007).	
2	Thermodynamics and Statistical Physics, Agrawal Prakash, PragatiPrakashan, 27 <sup>th</sup> edition (2015)	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.physicstutoronline.co.uk/alevelphysicsnotes/">https://www.physicstutoronline.co.uk/alevelphysicsnotes/</a>	
2	<a href="https://www.askiitians.com/revision-notes/physics/atomic-physics/">https://www.askiitians.com/revision-notes/physics/atomic-physics/</a>	
3	<a href="http://www.khanacademy.org/science/physics/elasticity/surface_tension">www.khanacademy.org/science/physics/elasticity/surface_tension</a>	
4	<a href="https://sites.google.com/brown.edu/lecture-demonstrations/home?authuser=0">https://sites.google.com/brown.edu/lecture-demonstrations/home?authuser=0</a>	
Course Designed By: <b>Dr. P. Sagunthala, Dr. P. Yasotha</b>		

<b>Mapping with Programme Outcomes</b>										
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>CO1</b>	S	M	M	M	S	S	S	L	S	S
<b>CO2</b>	S	S	M	S	L	M	S	M	M	S
<b>CO3</b>	M	S	S	L	S	M	L	M	S	M

\*S-Strong; M-Medium; L-Low

**SEMESTER II / IV**

Course code	2AF/ 4AF	ALLIED PHYSICS-II	L	T	P	C
<b>Allied paper</b>			<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Pre-requisite</b>	The students are expected to learn the fundamentals of Nuclear Physics, Lasers, Semiconductors and electronics.		<b>Syllabus Version</b>		<b>2023-24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
1. identify and access the diverse applications of Physics.						
2. acquire knowledge in physics concepts and problem-solving skills						
3. expertise in various domains of Physics						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	Acquire knowledge on basic concepts of photoelectric effect and fission, fusion and to a get clear idea of wave mechanics.				K1	
2	Understand the features of Nuclear forces, photoelectric cells, semiconductor diodes and their fundamental concepts.				K2	
3	Recognize the concept of Laser properties and digital electronics and explore their applications in real life.				K4	
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>Unit: I</b>	<b>Modern Physics</b>				<b>12 hours</b>	
Photoelectric effect – Laws of photo electric effect – Einstein’s photoelectric equation – verification of Einstein’s photoelectric equation by Millikan’s experiment – photo electric cells – applications. <b>Wave mechanics:</b> De Broglie matter waves – determination of De Broglie wavelength – Experimental study of De Broglie matter wave by G.P.Thomson experiment.						
<b>Unit: II</b>	<b>Nuclear Physics</b>				<b>11 hours</b>	
Characteristics of nuclear forces – nuclear structure by liquid drop model – Binding energy – mass defect – particle accelerators – cyclotron and betatron –nuclear fission: definition – energy released – chain reaction – atom bomb – nuclear fusion: definition – source of Stellar energy – Hydrogen bomb - elementary particles – Leptons, Mesons and Baryons						
<b>Unit: III</b>	<b>Laser Physics</b>				<b>11 hours</b>	
Purity of spectral lines – Coherence length and time – spontaneous and induced emissions – population inversion – metastable state – conditions for laser actions – Ruby laser – Helium–neon laser – applications of lasers – Raman effect – Raman shift – stokes and anti-stokes lines – Laser Raman Spectrometer.						
<b>Unit: IV</b>	<b>Semiconductor Physics</b>				<b>12 hours</b>	
Volt – Ampere Characteristics of P-N junction Diode – Zener diode – applications of Zener diodes – photodiode – principle of LED– Frequency Modulation and Amplitude modulation – basic principle of antennas – block diagram of Superheterodyne receiver – block diagram of monochrome TV receiver – basic principles and applications of RADAR						
<b>Unit: V</b>	<b>Digital Electronics</b>				<b>12 hours</b>	
<b>Integrated Electronics</b> Steps in fabrication of Monolithic IC’s – General applications of IC’s. <b>Analog and digital computers</b> – organization of digital computers – number systems – conversion						

of binary into decimal – conversion of decimal to binary – binary addition and subtraction – Basic logic gates – NAND and NOR as universal logic gates – Demorgan’s theorems – Boolean algebra – applications of Demorgan’s theorems – Half adder and full adder circuits.		
<b>Unit: VI</b>	<b>Contemporary Issues</b>	<b>2 hours</b>
Expert lectures, online seminars – webinars		
<b>Total Lecture hours</b>		<b>60</b>
<b>Text Book(s)</b>		
1	Modern Physics, R.Murugesan, Kiruthiga Sivaprasath, Twelfth Revised Edition, S. Chand & Co. Ltd., Reprint (2006)	
2	Principles of Electronics, V.K. Metha , Reprint,S.Chand& Co (2000)	
<b>Reference Books</b>		
1	A Text Book of electronics, R.S Sedha, S.Chand& Co. Ltd. Reprint (2008).	
2	Modern Physics,Sehgal.Choppa, Sehgal,S.Chand& Co	
<b>Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]</b>		
1	<a href="https://www.askiitians.com/revision-notes/physics/atomic-physics/">https://www.askiitians.com/revision-notes/physics/atomic-physics/</a>	
2	<a href="https://www.askiitians.com/revision-notes/physics/nuclear-physics/">https://www.askiitians.com/revision-notes/physics/nuclear-physics/</a>	
3	<a href="https://www.askiitians.com/revision-notes/physics/solid-and-electronic-device/">https://www.askiitians.com/revision-notes/physics/solid-and-electronic-device/</a>	
Course Designed By: <b>Dr. P. Sagunthala and Dr. P. Yasotha</b>		

<b>Mapping with Programme Outcomes</b>										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	S	S	L	S	S
CO2	S	M	S	M	M	S	S	L	M	S
CO3	M	S	M	L	S	M	L	M	S	M

**SEMESTER I&II / SEMESTER III&IV**

<b>Course code</b>	<b>2PF/4PF</b>	<b>ALLIED PHYSICS PRACTICAL</b> (Examination at the end of II/ IV semester)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Allied Practical</b>			<b>0</b>	<b>0</b>	<b>2</b>	<b>3</b>
<b>Pre-requisite</b>		Should have the fundamental knowledge of Basic Experiments in physics	<b>Syllabus Version</b>		<b>2023- 24</b>	
<b>Course Objectives:</b>						
The main objectives of this course are to:						
<ol style="list-style-type: none"> <li>1. Understand the basics of Experimental techniques and apply it</li> <li>2. Gain knowledge about different light and optical properties.</li> <li>3. Motivate the students to apply the principles of physics in their day-to-day life.</li> </ol>						
<b>Expected Course Outcomes:</b>						
On the successful completion of the course, student will be able to:						
1	attain skill to understand the usage of basic laws and theories to determine various properties of the materials given.					K3
2	analyze the characteristics of various diodes and construct power supply.					K4
3	acquire the knowledge of the potentiometer and apply it for various experiments.					K5
<b>K1</b> - Remember; <b>K2</b> - Understand; <b>K3</b> - Apply; <b>K4</b> - Analyze; <b>K5</b> - Evaluate; <b>K6</b> - Create						
<b>LIST OF EXPERIMENTS</b> (Any twelve experiments)					<b>56 hours</b>	
<ol style="list-style-type: none"> <li>1. Acceleration due to gravity-Compound pendulum method</li> <li>2. Moment of inertia – Torsional pendulum method</li> <li>3. Young’s modulus - Uniform bending - Optic lever method</li> <li>4. Young’s modulus - Non-uniform bending - Pin and microscope</li> <li>5. Rigidity modulus – Static torsion method.</li> <li>6. Frequency of A.C - Sonometer</li> <li>7. Thermal conductivity - Lee’s disc method.</li> <li>8. Refractive index of a solid prism – Spectrometer</li> <li>9. Refractive index of a liquid prism – Spectrometer</li> <li>10. (i-d) curve - solid prism - Spectrometer</li> <li>11. Wavelength of spectral lines – Grating - Minimum deviation - Spectrometer</li> <li>12. Radius of curvature of lens - Newton’s rings method.</li> <li>13. Viscosity of highly viscous liquid – Stoke’s method.</li> <li>14. Surface tension - Drop weight method</li> <li>15. Low range voltmeter calibration - Potentiometer</li> <li>16. Low range ammeter calibration - Potentiometer</li> <li>17. Construction of IC regulated power supply</li> <li>18. Characteristics of PN Junction diode</li> <li>19. Characteristics of Zener diode</li> <li>20. Verification of truth tables of logic gates- AND, OR and NOT</li> </ol>						
<b>Contemporary Issues</b>					<b>4 hours</b>	
Online workshop, Webinars on Experimental Electronics						
<b>Total Practical Hours:</b>					<b>60</b>	
<b>Reference Books</b>						
1	Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers (2007)					
2	A text book of practical Physics, M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, Sultan Chand&Sons (2017)					

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	<a href="https://nptel.ac.in/courses/115/105/115105110/">https://nptel.ac.in/courses/115/105/115105110/</a>
2	<a href="https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK">https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK</a>
3	<a href="https://www.slideshare.net/mobile/sunilrathore77398/basicanalogelectronics">https://www.slideshare.net/mobile/sunilrathore77398/basicanalogelectronics</a>
Course Designed By: <b>Dr. P. Sagunthala and Dr. P. Yasotha</b>	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	M	L	M	S	M
CO2	S	S	M	S	S	L	M	S	S	S
CO3	M	M	S	S	L	M	S	S	S	M

\*S-Strong; M-Medium; L-Low





***Annexure***

**B. Sc. PHYSICS**

**Syllabus**  
**(With effect from 2023 – 24)**

**Program Code: 22C**



**DEPARTMENT OF PHYSICS**  
**Bharathiar University**  
**(A State University, Accredited with “A“**  
**Grade by NAAC and 13<sup>th</sup> Rank among**  
**Indian Universities by MHRD-NIRF)**  
**Coimbatore 641 046, INDIA**



**MARKS DISTRIBUTION (EXTERNAL(CEE) AND  
INTERNAL (CIA))**

**I. THEORY(Core/ Elective/ Allied Papers)**

Max. Marks	Comprehensive External Examinations (CEE)		Continuous Internal Assessments (CIA)		Overall Passing Minimum (Internal + External)
	Max. Marks	Passing Minimum	Max. Marks	Passing Minimum	
100	75	40	25	-	40
75	55	30	20	-	30

**Distribution of marks for CIA for Core/ Elective/ Allied Theory Papers(Each student should attend at least one test)**

S. No	Component	Allotment of Internal Assessment marks for a maximum of	
		25	20
1	Tests (average of two tests of 2 hours each)	05	05
2	End semester model test (3 hours)	10	10
3	Assignments- 2 No.s/ Quiz/ Group discussion	5	-
4	Seminar	-	-
5	Attendance	5	5

**II. PRACTICAL (Core/ Elective/ Allied Practical)**

Max. Marks	Comprehensive External Examinations (CEE)		Continuous Internal Assessments (CIA)		Overall Passing Minimum (Internal + External)
	Max. Marks	Passing Minimum	Max. Marks	Passing Minimum	
100	75	40	25	-	40
75	55	30	20	-	30
50	30	20	20	-	20

**A. Distribution of marks for CIA for Core/  
Elective/ Allied Practical(Each  
student should attend at least  
one test)**

S. No	Component	Allotment of Internal Assessment marks for a maximum of		
		25	20	
1	Record	10	05	
2	Tests: One best test out of two tests	10	10	
3	Attendance (Minimum 10 experiments to be completed)	5	5	

**B. Distribution of marks for CEE for Core/ Elective/ Allied Practical**

S. No	Component	Allotment of Comprehensive External Examination marks for a maximum of		
		75	55	
1	Record	5	5	
2	Formula, Circuit diagram, Tabular column and etc.,	20	20	
3	Observation	40	20	
4	Calculation	5	5	
5	Result	5	5	

**Distribution of marks for attendance**

Attendance	Marks
90% and above	5
Between 85 and 90%	4
Between 80 and 85%	3
Between 75 and 80%	2
Between 70 and 75%	1

### QUESTION PAPER PATTERN

The following question paper patterns shall be followed for OBE pattern syllabi for the candidates admitted from the academic year 2023-24 wherever applicable otherwise provided in syllabi itself.

<b>Maximum 75 Marks – wherever applicable</b>			
<b>SECTION A</b>	Multiple choice questions with four options	10*1=10	10 questions – 2 from each unit
<b>SECTION B</b>	Short answer questions of either / or type	5*5=25	5 questions – 1 from each unit
<b>SECTION C</b>	Essay-type questions of either / or type	5*8=40	5 questions – 1 from each unit

<b>Maximum 45 Marks – wherever applicable</b>			
<b>SECTION A</b>	Multiple choice questions with four options	10*1=10	10 questions – 2 from each unit
<b>SECTION B</b>	Short answer questions of either / or type	5*3=15	5 questions – 1 from each unit
<b>SECTION C</b>	Essay-type questions of either / or type	5*6=30	5 questions – 1 from each unit

The General Awareness paper to have multiple-choice questions (with four options) to be evaluated by using OMR. For other courses in Part IV namely, Environmental Studies, Value Education – Human Rights, Yoga for Human Excellence and Women's Rights the question paper pattern should be 5 out of 10. E