B.Sc., PHYSICS

Syllabus

Program Code: UPH

2021-2022 onwards

MANNAR THIRUMALAI NAICKER COLLEGE

(AUTONOMOUS)

Re-accredited with "A" Grade by NAAC

PASUMALAI, MADURAI – 625 004

Eligibility for Admission

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu with Physics as one of the subject in Higher Secondary Education.

Subjects of Study

Part I : Tamil / Company Secretarial Practice and Modern Office Management

Part II : English

Part III :

1. Core Subjects
2. Allied Subjects
3. Electives

Part IV :

1. Non Major Electives (II Year)
2. Skill Based Subjects
3. Environmental Studies - Mandatory Subject
4. Value Education - Mandatory Subject

Part V :

Extension Activities

Pattern of the question paper for the Continuous Internal Assessment

Note: Duration – 1 hour

(For Part I, Part II & Part III)

The components for continuous internal assessment are:

Part –A

Four multiple choice questions (answer all) 4 x01= 04 Marks

Part –B

Three short answers questions (answer all) 3 x02= 06 Marks

Part –C

Two questions (‘either …. or ‘type) 2 x 05=10 Marks

Part –D

Two questions out of three 1 x 10 =10 Marks

Total 30 Marks

The scheme of Examination for Part-I, II & III

The components for continuous internal assessment are:

(60 Marks of two continuous internal assessments will be converted to 15 marks)

Two tests and their average	--15 marks
Seminar /Group discussion	--5 marks
Assignment	--5 marks

Total	25 Marks

Pattern of the question paper for the Summative Examinations:

Note: Duration- 3 hours

Part –A

Ten multiple choice questions	10 x01	= 10 Marks

No Unit shall be omitted: not more than two questions from each unit.)

Part –B

Short answer questions (one question from each unit)	5 x02	= 10 Marks

Part –C

Five Paragraph questions (‘either …. or ‘type)	5 x 05	= 25 Marks

(One question from each Unit)

Part –D

Three Essay questions out of five	3 x 10	=30 Marks

(One question from each Unit)

Total	75 Marks

Part-IV- Skill Based Papers / NME:

The Scheme of Examination for Skill Based Papers: (Except Practical Lab Subjects)

Pattern of the questions paper for the continuous Internal Assessment

45 MCQs will be asked for each internal assessment tests (45 x 1=45 Marks**) and converted for 15 marks**

The components for continuous internal assessment are:

Two tests and their average	--15 marks
Seminar /Group discussion	--5 marks
Assignment	--5 marks

Total	25 Marks

Summative Examination Pattern

Pattern of the Question Paper for Skill Based Papers (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks**)**

(15MCQ's from each unit)

Part-IV- Environmental Studies and Value Education

The Scheme of Examination (Environmental Studies and Value Education)

Two tests and their average	--15 marks
Project Report	--10 marks*****
Total	--25 marks

***** The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

Question Paper Pattern

(Internal Assessment)

Pattern of the Question Paper for Environmental Studies & Value Education only) (Internal)

45 MCQs will be asked for each internal assessment tests (45 x 1=45 Marks**) and converted for 15 marks**

Two tests and their average	--	15 marks
Project	--	10 marks

Total		25 Marks

Summative Examination Pattern

Pattern of the Question Paper for Environmental Studies & Value Education only) (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks**)**

(15MCQ's from each unit)

Part V Extension Activities: (Maximum Marks: 100)

1. NCC
2. NSS
3. Physical Education
4. YRC
5. RRC
6. Health & Fitness Club
7. Eco Club
8. Human Rights Club

Pattern of the Question Paper for (Internal Examination & Summative Examination)

Internal Examinations	- - 40 Marks
Summative Examinations	- - 60 Marks
	100

Minimum Marks for a Pass

40% of the aggregate (Internal +Summative Examinations).
No separate pass minimum for the Internal Examinations.
27 marks out of 75 is the pass minimum for the Summative Examinations.

VISION

To enable the students of physics evolve as innovators, leaders and responsible citizens through imparting strong foundation in basics

MISSION

To offer a comprehensive undergraduate physics degree program

The 12 Graduate Attributes*:

1. (KB) A knowledge base for engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
2. (PA) Problem analysis: An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions
3. (Inv.) Investigation: An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.
4. (Des.) Design: An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
5. (Tools) Use of engineering tools: An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
6. (Team) Individual and teamwork: An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
7. (Comm.) Communication skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
8. (Prof.) Professionalism: An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
9. (Impacts) Impact of engineering on society and the environment: An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.

10. (Ethics) Ethics and equity: An ability to apply professional ethics, accountability, and equity.
11. (Econ.) Economics and project management: An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
12. (LL) Life-long learning: An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge

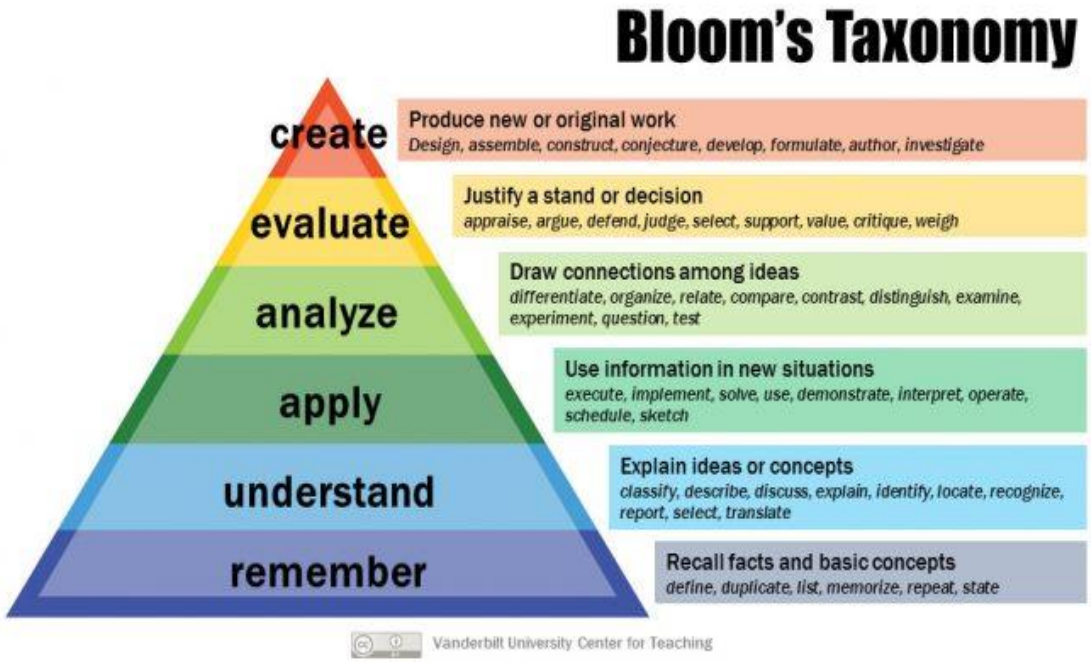
WA	Graduate Attributes	Caption as
WA1	Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.	**Knowledge Base**
WA2	An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions	**Problem Analysis & Investigation**
WA4	An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.	
WA10	Communication skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.	**Communication Skills & Design**
WA3	An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.	
WA9	An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.	**Individual and Team Work**
WA6	An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.	**Professionalism, Ethics and equity**
WA8	An ability to apply professional ethics, accountability, and equity.	
WA12	An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge	**Lifelong learning**
WA5	An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.	**Use of engineering tools**
WA7	An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such	**Impact of engineering on society and**

	interactions; and the concepts of sustainable design and development and environmental stewardship.	**the environment**
WA11	An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations	**Economics and project management**

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
PEO1:	The accumulation of facts of nature and the ability to develop an understanding and knowledge of basic Physics.
PEO2:	The ability to use this knowledge to analyze new situations and learn skills and interpret the results and make predictions for the future developments
PEO3:	Apply knowledge of Physics in theoretical and laboratory skills to unfamiliar contexts to identify and analyze problems in Physics
PEO4:	Demonstrate Physics-related technological skills that are relevant to employment opportunities.
PEO5:	Adapt to the constantly evolving scientific thinking and be life- long learners.
PEO6:	Understand the concepts of physics and apply that knowledge to manage projects in multidisciplinary fields

PO NO	**PROGRAMME OUTCOMES (POs)**	
At the end of the programme, the students will be able to		
PO – 1	Demonstrate the knowledge and understanding of Science concepts and its relevant fields.	**Disciplinary Knowledge**
PO – 2	Identify, formulate, analyse complex problems and reach valid conclusions using the methodologies of Science.	**Problem Solving**
PO – 3	Employ critical and analytical thinking in understanding the concepts and apply them in various problems appearing in different branches of Science.	**Analytical Reasoning & Critical Thinking**
PO - 4	Communicate the known concepts effectively within the profession and with any forum	**Communication Skills**
PO - 5	Function successfully as a member/leader in any team and to apply ethics, accountability and equity in their life.	**Team Work and Moral/Ethical Awareness**
PO - 6	Use ICT tools in various learning situations, related information sources, suitable software to analyze data and furthermore participating in learning activities throughout life to meet the demands of work place through knowledge /up-skilling / re-skilling	**Digital Literacy & Life-long Learning**

PROGRAM SPECIFIC OUTCOME (PSOs)	
PSO1:	Demonstrate a fundamental/systematic or coherent understanding of the academic field of Physics, its different learning areas and applications in basic Physics like Mechanics & Properties of Matter, Heat & Thermodynamics, Electricity & Magnetism, Optics & Spectroscopy, Nuclear & Particle Physics, Condensed matter Physics, Atomic & Molecular Physics, Mathematical Physics, Classical & Statistical Mechanics, Quantum Mechanics & relativity, Electronics and its linkages with related disciplinary areas / subjects like Chemistry, Mathematics, Life sciences, Environmental sciences, Atmospheric Physics, Computer science, Information Technology.
PSO2:	Tackle problems and offer out of the box solutions based on analysis and critical thinking deeply rooted in concepts of Physics.
PSO3:	Problem–solving skills that are required to solve different types of Physics–related problems with well–defined solutions, and tackle open–ended problems that belong to the disciplinary–area boundaries.
PSO4:	Demonstrate the ability to use skills in Physics and its related areas of technology for formulating and tackling Physics–related problems and identifying and applying appropriate physical principles and methodologies to solve a wide range of problems associated with Physics.
PSO5:	Recognize the importance of mathematical modeling simulation and computing, and the role of approximation and mathematical approaches to describing the physical world.
PSO6:	Plan and execute Physics–related experiments or investigations, analyze and interpret data/information collected using appropriate methods, including the use of appropriate software such as programming languages and purpose–written packages, and report accurately the findings of the experiment/investigations while relating the conclusions/findings to relevant theories of Physics.



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS), MADURAI

PHYSICS CURRICULUM

(For the student admitted during the academic year 2021-2022 onwards)

Course Code	Title of the Course	Hours	Credits	Maximum Marks		
				Int	Ext	Total
FIRST SEMESTER						
Part – I	**Tamil / Alternate Course**					
21UTAG11	**இக்காலக் கவிதையும் நாடகமும்**	6	3	25	75	100
Part – II	**English**					
21UENG11	Communicative English - I	6	3	25	75	100
Part - III	**Core Courses**					
21UPHC11	**Mechanics, Properties of Matter and Sound**	4	4	25	75	100
21UPHCP1	Major Physics Practical – I	2	-	-	-	-
Part III	**Allied Course**					
21UMTA11	Allied Mathematics – I	6	4	25	75	100
Part IV	**Skill Based Courses**					
21UPHS11	Laser and Its Applications	2	2	25	75	100
21UPHS12	Basics of Micro Soft office	2	2	25	75	100
Part IV	**Mandatory Course**					
21UEVG11	Environmental Studies	2	2	25	75	100
	Total	**30**	**20**	**175**	**525**	**700**
SECOND SEMESTER						
Part – I	**Tamil / Alternate Course**					
21UTAG21	**இடைக்கால இலக்கியமும் சிறுகதையும்**	6	3	25	75	100
Part – II	**English**					
21UENG21	Communicative English -II	6	3	25	75	100
Part - III	**Core Courses**					
21UPHC21	**Heat and Thermodynamics**	4	4	25	75	100
21UPHCP1	Major Physics Practical – I	2	2	40	60	100
Part III	**Allied Course**					
21UMTA21	Allied Mathematics – II	6	4	25	75	100
Part IV	**Skill Based Courses**					
21UPHS21	Bio physics	2	2	25	75	100
21UPHS22	Basics of C Programming	2	2	25	75	100
Part IV	**Mandatory Course**					
21UVLG21	Value Education	2	2	25	75	100
	Total	**30**	**22**	**215**	**585**	**800**

THIRD SEMESTER						
Part – I	**Tamil / Alternate Course**					
21UTAG31	**காப்பிய இலக்கியமும் உரைநடையும்**	6	3	25	75	100
Part – II	**English**					
21UENG31	Communicative English-III	6	3	25	75	100
Part - III	**Core Courses**					
21UPHC31	Electricity	4	4	25	75	100
21UPHC32	Magnetism	4	4	25	75	100
21UPHCP2	Major Physics Practical – II	2	-	-	-	-
Part III	**Allied Courses**					
21UCHA31	Allied Chemistry – I	4	4	25	75	100
21UCHAP1	Allied Chemistry Practical – I	2	-	-	-	-
Part IV	**NME**					
21UPHN31	**Physics Appliances in Everyday life**	2	2	25	75	100
	Total	**30**	**20**	**150**	**450**	**600**
FOURTH SEMESTER						
Part – I	**Tamil / Alternate Course**					
21UTAG41	**பண்டைய இலக்கியமும் புதினமும்**	6	3	25	75	100
Part – II	**English**					
21UENG41	Communicative English -IV	6	3	25	75	100
Part - III	**Core Courses**					
21UPHC41	Optics and Photometry	4	4	25	75	100
21UPHC42	Medical Instrumentation	4	4	25	75	100
21UPHCP2	Major Physics Practical – II	2	2	40	60	100
Part III	**Allied Courses**					
21UCHA41	Allied Chemistry – II	4	3	25	75	100
21UCHAP1	Allied Chemistry Practical –I	2	1	40	60	100
Part IV	**NME**					
21UPHN41	**Non Conventional Energy Resources**	2	2	25	75	100
Part V	**Extension Activities**					
21UEAG40 – 21UEAG44	**NSS, NCC, YRC, RRC**	-	1	40	60	100
	Total	**30**	**23**	**270**	**630**	**900**

FIFTH SEMESTER						
Part - III	**Core Courses**					
21UPHC51	Atomic Physics and Quantum Mechanics	6	6	25	75	100
21UPHC52	Analog Electronics	6	6	25	75	100
21UPHCP3	Non - Electronics Practical	3	-	-	-	-
21UPHCP4	Electronics Practical	3	-	-	-	-
Part III	**Core Elective Courses**					
21UPHE51 21UPHE52 21UPHE53	Concepts of Nuclear Physics Condensed Matter Physics Basics of Astrophysics	5	5	25	75	100
Part III	**Core Elective Courses**					
21UPHE54 21UPHE55 21UPHE56	Fundamentals of Molecular Spectroscopy Sensors and Organic Electronics Particle Physics	5	5	25	75	100
Part IV	**Skill Based Course**					
21UPHS51	Gemology	2	2	25	75	100
	Total	**30**	**24**	**125**	**375**	**500**
SIXTH SEMESTER						
Part - III	**Core Courses**					
21UPHC61	Principles of Classical and Statistical Mechanics	6	6	25	75	100
21UPHCP3	Non - Electronics Practical	3	4	40	60	100
21UPHCP4	Electronics Practical	3	5	40	60	100
21UPHPR1	Project and Viva - Voce	6	4	40	60	100
Part III	**Core Elective Courses**					
21UPHE61 21UPHE62 21UPHE63	Digital Principles and Applications Basics in Microprocessors Mathematical Physics	5	5	25	75	100
Part III	**Core Elective Courses**					
21UPHE64 21UPHE65 21UPHE66	Nanotechnology Non-renewable Energy Physics Communication Electronics	5	5	25	75	100
Part IV	**Skill Based Course**					
21UPHS61	Optoelectronics	2	2	25	75	100
	Total	**30**	**31**	**220**	**480**	**700**
	Grand Total	**180**	**140**	**1155**	**3045**	**4200**

FIRST SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**MECHANICS, PROPERTIES OF MATTER AND SOUND**							
Course Code	**21UPHC11**					**L**	**P**	**C**
Category	**CORE**					4	-	4
Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

The learners will be able:

1. To review the fundamental concepts in Centre of Mass, Linear Momentum, Collision
2. To recall the Properties of Rotational Mechanics
3. To analyze the basic concepts of Properties of Matter like elasticity, surface tension and viscosity.
4. To understand the concepts of Measurement of Gravitational Constant, acceleration due to gravity, Keplar's laws, escape velocity, black hole
5. To understand the Nature and Propagation of Sound Waves and acoustics

Unit: I	***Centre of Mass, Linear Momentum, Collision***	**12**

Many body problem - Single body problem - Centre of Mass - Centre of Mass of Continuous Bodies - Motion of the Centre of Mass - Ballistic pendulum - Compound pendulum - Linear Momentum and its Conservation Principle - Rocket Propulsion - Collision - Elastic Collision in One Dimension - Perfectly Inelastic Collision in One Dimension - Coefficient of Restitution - Elastic Collision in Two Dimensions - Impulse and Impulsive Force.

Unit: II	***Rotational Mechanics***	**12**

Rotation of a Rigid Body about a Given Fixed Line - Kinematics - Rotational Dynamics - Torque of a Force about the Axis of Rotation - $\Gamma=I\alpha$ - Bodies in Equilibrium - Bending of a Cyclist on a Horizontal Turn - Angular Momentum - $L=I\omega$ - Conservation of Angular Momentum - Angular Impulse - Kinetic Energy of a Rigid Body Rotating About a Given Axis - Power Delivered and Work Done by a Torque - Calculation of Moment of Inertia - Two Important Theorems on Moment of Inertia - Combined Rotation and Translation - Rolling - Kinetic Energy of a Body in Combined Rotation and Translation - Angular Momentum of a Body in Combined Rotation and Translation - Rolling of sphere without slipping.

Unit: III	***Properties of Matter***	**12**

Elasticity – Stress – Strain - Hooke's Law and the Modulii of Elasticity - Relation between Longitudinal Stress and Strain - Elastic Potential Energy of a Strained Body - Determination of Young's Modulus of the beam subjected to uniform bending using pin and microscope - Determination of Young's Modulus of the beam subjected to non-uniform bending using opticlever - Surface Tension - Surface Energy - Excess Pressure Inside a Drop - Excess Pressure in a Soap Bubble - Contact Angle - Rise of Liquid in a Capillary Tube - Viscosity - Flow through a Narrow Tube: Poiseuille's Equation - Stokes' Law - Terminal Velocity - Measuring Coefficient of Viscosity by Stokes' Method - Critical Velocity and Reynolds Number - Effect of temperature on viscosity.

Unit: IV	***Gravitation***	**12**

Comparison of four forces - Measurement of Gravitational Constant G - Gravitational Potential Energy - Gravitational Potential - Calculation of Gravitational Potential - Gravitational Field - Relation between Gravitational Field and Potential - Calculation of Gravitational Field - Variation in the Value of g with altitude, latitude and depth - Planets and Satellites - Kepler's Laws -

Weightlessness in a Satellite - Escape Velocity - Gravitational Binding Energy - Black Holes.		
Unit: V	***Sound and Acoustics***	**12**
Propagation of Sound Waves - Displacement Wave and Pressure Wave - Speed of a Sound Wave in a Material Medium - Speed of Sound in a Gas: Newton's Formula and Laplace's Correction - Effect of Pressure, Temperature and Humidity on the Speed of Sound in Air - Intensity of Sound Waves - Perception of Sound to Human Ear - Beats - Interference of Sound Waves - Standing Longitudinal Waves in Air Columns - Determination of Speed of Sound in Air – Diffraction - Doppler Effect - Sonic Booms - Musical Scale - Acoustics of Buildings.		
	Total Lecture Hours	**60 Hrs**

Books for Study:

1. H.C.Verma, **"Concepts of Physics - Volume 1",** BharatiBhawan (Publishers & Distributors), New Delhi, 2020
   - **Unit – I:** Chapter 9
   - Section – 9.1 to 9.11, Worked Out Examples
   - **Unit – II:** Chapter 10
   - Section – 10.1 to 10.14, 10.14(A, B, C, D, G, H), 10.15 to 10.20, Worked Out Examples
   - **Unit – III:** Chapter 14
   - Section – 14.1 to 14.20, Worked Out Examples
   - **Unit – IV:** Chapter 11
   - Section – 11.1 to 11.17, Worked Out Examples
   - **Unit – V:** Chapter 16
   - Section – 16.1 to 16.16, Worked Out Examples

Books for References:

1. R. Murugeshan, **Mechanics, Properties of Matter and Sound**, 1st edition, July 2016, Madurai
2. D. Halliday Resnick, Jearl Walker, **Principles of physics,** 9th Edition, Wiley India Pvt Ltd.,
3. D.S. Mathur**, Elements of Properties of matter,** S. Chand & Co., 2004
4. 4. Brijlal & N. Subrahmanyam, **A Text Book of Sound,** 2nd Edition, Vikas Publishing House Pvt. Ltd., 2019.

Web Resources:

1. https://youtu.be/fDJeVR0o__w
2. https://youtu.be/o7_zmuBweHI
3. https://youtu.be/QPoWoCh0vQw
4. https://en.wikipedia.org/wiki/Temperature_dependence_of_viscosity
5. https://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-a-black-hole-k4.html
6. https://wonderopolis.org/wonder/what-is-a-sonic-boom
7. https://youtu.be/PG_u4NDJtwU

Course Outcomes		**K Level**
After successful completion of the course, the student is expected to		
CO1:	Explain the conservation laws, properties of rotational mechanics, properties of matter, Gravitational potentials, sound waves and acoustics.	**K2**
CO2:	Apply conservation principles to Rocket Propulsion and collision	**K3**
CO3:	Summarize theorems on Moment of Inertia, properties of matter, gravitational potential and field, acoustics of buildings	**K3**
CO4:	Analyze the variation of g, effect of Pressure, Temperature and Humidity on the Speed of Sound	**K4**

CO5:	Illustrate Coefficient of Restitution, Kinetic Energy of a Body in Combined Rotation and Translation, properties of matter, Black Holes	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	2	2	2
CO 2	3	3	2	2	2	2
CO 3	3	3	2	2	2	2
CO 4	3	3	2	2	2	1
CO5	3	2	1	1	2	2

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	MECHANICS, PROPERTIES OF MATTER AND SOUND	Hrs	Pedagogy
I	**Centre of Mass, Linear Momentum, Collision** Many body problem - Single body problem - Centre of Mass - Centre of Mass of Continuous Bodies - Motion of the Centre of Mass - Ballistic pendulum - Compound pendulum - Linear Momentum and its Conservation Principle - Rocket Propulsion - Collision - Elastic Collision in One Dimension - Perfectly Inelastic Collision in One Dimension - Coefficient of Restitution - Elastic Collision in Two Dimensions - Impulse and Impulsive Force.	**12**	Chalk & Talk, Videos, PPT and Demonstration
II	**Rotational Mechanics** Rotation of a Rigid Body about a Given Fixed Line - Kinematics - Rotational Dynamics - Torque of a Force about the Axis of Rotation - $\Gamma=I\alpha$ - Bodies in Equilibrium - Bending of a Cyclist on a Horizontal Turn - Angular Momentum - $L=I\omega$ - Conservation of Angular Momentum - Angular Impulse - Kinetic Energy of a Rigid Body Rotating About a Given Axis - Power Delivered and Work Done by a Torque - Calculation of Moment of Inertia - Two Important Theorems on Moment of Inertia - Combined Rotation and Translation - Rolling - Kinetic Energy of a Body in Combined Rotation and Translation - Angular Momentum of a Body in Combined Rotation and Translation - Rolling of sphere without slipping.	**12**	Chalk & Talk, Videos, PPT and Demonstration
III	**Properties of Matter** Elasticity – Stress – Strain - Hooke's Law and the Modulii of Elasticity - Relation between Longitudinal Stress and Strain - Elastic Potential Energy of a Strained Body - Determination of Young's Modulus of the beam subjected to uniform bending using pin and microscope - Determination of Young's Modulus of the beam subjected to non-uniform bending using opticlever - Surface Tension - Surface Energy - Excess Pressure Inside a Drop - Excess	**12**	Chalk & Talk, Videos, PPT and Demonstration

	Pressure in a Soap Bubble - Contact Angle - Rise of Liquid in a Capillary Tube - Viscosity - Flow through a Narrow Tube: Poiseuille's Equation - Stokes' Law - Terminal Velocity - Measuring Coefficient of Viscosity by Stokes' Method - Critical Velocity and Reynolds Number - Effect of temperature on viscosity.		
IV	**Gravitation** Compare the four forces - Measurement of Gravitational Constant G - Gravitational Potential Energy - Gravitational Potential - Calculation of Gravitational Potential - Gravitational Field - Relation between Gravitational Field and Potential - Calculation of Gravitational Field - Variation in the Value of g with altitude, latitude and depth - Planets and Satellites - Kepler's Laws - Weightlessness in a Satellite - Escape Velocity - Gravitational Binding Energy - Black Holes.	**12**	Chalk & Talk, Videos, PPT and Demonstration
V	**Sound and Acoustics** Propagation of Sound Waves - Displacement Wave and Pressure Wave - Speed of a Sound Wave in a Material Medium - Speed of Sound in a Gas: Newton's Formula and Laplace's Correction - Effect of Pressure, Temperature and Humidity on the Speed of Sound in Air - Intensity of Sound Waves - Perception of Sound to Human Ear - Beats - Interference of Sound Waves - Standing Longitudinal Waves in Air Columns - Determination of Speed of Sound in Air – Diffraction - Doppler Effect - Sonic Booms - Musical Scale - Acoustics of Building.	**12**	Chalk & Talk, Videos, PPT and Demonstration

Course Designed by: **1. Dr.P.Kavitha, 2. Dr.S.S.Jayabalakrishnan**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K – Level**		
CI AI	**CO1**	Up to K4	2	K1,K2	1	K1	2(K2&K2)	1 K2
	CO2	Up to K4	2	K1,K2	2	K2	2(K3&K3)	1 K3
CI AII	**CO3**	Up to K4	2	K1,K2	1	K1	2(K3&K3)	1K3
	CO4	Up to K4	2	K1,K2	2	K2	2(K4&K4)	1 K4
Question Pattern CIA I & II	No. of Questions to be asked		**4**		**3**		**4**	**2**
	No. of Questions to be answered		**4**		**3**		**2**	**1**
	Marks for each question		**1**		**2**		**5**	**10**
	Total Marks for each section		**4**		**6**		**10**	**10**

***Note:** It is the decision of the course teacher to ask 2 Questions in any unit under section-B (short answer questions)

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	K5							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	K5							
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

UNIT-V will be allotted for individual Assignment in CO5 - K4 level which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)											
S.No.	**COs**	**K - Level**	**Unit**	**MOQs**		**Short Answers**		**Section C* (Either / or Choice)**		**Section D* (Open Choice)**	
				No.of Questions	**K – Level**	**No.of Questions**	**K – Level**	**No.of Questions**	**K – Level**	**No.of Questions**	**K – Level**
1	**CO1 - CO5**	**K1 to K4**	**I**	2	K1 & K2	1	K1	2	K2 & K2	1	K2
2	**CO1 - CO5**	**K1 to K4**	**II**	2	K1 & K2	1	K1	2	K3 & K3	1	K3
3	**CO1 - CO5**	**K1 to K4**	**III**	2	K1 & K2	1	K2	2	K3 & K3	1	K3
4	**CO1 - CO5**	**K1 to K4**	**IV**	2	K1 &K2	1	K2	2	K4 & K4	1	K4
5	**CO1 - CO5**	**K1 to K4**	**V**	2	K1 & K2	1	K2	2	K4 & K4	1	K4
No. of Questions to be Asked				10		5		10		5	
No. of Questions to be answered				10		5		5		3	
Marks for each question				1		2		5		10	
Total Marks for each section				10		10		25		30	

*** In Section C & D - One question should be a problem**
Section C should contain minimum of four CO levels **(CO2 - CO5)**
Section D should contain minimum of three CO levels **(CO3 - CO5)**

Distribution of Marks with K Level							
K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either/ or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	5	4			9	12	47
K2	5	6	10	10	31	34.66	
K3			20	20	40	27	27
K4			20	20	40	26.66	26
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a			
16) b			
17) a			
17) b			
18) a			
18) b			
19) a			
19) b			
20) a			
20) b			
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21			
22			
23			
24			
25			

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**MAJOR PHYSICS PRACTICAL - I**			
Course Code	**21UPHCP1**	**L**	**P**	**C**
Category	**Core**	-	2	-

Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓ ENTREPRENEURSHIP

Course Objectives:

COURSE OBJECTIVES:

The learners will be able:

1. To create the practical knowledge in basic physics experiments.
2. To understand the bending of beam, compound pendulum and torsion pendulum.
3. To understand current conduction in electrical circuits.
4. To motivate the students to apply the experimental techniques in Optics and Sound.
5. To create skill in doing the experiment individually

LIST OF EXPERIMENTS (Any Fourteen Experiments)

1. Young's Modulus - Uniform bending (Pin & Microscope)
2. Young's Modulus - Non –Uniform bending – Optic lever
3. Rigidity Modulus - Torsion Pendulum with loads
4. Surface tension - By capillary rise method
5. Viscosity of Liquid - By Capillary rise method
6. Moment of Inertia - Torsion Pendulum
7. Acceleration due to gravity - Compound Pendulum
8. Laws of transverse vibration - Sonometer
9. Frequency of tuning fork - Sonometer
10. A.C Frequency - Melde's apparatus
11. Velocity of Sound waves - Ultrasonic Interferometer
12. Thermal conductivity of Bad conductor - Lee's disc
13. Emissivity of the Surface - Joule's Calorimeter
14. Specific Heat Capacity - Newton's Law of Cooling
15. Thickness of a wire - Air wedge
16. Spectrometer - Refractive index of a prism

Total Practical Hours **30 Hrs**

Books for Study:

1. Srinivasan.M.N., Balasubramanian.S., Ranganathan.R., **A Text Book of Practical Physics,**

2017 Edition, Sultan Chand & Sons	
Books for References:	
1. Ouseph.C., **Practical Physics and Electronics,** 2013, S.Viswanathan.P.Ltd.	
Web Resources:	
1. https://nptel.ac.in/course.html/physics/experimental physics I, II and III **2. https://nptel.ac.in/courses/115/105/115105110/** 3. **https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK**	
Course Outcomes	**K Level**
On successful completion of the course, the learners should be able to	
CO1: Analyze the concepts of Viscosity, Surface Tension and Young's Modulus of different substances	**K4**
CO2: Explore the knowledge of Spectrometer and other Optical instruments	**K3**
CO3: Realize the principles and applications of Potentiometer, Sonometer,	**K4**
CO4: Explore the knowledge of Melde's apparatus to find Frequency of tunning fork	**K3**
CO5: Understand the Thermal conductivity of Bad conductor	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	2	3	1
CO 2	3	1	3	3	1	3
CO 3	2	2	2	3	2	1
CO 4	3	3	2	3	1	2
CO5	3	3	2	2	3	3

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Semester	Major Physics Practical - I	Hrs	Pedagogy
I	1. Young's Modulus - Uniform bending (Pin & Microscope) 2. Rigidity Modulus - Torsion Pendulum with loads 3. Surface tension - By capillary rise method 4. Acceleration due to gravity - Compound Pendulum 5. Laws of transverse vibration - Sonometer 6. Thermal conductivity of Bad conductor - Lee's disc 7. Specific Heat Capacity - Newton's Law of Cooling 8. Thickness of a wire - Air wedge	30	Demonstration

Course Designed by: **1. Dr.S.S.Jayabalakrishnan, 2. Dr.P.Kavitha**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**Allied Mathematics – I**					
Course Code	**21UMTA11**			**L**	**P**	**C**
Category	Allied			6	-	4
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED	ENTREPRENEURSHIP		

Course objectives:

- To familiarize with the theory of equations.
- To introduce transformation of equations.
- To apply Newton's method and Horner's Method.
- To provides the capability of solving the physical problems on skill development.
- To develop the knowledge of algebraic concepts on mathematics

Unit: I		18
Theory of Equation – An n^{th} degree equation has exactly n roots – Relation between the roots and the coefficients.		
Unit: II		18
Reciprocal Equations- Transformation of Equations		
Unit: III		18
Finding the roots up to two decimals by Newton's method and Horner's Method		
Unit: IV		18
Radius of curvature, Center of curvature of plane curves.		
Unit: V		18
Integral calculus – Evaluation of Definite Integrals.		
	Total Lecture Hours	90

Books for Study:

S.Arumugam, **Ancillary Mathematics Volume I**, New Gamma Publication, 1999 ,Reprint, Palayamkottai, 2006.

Unit I - Chapter 1: Page No 1 to 26
Unit II - Chapter 1 : Page No 27 to 40
Unit III - Chapter 1: Page No 40 to 48
Unit IV - Chapter 3: Page No 65 to 90
Unit V - Chapter 3: Page No 91 to 113

Books for References:

1. T.K .ManickavashagamPillai and S.Narayanan**, Algebra,Volume I and II,**S.ViswanthanPrinters and Publishers Pvt Ltd, Chennai, 2009.
2. Hari kishan, Theory of equations, Atlantic publishers and Distributers Pvt Ltd, December 2013.
3. Narayanan. S and Manickavasagam Pillai. T.K, Calculus Volume II , (2015)

Web Resources

https://www.math24.net/curvature-radius/
https://www.intmath.com/applications-differentiation/8-radius-curvature.php

COURSE OUTCOMES		K Level
On the successful completion of the course, the students will be able to		
CO1:	Find the real and imaginary roots of given equation	K3
CO2:	Determine the sum of the powers of the roots of equations using Newton's theorem and roots of reciprocal equations	K3
CO3:	Solve Numerical equations to obtain the approximate solutions using Newton's and Horner's method.	K3
CO4:	Determine the Radius, Center and Circle of curvature.	K4
CO5:	Evaluate the Definite Integral.	K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	2	3	-
CO 2	2	1	2	2	2	-
CO 3	2	2	2	2	3	2
CO 4	3	2	3	3	2	1
CO5	2	1	2	2	3	-

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

UNIT	COURSE NAME	Hrs	Pedagogy
I	Theory of Equation – An n^{th} degree equation has exactly n roots – Relation between the roots and the coefficients.	18	Chalk & Talk
II	Reciprocal Equations- Transformation of Equations	18	Chalk & Talk
III	Finding the roots up to two decimals by Newton's method and Horner's Method.	18	Chalk & Talk
IV	Radius of curvature, Center of curvature of plane curves.	18	Chalk & Talk
V	Integral calculus – Evaluation of Definite Integrals.	18	Chalk & Talk

Course Designed by: **Mrs.S.Andal** and **Mrs.S.Ragavi**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of. Questions	K - Level	No. of. Questions	K - Level		
CI AI	CO1	Upto K3	2	K1&K2	1	K1	2	3
	CO2	Upto K3	2	K1&K2	2	K2	2	3
CI AII	CO3	Upto K3	2	K1&K2	1	K2	2	3
	CO4	Upto K4	2	K1&K2	2	K2	2	3
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	**Upto K3**	**2**	**K1 & K2**	**1**	**K1**	**2(K1 & K1)**	**1(K2)**
2	CO2	**Upto K3**	**2**	**K1 & K2**	**1**	**K1**	**2(K3 & K3)**	**1(K3)**
3	CO3	**Upto K3**	**2**	**K1 & K2**	**1**	**K2**	**2(K3 & K3)**	**1(K4)**
4	CO4	**Upto K4**	**2**	**K1 & K2**	**1**	**K2**	**2(K4 & K4)**	**1(K3)**
5	CO5	**Upto K4**	**2**	**K1 & K2**	**1**	**K2**	**2(K2 & K2)**	**1(K3)**
No. of Questions to be Asked			**10**		**5**		**10**	**5**
No. of Questions to be answered			**10**		**5**		**5**	**3**
Marks for each question			**1**		**2**		**5**	**10**
Total Marks for each section			**10**		**10**		**25**	**30**
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K3	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**LASER AND ITS APPLICATIONS**							
Course Code	**21UPHS11**					**L**	**P**	**C**
Category	**Skill**					2	-	2
Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

The Learner will be able:

1. To understand the principle and characteristics of laser.
2. \To remember the Laser action and Optical resonators.
3. To understand the classification of lasers.
4. To understand and apply the lasers in medical field and process of lasers in materials.
5. To understand and apply the lasers in communication and commercial fields.

Unit: I	**Principles of Lasers**	**6**

Absorption, Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Relation between Einstein's A and B coefficients(No derivation) – Population Inversion – Definition of Pumping - methods of pumping – Characteristics of a Laser beam – Laser medium – Expression for threshold gain.

Unit: II	**Laser action and Optical resonator**	**6**

Principle of Laser action – optical feedback – Efficiency of Laser – Three , Four level lasers – Optical resonators – Febry-Perot resonator – concentric resonator – Confocal resonator – Combination of plane and spherical resonator – Q-Switching – Techniques for Q-Switching.

Unit: III	**Laser Systems**	**6**

Solid state lasers- Ruby Laser, Nd-YAG laser – Nd-Glass laser – Gas laser-He:Ne Laser, Ionic Lasers – Molecular Gas (CO_2 Gas) laser – Liquid laser – Diode Laser-Diode Pumped Laser

Unit: IV	**Applications of Laser's in materials**	**6**

Lasers in Medicine and Surgery – Material processing – Laser welding – Laser cutting – Metrology – LIDAR -– Monostatic pulsed coherent LIDARS – Differential Absorption LIDAR (DIAL) – Advantages of LIDAR - Second and Third Harmonic Generation

Unit: V	**Applications of Laser's in Communication and Commercial fields**	**6**

Optical fiber communication - Lasers in optical communication – Free space communication – Laser Velocimeter – pollutant Detection system – Laser printing process – Colour laser printers – Barcode reader – types of Barcode scanner – LED scanners – Camera based readers.

	Total Lecture Hours	**30 Hrs**

Books for Study:

Material will be given by the Department

Books for References:	
1. Sathya Prakash, Laser Systems and Applications, Pragati Prakashan ,Meerut,Fourth Edition,2016. 2. Richa Sharma and Vibhu Sharma, Laser Systems and Applications, AITBS Publishers,New Delhi,First Edition,2010. 3. Mohan.S, Arjunan.V, Selvarani.M,and Kanchana Mala.M , Laser Physics, MJP publishers , Chennai,, First Edition,2012.	
Web Resources:	
1. Laser: Fundamentals and Applications - Course (nptel.ac.in) **2. Laser Basics - YouTube** **3. www.edvicer.com/course/Laser-Fundamentals-and-Applications-53** **4. Laser: Fundamentals and Applications - Course (nptel.ac.in)**	
Course Outcomes	**K Level**
After successful completion of the course, the student is expected to	
CO1: Define Spontaneous and Stimulated emission of radiation, Population Inversion, Principle of Laser action, Q-Switching, Gas and liquid laser, LIDAR	**K2**
CO2: Describe Relation between Einstein's A and B coefficients, Techniques for Q-Switching, Solid state lasers, Lasers in Medicine and Surgery, Laser Velocimeter	**K3**
CO3: Write methods of pumping, Efficiency of Laser, Optical resonators, Molecular Gas (CO_2 Gas) laser, Laser material processing, Laser communication	**K3**
CO4: Functioning of threshold gain, optical feedback,Nd:YAG gas laser, Laser in Metrology, LED scanners	**K4**
CO5: Examine Laser medium, Febry-Perot resonator, Ruby Laser, Differential Absorption LIDAR (DIAL), Camera based readers	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	3	3
CO 2	3	2	3	2	2	2
CO 3	3	3	3	1	2	3
CO 4	3	2	3	3	1	2
CO5	3	2	2	2	2	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

UNIT	Laser and Its Application	Hrs	Pedagogy
I	Absorption, Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Relation between Einstein's A and B coefficients – Population Inversion – Definition of Pumping - methods of pumping – Characteristics of a Laser beam – Laser medium – Expression for threshold gain.	**6**	**PPT, Lecture, Chalk&Talk, Demonstration**
II	Principle of Laser action – optical feedback – Efficiency of Laser – Three ,Four level lasers – Optical resonators – Febry-Perot resonator – concentric resonator – Confocal resonator – Combination of plane and spherical resonator – Q-Switching – Techniques for Q-Switching.	**6**	**PPT, Lecture, Chalk&Talk, Demonstration**
III	Solid state lasers- Ruby Laser, Nd-YAG laser – Nd-Glass laser – Gas laser-He:Ne Laser,Ionic Lasers – Molecular Gas (CO_2 Gas) laser – Liquid laser	**6**	**PPT, Lecture, Chalk&Talk, Demonstration**
IV	Lasers in Medicine and Surgery – Material processing – Laser welding –Laser cutting – Metrology – LIDAR – Monostatic pulsed coherent LIDARS – Differential Absorption LIDAR (DIAL) – Advantages of LIDAR	**6**	**PPT, Lecture, Chalk&Talk, Demonstration**
V	Lasers in optical communication – optical fiber communication – Free space communication – Laser Velocimeter – pollutant Detection system – Laser printing process – Colour laser printers – Barcode reader – types of Barcode scanner – LED scanners – Camera based readers	**6**	**PPT, Lecture, Chalk&Talk, Demonstration**

Course Designed by: **1. Dr.S.S.Jayabalakrishnan, 2. Dr.P.Kavitha**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**BASICS OF MICROSOFT OFFICE**							
Course Code	**21UPHS12**					**L**	**P**	**C**
Category	**Skill**					2	-	2
Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

The learners will be able:
1. To remember desktop, recycle bin, creating shortcuts and control panel windows vista.
2. To understand the opening screen of Microsoft word screen, home panel, page setup and mailing panel in Microsoft office word 2007.
3. To understand formatting and alignment of text, spell checking, saves as options and printing the document in Microsoft office word 2007.
4. To understand worksheet in excel 2007, worksheet fitting on a pages, formatting numbers and labels and adding-deleting rows and columns in Microsoft office word 2007.
5. To remember the different molecular mechanisms.

Unit: I	***Microsoft Windows vista***	**6**

Introduction – What's new in Windows Vista – Desktop of Windows Vista - Exploring the Taskbar – Computer – Recycle Bin – Creating Shortcuts – Introduction to Control Panel of Windows Vista – Accessing Control Panel.

Unit: II	***Microsoft Office Word 2007***	**6**

Introduction to Microsoft Office Word 2007 - What's new in Microsoft Office Word 2007 – Creating professional looking documents – Share documents confidently – Go beyond documents – Recover from Computer Problems – Opening Screen of Microsoft Word Screen – Home Panel – Insert Panel – Page Layout Panel – Page setup – Reference Panel – Mailing Panel – Review Panel – views – Office Button.

Unit: III	***Working with Documents in Word 2007***	**6**

Introduction– Saving the file – Formatting the text – Alignment of text – Applying fonts – Spell checking – Consulting Thesaurus – Assign Character Styles – Borders and Shading – Closing the file –Save as option – Printing your Document – Editing the Document – Editing Tools – AutoCorrect – AutoFormat – Find and Replace – Find – Replace Text – Page Numbering – Header and Footer – Footnotes and Endnotes – Splitting Panes – Tiling of the Documents – Using Mail Merge in Word 2007.

Unit: IV	***Microsoft Office Excel 2007***	**6**

Understanding Spreadsheets – Creating a Worksheet in Excel 2007 – Copying Formula – Formulas that Make Decisions – Styles – Functions in Excel – Using Auto calculate – References – Sum Function – Average Function – Creating Charts in Excel – Auditing a Workbook – Comments Inserting – Outlines – Worksheet Fitting on a Pages – Function Wizard – Goal Seeking – Scenarios Manager – Creating a Pivot Table Report – Typing with AutoFill – Formatting Numbers and Labels – Changing the size of Rows and Columns – Adding and Deleting Rows and Columns – Inserting (and Removing) Page Breaks – Applying Themes – Add or Remove a Sheet Background – Convert text to Columns – Protect Worksheet or Workbook Elements – Functions in Excel.

Unit: V	***Microsoft Office PowerPoint 2007***	**6**

Creating Presentation from Template – Creating a New Presentation – PowerPoint Views – Entering the Text – Moving the Text – Changing the Colour – Adding Graphics to a Slide – Reordering Slides – Duplicating Slides – Deleting Slides – Adding an Animated Cartoon to a Slide – Adding Slide Transitions – Adding Text Transitions – Viewing a Presentation – Making Slide Shows – Hiding a Slide – Notes, Handouts and Masters for Presentation – Packing Presentations to Go.

	Total Lecture Hours	**30 Hrs**

Books for Study:

1. Dinesh Maidasani, **Microsoft Office 2007**, Firewal Media, An Imprint of Laxmi Publications Pvt. Ltd., 2012.
   - Unit –I :Pages 1 to 49
   - Unit – II :Pages 55 to 84
   - Unit-III :Pages 89 to 115
   - Unit-IV :Pages 119 to 167
   - Unit –V **:**Pages 171 to 191

Books for References:

1. Prof. Satish Jain, M. Geetha, Kratika, **Microsoft office 2007 Training Guide**, BPB Publications.
2. Bittu Kumar, **Mastering MS Office**, V & S Publications.
3. Ramesh Bangia, **Learning MS Office 2007**, Khanna Book Publishing Co. (p) Ltd.

Web Resources:

1. **https://www.google.com/url?sa=t&source=web&rct=j&url=https://m.youtube.com/watch%3Fv%3DMWEhXzJoz8E&ved=2ahUKEwjdme7GnoLwAhV54XMBHYkABa0Q28sGMAN6BAgDEHs&usg=AOvVaw0YxneLhgQojEMkBCBl_C2d**
2. **https://www.google.com/url?sa=t&source=web&rct=j&url=https://m.youtube.com/watch%3Fv%3D8ROOt0xiNyQ&ved=2ahUKEwjdme7GnoLwAhV54XMBHYkABa0Q28sGMAZ6BQgDEPAB&usg=AOvVaw2HbowzhglpSwyqYlJL71u8**
3. **https://www.google.com/url?sa=t&source=web&rct=j&url=https://m.youtube.com/watch%3Fv%3Dc7pRb2Sy1zo&ved=2ahUKEwjdme7GnoLwAhV54XMBHYkABa0Q28sGMAd6BQgDEPwB&usg=AOvVaw0iKbXMf1OKAqhq-vGsV81f**

Course Outcomes		K Level
On successful completion of the course, the learners should be able to		
CO1:	Understand Desktop of Windows Vista and Exploring the Taskbar.	**K2**
CO2:	Analyze the new in Microsoft Office Word 2007 – Creating professional looking documents.	**K3**
CO3:	Analyze the Saving the file, Formatting the text, Alignment of text , Applying fonts, Spell checking , Consulting Thesaurus, Assign Character Styles, Borders and Shading, Closing the file and Save as option.	**K3**
CO4:	Applying Themes, Add or Remove a Sheet Background, Convert text to Columns, Protect Worksheet or Workbook Elements and Functions in Excel.	**K4**
CO5:	Influence of Creating Presentation from Template, Creating a New Presentation and PowerPoint Views.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**3**	**3**	**2**	**2**	**2**
CO 2	**3**	**3**	**2**	**2**	**2**	**2**
CO 3	**3**	**3**	**2**	**2**	**2**	**2**
CO 4	**3**	**3**	**2**	**2**	**2**	**1**
CO5	**3**	**2**	**1**	**1**	**2**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Basics of Microsoft Office	Hrs	Pedagogy
I	Introduction – What's new in Windows Vista – Desktop of Windows Vista - Exploring the Taskbar – Computer – Recycle Bin – Creating Shortcuts – Introduction to Control Panel of Windows Vista – Accessing Control Panel.	**6**	Lecture, Chalk&Talk, Demonstration
II	Introduction to Microsoft Office Word 2007 - What's new in Microsoft Office Word 2007 – Creating professional looking documents – Share documents confidently – Go beyond documents – Recover from Computer Problems – Opening Screen of Microsoft Word Screen – Home Panel – Insert Panel – Page Layout Panel – Page setup – Reference Panel – Mailing Panel – Review Panel – views – Office Button.	**6**	Lecture, Chalk&Talk, Demonstration
III	Introduction– Saving the file – Formatting the text – Alignment of text – Applying fonts – Spell checking – Consulting Thesaurus – Assign Character Styles – Borders and Shading – Closing the file – Save as option – Printing your Document – Editing the Document – Editing Tools – AutoCorrect – AutoFormat – Find and Replace – Find – Replace Text – Page Numbering – Header and Footer – Footnotes and Endnotes – Splitting Panes – Tiling of the Documents – Using Mail Merge in Word 2007.	**6**	Lecture, Chalk&Talk, Demonstration
IV	Understanding Spreadsheets – Creating a Worksheet in Excel 2007 – Copying Formula – Formulas that Make Decisions – Styles – Functions in Excel – Using Auto calculate – References – Sum Function – Average Function – Creating Charts in Excel – Auditing a Workbook – Comments Inserting – Outlines – Worksheet Fitting on a Pages – Function Wizard – Goal Seeking – Scenarios Manager – Creating a Pivot Table Report – Typing with AutoFill – Formatting Numbers and Labels – Changing the size of Rows and Columns – Adding and Deleting Rows and Columns – Inserting (and Removing) Page Breaks – Applying Themes – Add or Remove a Sheet Background – Convert text to Columns – Protect Worksheet or Workbook Elements – Functions in Excel.	**6**	Lecture, Chalk&Talk, Demonstration
V	Creating Presentation from Template – Creating a New Presentation – PowerPoint Views – Entering the Text – Moving the Text – Changing the Colour – Adding Graphics to a Slide – Reordering Slides – Duplicating Slides – Deleting Slides – Adding an Animated Cartoon to a Slide – Adding Slide Transitions – Adding Text Transitions – Viewing a Presentation – Making Slide Shows – Hiding a Slide – Notes, Handouts and Masters for Presentation – Packing Presentations to Go.	**6**	Lecture, Chalk&Talk, Demonstration

Course Designed by: **1. Dr.S.Francis, 2. Dr.P.Kavitha**

SECOND SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**HEAT AND THERMODYNAMICS**							
Course Code	**21UPHC21**					**L**	**P**	**C**
Category	**Core**					4	-	4
Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

The learners will be able:

1. To remember the fundamental concepts in Law of Thermodynamics.
2. To recall the Properties of Kinetic Theory of Gases.
3. To analyze and apply the basic concepts Specific Heat Capacity.
4. To understand and apply Isothermal and Adiabatic Processes
5. To reveal the properties of Thermal Radiation.

Unit: I	***Heat, Temperature and Laws of Thermodynamics***	**12**

Hot and Cold Bodies - Zeroth Law of Thermodynamics - Defining Scale of Temperature: Mercury and Resistance Thermometers - Constant Volume Gas Thermometer - Callender's Compensated Constant Pressure Thermometer - Adiabatic and Diathermic Walls - Thermal Expansion -The First Law of Thermodynamic - Work Done by a Gas - Heat Engines - The Second Law of Thermodynamics - Reversible and Irreversible Processes – Entropy - Otto cycle - Carnot Engine

Unit: II	***Kinetic Theory of Gases***	**12**

Introduction - Assumptions of Kinetic Theory of Gases - Calculation of the Pressure of an Ideal Gas - rms Speed - Kinetic Interpretation of Temperature - Deductions from Kinetic Theory - Ideal Gas Equation - Maxwell's Distribution Law - Thermodynamic State - Brownian Motion – Vapour – Evaporation - Saturated and Unsaturated Vapour: Vapour Pressure – Boiling Point– Humidity - Determination of Relative Humidity - Fog and Dew - Dew Point - Phase Diagrams: Triple Point.

Unit: III	***Calorimetry***	**12**

Units of Heat and Calorimetry - Specific Heat Capacity and Molar Heat Capacity - Determination of Specific Heat Capacity by Regnault's apparatus - Specific Latent Heat of Fusion and Vaporization - Measurement of Specific Latent Heat of Fusion of Ice - Measurement of Specific Latent Heat of Vaporization of Water - Mechanical Equivalent of Heat.

Unit: IV	***Specific Heat Capacities of Gases***	**12**

Specific Heat Capacities C_p & C_v and relation between them for an Ideal Gas - Determination of C_p of a Gas by Regnault's apparatus- Determination of C_v of a Gas by Joly's differential steam calorimeter - Isothermal and Adiabatic Processes - Relations between p, V, T in a Reversible Adiabatic Process - Work Done in an Adiabatic Process - Equipartition of Energy.

Unit: V	***Heat Transfer***	**12**

Three Processes of heat transfer - Series and Parallel Connection of Rods - Measurement of Thermal Conductivity of a Solid by Forbe's method - Thermal Conductivity of a bad conductor by Lee's disc method - Convection - Radiation - Prevost Theory of Exchange - Nature of Thermal Radiation - Blackbody Radiation – Kirchhoff's Law - Planck's law - Stefan-Boltzmann Law - Newton's Law of Cooling - Detection and Measurement of Radiation by Bolometer and Thermopile.

	Total Lecture Hours	**60 Hrs**

Books for Study:

1. H.C.Verma, **"Concepts of Physics - Volume 2",** Bharati Bhawan (Publishers & Distributors), New Delhi, 2020
   - **Unit – I:**Chapter 23&Chapter 26
   - Section – 23.1 to 23.10, Worked Out Examples
   - Section – 26.1 to 26.7, Worked Out Examples
   - **Unit – II:**Chapter 24
   - Section – 24.1 to 24.19, Worked Out Examples
   - **Unit – III:**Chapter 25
   - Section – 25.1 to 25.9, Worked Out Examples
   - **Unit – IV:**Chapter 27
   - Section – 27.1 to 27.8, Worked Out Examples
   - **Unit – V:**Chapter 28
   - Section – 28.1 to 28.12, Worked Out Examples

Books for References:

1. Brjlal, Subramaniyam and P.S. Hemne, **Heat, Thermodynamics and Statistical Physics ,** S.Chand & Co.2004
2. D.S. Mathur, **Heat and Thermodynamics,** S. Chand & Co.2002.
3. R. Murugesan, **Heat and Thermodynamics,** S. Chand & Co.2004
4. D. Halliday Resnick, Jearl Walker, **Fundamental of physics,** Wiley India Pvt Ltd., 6th Edition

Web Resources:

1. https://youtu.be/G-unUOg1bvY
2. https://youtu.be/-42JmVBdlM4
3. https://youtu.be/dHdlH3l8FkM
4. https://komonews.com/weather/faq/what-is-the-dew-point-and-how-does-fog-form-12-26-2015#:~:text=The%20dew%20point%20is%20the,60%2C%20that%20feels%20quite%20humid.
5. https://userpages.umbc.edu/~tokay/chapter5new.html
6. https://www.britannica.com/science/Stefan-Boltzmann-law
7. https://youtu.be/8Z5Vcppax9k

Course Outcomes		**K Level**
After successful completion of the course, the student is expected to		
CO1:	Explain the laws of thermodynamics, kinetic theory of gases, calorimetry and specific heat capacities of gases	**K3**
CO2:	Solve Ideal Gas equation, RMS Speed, mechanical equivalent of heat, p, V, T and Work Done in an Adiabatic Process	**K3**
CO3:	Calculate Specific Heat Capacities of gases and thermal conductivity of solids	**K4**
CO4:	Discuss about Mercury and resistance Thermometers, relation between C_p and C_v for an Ideal Gas, Specific latent heat of fusion and vaporization	**K4**
CO5:	Illustrate Callender's compensated constant pressure thermometer, Carnot engine, Blackbody radiation, Stefan-Boltzmann law	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	2	2	2
CO 2	3	3	2	1	2	2
CO 3	3	3	3	1	2	2
CO 4	3	3	2	1	2	2
CO5	3	3	2	1	2	2

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	HEAT AND THERMODYNAMICS	Hrs	Pedagogy
I	**Heat, Temperature and Laws of Thermodynamics** Hot and Cold Bodies - Zeroth Law of Thermodynamics - Defining Scale of Temperature: Mercury and Resistance Thermometers - Constant Volume Gas Thermometer - Callender's Compensated Constant Pressure Thermometer - Adiabatic and Diathermic Walls - Thermal Expansion -The First Law of Thermodynamic - Work Done by a Gas - Heat Engines - The Second Law of Thermodynamics - Reversible and Irreversible Processes – Entropy - Otto cycle - Carnot Engine	12	Chalk & Talk, Videos and PPT
II	**Kinetic Theory of Gases** Introduction - Assumptions of Kinetic Theory of Gases - Calculation of the Pressure of an Ideal Gas - rms Speed - Kinetic Interpretation of Temperature - Deductions from Kinetic Theory - Ideal Gas Equation - Maxwell's Distribution Law - Thermodynamic State - Brownian Motion – Vapour – Evaporation - Saturated and Unsaturated Vapour: Vapour Pressure – Boiling Point– Humidity - Determination of Relative Humidity - Fog and Dew. - Dew Point - Phase Diagrams: Triple Point	12	Chalk & Talk, Videos and PPT
III	**Calorimetry** Units of Heat and Calorimetry - Specific Heat Capacity and Molar Heat Capacity - Determination of Specific Heat Capacity by Regnault's apparatus - Specific Latent Heat of Fusion and Vaporization - Measurement of Specific Latent Heat of Fusion of Ice - Measurement of Specific Latent Heat of Vaporization of Water - Mechanical Equivalent of Heat	12	Chalk & Talk, Videos and PPT
IV	**Specific Heat Capacities of Gases** Specific Heat Capacities C_p & C_v and relation between them for an Ideal Gas - Determination of C_p of a Gas by Regnault's apparatus- Determination of C_v of a Gas by Joly's differential steam calorimeter - Isothermal and Adiabatic Processes - Relations between p, V, T in a Reversible Adiabatic Process - Work Done in an Adiabatic Process - Equipartition of Energy	12	Chalk & Talk, Videos and PPT
V	**Heat Transfer**	12	Chalk & Talk,

	Three Processes of heat transfer - Series and Parallel Connection of Rods - Measurement of Thermal Conductivity of a Solid by Forbe's method - Thermal Conductivity of a bad conductor by Lee's disc method - Convection - Radiation - Prevost Theory of Exchange - Nature of Thermal Radiation -Blackbody Radiation – Kirchhoff's Law - Planck's law - Stefan-Boltzmann Law - Newton's Law of Cooling - Detection and Measurement of Radiation by Bolometer and Thermopile		Videos and PPT

Course Designed by: **1. Dr.P.Kavitha, 2. Dr.R.Sangeetha**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of. Questions	K - Level	No. of. Questions	K – Level		
CI AI	CO1	Up to K3	2	K1,K2	1	K1	2(K2&K2)	1 K2
	CO2	Up to K3	2	K1,K2	2	K2	2(K3&K3)	1 K3
CI AII	CO3	Up to K4	2	K1,K2	1	K1	2(K3&K3)	1K3
	CO4	Up to K4	2	K1,K2	2	K2	2(K4&K4)	1 K4
Question Pattern CIA I & II	No. of Questions to be asked		**4**		**3**		**4**	**2**
	No. of Questions to be answered		**4**		**3**		**2**	**1**
	Marks for each question		**1**		**2**		**5**	**10**
	Total Marks for each section		**4**		**6**		**10**	**10**

***Note:** It is the decision of the course teacher to ask 2 Questions in any unit under section-B (short answer questions)

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	K5							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	K5							
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
UNIT-V ***will be allotted for individual Assignment in*** **CO5 - K4** ***level which carries five marks as part of CIA component.***

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)											
S.No.	COs	K - Level	Unit	MOQs		Short Answers		Section C (Either / or Choice)		Section D (Open Choice)	
				No.of Questions	K – Level	No.of Questions	K – Level	No.of Questions	K – Level	No.of Questions	K – Level
1	**CO1 - CO5**	**K1 to K3**	**I**	2	K1 & K2	1	K1	2	K2 & K2	1	K2
2	**CO1 - CO5**	**K1 to K3**	**II**	2	K1 & K2	1	K1	2	K3 & K3	1	K3
3	**CO1 - CO5**	**K1 to K4**	**III**	2	K1 & K2	1	K2	2	K3 & K3	1	K3
4	**CO1 - CO5**	**K1 to K4**	**IV**	2	K1 &K2	1	K2	2	K4 & K4	1	K4
5	**CO1 - CO5**	**K1 to K4**	**V**	2	K1 & K2	1	K2	2	K4 & K4	1	K4
No. of Questions to be Asked				10		5		10		5	
No. of Questions to be answered				10		5		5		3	
Marks for each question				1		2		5		10	
Total Marks for each section				10		10		25		30	
*** In Section C & D - One question should be a problem** **Section C** should contain minimum of four CO levels **(CO2 - CO5)** **Section D** should contain minimum of three CO levels **(CO3 - CO5)**											

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	12	47
K2	5	6	10	10	31	34.66	
K3			20	20	40	27	27
K4			20	20	40	26.66	26
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a			
16) b			
17) a			
17) b			
18) a			
18) b			
19) a			
19) b			
20) a			
20) b			
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21			
22			
23			
24			
25			

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**MAJOR PHYSICS PRACTICAL - I**							
Course Code	**21UPHCP1**					**L**	**P**	**C**
Category	**Core**					-	2	2
Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

The learners will be able:
1. To create the practical knowledge in basic physics experiments.
2. To understand the bending of beam, compound pendulum and torsion pendulum.
3. To understand current conduction in electrical circuits.
4. To motivate the students to apply the experimental techniques in Optics and Sound.
5. To create skill in doing the experiment individually

LIST OF EXPERIMENTS (Any Fourteen Experiments)

1. Young's Modulus - Uniform bending (Pin & Microscope)
2. Young's Modulus - Non –Uniform bending – Optic lever
3. Rigidity Modulus - Torsion Pendulum with loads
4. Surface tension - By capillary rise method
5. Viscosity of Liquid - By Capillary rise method
6. Moment of Inertia - Torsion Pendulum
7. Acceleration due to gravity - Compound Pendulum
8. Laws of transverse vibration - Sonometer
9. Frequency of tuning fork - Sonometer
10. A.C Frequency - Melde's apparatus
11. Velocity of Sound waves - Ultrasonic Interferometer
12. Thermal conductivity of Bad conductor - Lee's disc
13. Emissivity of the Surface - Joule's Calorimeter
14. Specific Heat Capacity - Newton's Law of Cooling
15. Thickness of a wire - Air wedge
16. Spectrometer - Refractive index of a prism

Total Practical Hours **30 Hrs**

Books for Study:

1. Srinivasan.M.N., Balasubramanian.S., Ranganathan.R., **A Text Book of Practical Physics,** 2017 Edition, Sultan Chand & Sons

Books for References:

1. Ouseph.C., **Practical Physics and Electronics,** 2013, S.Viswanathan.P.Ltd.

Web Resources:

1. **https://nptel.ac.in/course.html/physics/experimental physics I, II and III**
2. **https://nptel.ac.in/courses/115/105/115105110/**
3. **https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK**

Course Outcomes	**K Level**
On successful completion of the course, the learners should be able to	

CO1:	Analyze the concepts of Viscosity, Surface Tension and Young's Modulus of different substances	**K4**
CO2:	Explore the knowledge of Spectrometer and other Optical instruments	**K3**
CO3:	Realize the principles and applications of Potentiometer, Sonometer,	**K4**
CO4:	Explore the knowledge of Melde's apparatus to find Frequency of tunning fork	**K3**
CO5:	Understand the Thermal conductivity of Bad conductor	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**3**	**3**	**2**	**3**	**1**
CO 2	**3**	**1**	**3**	**1**	**1**	**3**
CO 3	**2**	**2**	**2**	**1**	**2**	**1**
CO 4	**3**	**3**	**2**	**2**	**1**	**2**
CO 5	**2**	**3**	**2**	**2**	**2**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Semester	Major Physics Practical - I	Hrs	Pedagogy
II	1. Young's Modulus - Non –Uniform bending – Optic lever 2. Viscosity of Liquid -By Capillary rise method 3. Moment of Inertia - Torsion Pendulum 4. Frequency of tuning fork - Sonometer 5. A.C Frequency - Melde's apparatus 6. Velocity of Sound waves - Ultrasonic Interferometer 7. Emissivity of the Surface - Joule's Calorimeter 8. Spectrometer - Refractive index of a prism	**30**	Demonstration

Course Designed by: **1. Dr.S.S.Jayabalakrishnan, 2. Dr.P.Kavitha**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**Allied Mathematics –II**							
Course Code	**21UMTA21**					**L**	**P**	**C**
Category	**Allied**					6	-	4
Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course objectives:

- To learn about linear programming problems
- To solve linear programming problem using simplex method
- To solve Transportation problem, Assignment problem
- To recall linear differential equations
- To solve first and second order differential equations

Unit: I		18

Linear Programming Problems – Mathematical Formulation of a LPP – Graphical Solution of a LPP – Slack and Surplus Variables – Standard form of LPP.

Unit: II		18

Transportation Problem – Finding Initial feasible solution by North West Corner Method and Vogel's Approximation method – Optimal Solution of transportation problem.

Unit: III		18

Assignment problem – Solution of Assignment problems – Travelling sales man problem.

Unit: IV		18

Exact Differential Equation – Linear Differential Equation

Unit: V		18

Second Order Differential Equation with RHS x^n, e^{ax}, sin ax, cos ax, e^{ax} sin x, e^{ax} cos bx.

	Total Lecture Hours	90

Books for Study:

1. Dr. S. Arumugam and Issac, Topics in operations Research (Linear Programming) New Gamma Publishing House, June 2012, Palayamkottai.
   Unit I Chapter 3 Section 3.1 – 3.4
   Unit II Chapter 4 Section 4.1 & 4.2
   Unit III Chapter 5 Section 5.1 & 5.2
2. Dr. S. Arumugam, Ancillary Mathematics Vol III, New Gamma Publishing House, Palayamkottai.
   Unit IV Chapter 1 Section 1.3,1.5
   Unit V Chapter 2 Section 2.1,2.2

Books for References:

1. Gupta. R.K, Operations Research, Krishna Prakash Mandir, Second Edition, 1988, Meerut.
2. Kanti Swarup , Gupta. P.K and Man Mohan, Introduction to Operations Research, Sultan Chand and sons Publications, August 1997, New Delhi.
3. Narayanan.S and Manicavasagam Pillai.T.K., Differential Equation and its Application, Viswanathan.S, Printers and Publishers Pvt. Ltd., Reprint 2006, Chennai.

Web Resources		
1. https://nptel.ac.in/courses/112/106/112106134/ 2. https://nptel.ac.in/courses/110/106/110106062/		
COURSE OUTCOMES		**K Level**
On the successful completion of the course, the students will be able to		
CO1:	Formulate Linear Programming Problem using graphical, writing standard form of LPP	**K3**
CO2:	Classify different techniques on solving LPP for TP.	**K2**
CO3:	Understand Assignment problems and travelling salesman problem.	**K2**
CO4:	Capable of solving the differential equation.	**K3**
CO5:	Develop logical skills in solving the differential equations with different RHS	**K4**

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	3	3	1	3	2
CO 2	3	2	2	1	3	3
CO 3	3	2	2	2	3	2
CO 4	2	-	1	1	2	-
CO5	3	1	-	-	3	-

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

UNIT	COURSE NAME	Hrs	Pedagogy
I	Linear Programming Problems – Mathematical Formulation of a LPP – Graphical Solution of a LPP – Slack and Surplus Variables – Simplex method of solving a LPP.	**18**	**Chalk & Talk**
II	Transportation Problem – Finding Initial feasible solution by North West Corner Method and Vogel's Approximation method – Optimal Solution of transportation problem.	**18**	**Chalk & Talk**
III	Assignment problem – Solution of Assignment problems – Travelling sales man problem.	**18**	**Chalk & Talk**
IV	Exact Differential Equation – Linear Differential Equation	**18**	**Chalk & Talk**
V	Second Order Differential Equation with RHS x^n, e^{ax}, sin ax, cos ax, e^{ax} sin x, e^{ax} cos bx.	**18**	**Chalk & Talk**

Course Designed by: **Mrs.S.Ragavi** and **Mrs.S.Andal**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of. Questions	K - Level	No. of. Questions	K - Level		
CI AI	CO1	Upto K2	2	K1 & K2	1	K1	2	3
	CO2	Upto K3	2	K1 & K2	2	K2	2	3
CI AII	CO3	Upto K4	2	K1 & K2	1	K2	2	3
	CO4	Upto K4	2	K1 & K2	2	K2	2	3
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1 & K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K1 & K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K1 & K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1 & K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K3	
22	CO2	K2	
23	CO3	K2	
24	CO4	K3	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**BIOPHYSICS**							
Course Code	**21UPHS21**					**L**	**P**	**C**
Category	**Skill**					2	-	2
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

The students will be able:

1. To understand the electromagnetic radiation spectrum and arrangements of electron in orbitals in an atom.
2. To remember the radio activities and their applications.
3. To apply the concepts of biophysics in instruments.
4. To understand the structure of molecular components of cell, lipids and nuclides.
5. To remember the different molecular mechanisms.

Unit: I	***Basic Biophysics***	**6**

Electromagnetic Radiation –Electronic Configuration-Quantum Numbers – Rules for the arrangements of Electrons in Orbitals –Hybridization – Types of Hybridization.

Unit: II	***Radiation Biophysics***	**6**

Non – Ionising Radiation- Ionising Radiation – Radioactivity – Properties of Radioactivity –Types of Radiation- Alpha Rays – Beta Rays – Gamma Rays- X-Rays Neutron-Application of Radiation – Carbon Dating – Clinical Diagnosis – X-ray Radiography- Computed Tomography.

Unit: III	***Instrumentation in Biophysics***	**6**

Microscopy – Light Microscopy –Fluorescence Microscopy – Electron Microscopy- Transmission Electron Microscope – Scanning Electron Microscope – Instrumentation of MRI –Atomic Absorption Spectroscopy (AAS).

Unit: IV	***Cellular Biophysics***	**6**

Prokaryotes and Eukaryotes - Molecular Components of Cell – Carbohydrates – Lipids _ Proteins – Nucleic Acids

Unit: V	***Physics of Biomolecules***	**6**

Molecular Forces – Strong Force- Inter-Molecular Weak Forces- Structural Organization of Proteins-Structural Organization of Nucleic Acids-Molecular Mechanism of Genetic Information Transfer-Genetic Code-Transfer of Genetic Information –Molecular Mechanism of Protein Synthesis-Principle of Molecular Recognition.

	Total Lecture Hours	**30 Hrs**

Books for Study:

1. MogantyR.Rajeswari, **An Introduction to Biophysics**, First Edition, Rastogi Publications, New Delhi
   Unit: I Page.No : 1 - 2 ; 10 - 22
   Unit:II Page No: 314 – 323, 328-330
   Unit:III Page No: 299 – 305 ; 292-294 ;297 , 298
2. P.K.Srivastava, **Elementary Biophysics**,Second Edition, Narosa Publishing House.
   Unit IV: 85-100

Unit V: 7.1 to 7.10
Books for References:
1.Bio-Physics, Moan P.Arora,First edition (2004), Himalaya Publishin house. 2.Bio-Physics, Vasanthapattabi, N.Gautham, Reprint 2005, Narosa publishing House. 3.Bio-Physics principles and techiques – M.A. Subramanian, MJP publishers,2005.
Web Resources:
1. **https://onlinecourses.nptel.ac.in/noc20_cy33/preview** 2. **https://nptel.ac.in/courses/115/101/115101121/** 3. **https://onlinecourses.nptel.ac.in/noc20_ph02/preview**

Course Outcomes		**K Level**
After successful completion of the course, the student is expected to		
CO1:	Understand Electronic Configuration **,** Ionising Radiation, Basic concepts microscopy, Molecular Components of Cell, Molecular Forces.	**K2**
CO2:	Application of Rules for the arrangements of Electrons in Orbitals, Application of Radiation Carbon Dating, Electron Microscopy, Carbohydrates , Structural Organization of Proteins.	**K3**
CO3:	Analyse the structure of atoms, Properties of Radioactivity , Magnetic Resonance Image , Proteins, Molecular Mechanism of Genetic Information Transfer.	**K3**
CO4:	Evaluate Hybridization , X-ray Radiography, Atomic Absorption Spectroscopy , Nucleic Acids, Molecular Mechanism of Protein Synthesis.	**K4**
CO5:	Influence of Types of Hybridization ,Clinical Diagnosis ,Techniques, Hetro Macromolecules, Molecular Recognition	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	3	3	1
CO 2	3	3	3	1	3	2
CO 3	3	2	1	2	3	2
CO 4	3	2	2	2	3	2
CO5	3	3	2	2	3	2

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

UNIT	Bio Physics	Hrs	Pedagogy
I	Electro Magnetic Radiation –Electronic Configuration-Quantum Numbers – Rules for the arrangements of Electrons in Orbitals – Hybridization – Types of Hybridization	6	Lecture, Chalk&Talk, PPT
II	Non – Ionising Radiation- Ionising Radiation – Radioactivity – Properties of Radioactivity –Types of Radiation- Alpha Rays – Beta Rays – Gamma Rays- X-Rays Newtron-Application of Radiation – Carbon Dating – Clinical Diagnosis – X-ray Radiography- Computed Tomography.	6	Lecture, Chalk&Talk, Demonstration
III	Microscopy – Light Microscopy –Fluorescence Microscopy – Electron Microscopy- Transmission Electron Microscope – Scanning Electron Microscope – Instrumentation of MRI –Atomic Absorption Spectroscopy (AAS)	6	Lecture, Chalk&Talk, PPT
IV	Prokaryotes and Eukaryotes - Molecular Components of Cell – Carbohydrates – Lipids _ Proteins – Nucleic Acids	6	Lecture, Chalk&Talk, PPT
V	Molecular Forces – Strong Force- Inter-Molecular Weak Forces- Structural Organization of Proteins- Structural Organization of Nucleic Acids-Molecular Mechanism of Genetic Information Transfer- Genetic Code-Transfer of Genetic Information – Molecular Mechanism of Protein Synthesis- Principle of Molecular Recognition	6	Lecture, Chalk&Talk, PPT

Course Designed by: **1. Dr.R.Sangeetha, 2. Dr.S.S.Jayabalakrishnan**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**BASICS OF C PROGRAMMING**							
Course Code	**21UPHS22**					**L**	**P**	**C**
Category	**Skill**					2	-	2
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

The learners will be able:
1. To remember Programming fundamentals, Program Development Life Cycle and Algorithm.
2. To understand the Data types, variables and constants.
3. To understand simple, compound expressions and classification of Operators.
4. To understand statements, classification of statements and branching statements.
5. To remember the Looping statements.

Unit: I	***Programming fundamentals***	**6**

Programming fundamentals – Program Development Life Cycle – Algorithm – Control structures – Flow chart – Pseudo code – Programming paradigms.

Unit: II	***Data types, variables and constants***	**6**

Introduction – C standards – Learning programming language and natural language: An analogy – C Character set – identifiers and keywords – declaration statement - Data types – type qualifiers and type modifiers – difference between declaration and definition – data object, L-value and R-value – Variables and constants – Structure of a C program – Executing a C program.

Unit: III	***Operators and Expressions***	**6**

Introduction – Expression – simple and compound expressions – classification of Operators – Combined precedence of all operators – reading strings from the keyboard – printing strings on the screen – unformatted functions.

Unit: IV	***Decision making statements***	**6**

Introduction – statements– classification of statements – branching statements.

Unit: V	***Looping statements***	**6**

Iteration statements. Storage class: Storage duration – life time of an object – storage classes.

	Total Lecture Hours	**30 Hrs**

Books for Study:

1. Anita Goel, Ajay Mittal, **Computer Fundamentals and Programming in C,** Pearson, New Delhi, 2014.
   - Unit – I: Page No 2.25 – 2.35.
   - Unit – II : Page No 3.1 – 3.18.
   - Unit – III :Page No 4.1 – 4.32.

* Unit – IV : Page No 5.1 – 5.22.
* Unit – V :Page No 5.23 – 5.33, 10.1 – 10.9.

Books for References:

1. S.Ramasamy and P.Radhaganesan, **Programming in C (II Edition)**, Scitech Publication (India) Private Limited, Chennai, 2010.
2. Byron Gottfried, **Programming with C (III Edition)**, Tata McGraw Hill, New Delhi, 2012.

Web Resources:

1. https://www.google.com/url?sa=t&source=web&rct=j&url=https://m.youtube.com/watch%3Fv%3D8PopR3x-VMY&ved=2ahUKEwiwj-nLn4LwAhXBILcAHdt9DtQQ28sGMA16BAgiEAc&usg=AOvVaw2YkCT2pE9EcsefuPr5ulDW
2. https://www.google.com/url?sa=t&source=web&rct=j&url=https://m.youtube.com/watch%3Fv%3DKJgsSFOSQv0&ved=2ahUKEwiwj-nLn4LwAhXBILcAHdt9DtQQ28sGMA56BAgiEEI&usg=AOvVaw0yXF91f-O9M6mNzEx9n5q_
3. https://www.google.com/url?sa=t&source=web&rct=j&url=https://m.youtube.com/watch%3Fv%3Dqr7x2oAUp5k&ved=2ahUKEwicxIm9oILwAhVx7HMBHWjAA5A4ChCjtAF6BAgIEAQ&usg=AOvVaw3Jax4nzYCtoC0f9CRXTpNQ

Course Outcomes		K Level
On successful completion of the course, students will be able:		
CO1:	Recalling and Understanding concepts of the fundamentals of programming.	**K2**
CO2:	Build the knowledge in the building blocks of C.	**K3**
CO3:	Qualify the students with the basic knowledge of C programming.	**K3**
CO4:	Utilize the statements, classification of statements and branching statements.	**K4**
CO5:	Build the skill in writing C-language program.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	2	3	1
CO 2	3	1	3	3	1	3
CO 3	2	2	2	3	2	1
CO 4	3	3	2	3	1	2
CO5	3	3	2	2	3	3

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Basics of C Programming	Hrs	Pedagogy
I	Programming fundamentals – Program Development Life Cycle – Algorithm – Control structures – Flow chart – Pseudo code – Programming paradigms.	**6**	**Lecture, Chalk&Talk, Demonstration**
II	Introduction – C standards – Learning programming language and natural language: An analogy – C Character set – identifiers and keywords – declaration statement - Data types – type qualifiers and type modifiers – difference between declaration and definition – data object, L-value and R-value – Variables and constants – Structure of a C program – Executing a C program.	**6**	**Lecture, Chalk&Talk, Demonstration**
III	Introduction – Expression – simple and compound expressions – classification of Operators – Combined precedence of all operators – reading strings from the keyboard – printing strings on the screen – unformatted functions.	**6**	**Lecture, Chalk&Talk, Demonstration**
IV	Introduction – statements– classification of statements – branching statements.	**6**	**Lecture, Chalk&Talk, Demonstration**
V	Iteration statements. Storage class: Storage duration – life time of an object – storage classes.	**6**	**Lecture, Chalk&Talk, Demonstration**

Course Designed by: **1. Dr.S.Francis, 2. Dr.R.Sangeetha**

THIRD SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**ELECTRICITY**				
Course Code	**21UPHC31**		**L**	**P**	**C**
Category	**Core**		**4**	**-**	**4**
Nature of course:	**EMPLOYABILITY**	✓ SKILL ORIENTED	ENTREPRENEURSHIP		

COURSE OBJECTIVES:

The learners will be able to:
1. Remember the Coulomb's Law, Flux of an Electric Field, Capacitors and Capacitance, Kirchhoff's Law, RMS Current.
2. Recall the Relation between Electric field and Potential, Flux of an Electric Field, Combination of Capacitors, Drift speed, Simple AC Circuits.
3. Analyze about Torque on an Electric Dipole placed in an Electric Field, Earthing a conductor, Corona Discharge, Temperature Dependence of Resistivity, AG Generator
4. Understand the Potential Energy of a Dipole, Spherical Charge Distribution, Electric Field due to a point charge, Stretched-wire potentiometer, Vector Method to Find the Current in an AC Circuit.
5. Reveal the Electric Field inside a Conductor, Application of Gauss's Law, Parallel-plate Capacitor with a Dielectric, Wheatstone Bridge, Hot-wire Instruments.

Unit: I	**Electric Field and Potential**	**12**

Electric charge - Coulomb's Law - Electric Field - Lines of Electric Force - Electric Potential Energy - Electric Potential - Electric Potential due to a Point Charge - Relation between Electric field and Potential - Electric Dipole - Torque on an Electric Dipole placed in an Electric Field - Potential Energy of a Dipole placed in a Uniform Electric Field - Conductors, Insulators and Semiconductors - The Electric Field inside a Conductor.

Unit: II	**Gauss's Law**	**12**

Flux of an Electric Field through a Surface - Solid Angle - Gauss's Law and its Derivation from Coulomb's Law - Application of Gauss's Law - Spherical Charge Distribution - Earthing a conductor.

Unit: III	**Capacitors**	**12**

Capacitors and Capacitance - Calculation of Capacitance - Combination of Capacitors - Force between the Plates of a Capacitors - Energy Stored in a Capacitors and Energy Density in Electric Field - Dielectrics - Parallel-plate Capacitor with a Dielectric - An Alternative Form of Gauss's Law - Electric Field due to a point charge q placed in an Infinite Dielectric - Energy in the Electric field in a Dielectric - Corona Discharge.

Unit: IV	**Electric Current In Conductors**	**12**

Electric Current and current Density - Drift speed - Ohm's Law - Temperature Dependence of Resistivity - Battery and e.m.f. - Energy Transfer in an Electric Circuit - Kirchhoff's Law - Combination of Resistors in Series and Parallel - Grouping of Batteries - Wheatstone Bridge – Desauty's Bridge- Ammeter and Voltmeter - Stretched-wire potentiometer - Charging and discharging of Capacitors.

Unit: V	**Alternating Current**	**12**

Alternating Current - AC Generator or AC Dynamo - Instantaneous and RMS Current - Simple AC Circuits - Vector Method to Find the Current in an AC Circuit - More AC Circuits - Power in AC Circuits - Choke Coil - Hot-wire Instruments.

	Total Lecture Hours	60

Book for Study:

H.C.Verma, **"Concepts of Physics - Volume 2",** Bharati Bhawan (Publishers & Distributors), New Delhi, 2020

Unit – I: Chapter 29
Section – 29.1 to 29.13, Worked Out Examples
Unit – II: Chapter 30
Section – 30.1 to 30.6, Worked Out Examples
Unit – III: Chapter 31
Section – 31.1 to 31.11, Worked Out Examples
Unit – IV: Chapter 32
Section – 32.1 to 37.13, Worked Out Examples
Unit – V: Chapter 39
Section – 39.1 to 39.9, Worked Out Examples

Books for Reference:

1. Narayanamoorthy & Nagarathinam, **Electricity & Magnetism**, National Publishing Co.
2. Sehgal, Chopra & Sehgal, **Electricity & Magnetism**, Sultan Chand & Sons, New Delhi, 1998.
3. Brijlal & Subramaniyam, **Electricity & Magnetism**, S.Chand & Co. 20th Revised Edition, New Delhi, 2007.
4. R.Murugesan, **Electricity & Magnetism**, S.Chand & Co., 9th, Revised Edition, New Delhi, 2011.
5. D. Halliday Resnick, Jearl Walker, **Fundamental of physics,** Wiley India Pvt Ltd., 6th Edition

Web Resources :

https://youtu.be/kAOZZmMstX4
https://youtu.be/nGQbA2jwkWI
https://youtu.be/x1-SibwIPM4
https://youtu.be/Pd9HY8iLiCA
https://youtu.be/rtlJoXxlSFE?list=PLyQSN7X0ro2314mKyUiOILaOC2hk6Pc3j
https://youtu.be/Zu2gomaDqnM?list=PLyQSN7X0ro2314mKyUiOILaOC2hk6Pc3j
https://ocw.mit.edu/courses/physics/8-02-physics-ii-electricity-and-magnetism-spring-2007/readings/

COURSE OUTCOMES **On successful completion of the course, the students will be able to**		**K Level**
CO1	Explain Coulomb's Law, Flux of an Electric Field, Capacitors and Capacitance, Electric Current and current Density, Alternating Current.	**K2**
CO2	Solve the Electric Potential due to a Point Charge, Gauss's Law from Coulomb's Law, Combination of Capacitors, Combination of Resistors in Series and Parallel, Simple AC Circuits	**K3**
CO3	Calculate Potential Energy of a Dipole, Flux of an Electric Field, Energy Stored in a Capacitors and Energy Density in Electric Field, Current in an AC Circuit, Power in AC Circuits	**K3**
CO4	Discuss about the Electric Field inside a Conductor, Application of Gauss's Law, Stretched-wire potentiometer, Grouping of Batteries.	**K4**
CO5	Illustrate the Potential Energy of a Dipole, Spherical Charge Distribution, Parallel-plate Capacitor with a Dielectric, Wheatstone Bridge, Hot-wire Instruments.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	2	2	3
CO 2	3	3	2	2	2	3
CO 3	3	3	1	2	1	2
CO 4	3	2	1	1	1	2
CO5	3	1	2	1	1	2

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

UNIT	ELECTRICITY	Hrs	Mode
I	***Electric Field and Potential*** Electric charge - Coulomb's Law - Electric Field - Lines of Electric Force - Electric Potential Energy - Electric Potential - Electric Potential due to a Point Charge - Relation between Electric field and Potential - Electric Dipole - Torque on an Electric Dipole placed in an Electric Field - Potential Energy of a Dipole placed in a Uniform Electric Field - Conductors, Insulators and Semiconductors - The Electric Field inside a Conductor	12	Chalk & Talk, Videos and PPT
II	***Gauss's Law*** Flux of an Electric Field through a Surface - Solid Angle - Gauss's Law and its Derivation from Coulomb's Law - Application of Gauss's Law - Spherical Charge Distribution - Earthing a conductor.	12	Chalk & Talk, Videos and PPT
III	***Capacitors*** Capacitors and Capacitance - Calculation of Capacitance - Combination of Capacitors - Force between the Plates of a Capacitors - Energy Stored in a Capacitors and Energy Density in Electric Field - Dielectrics - Parallel-plate Capacitor with a Dielectric - An Alternative Form of Gauss's Law - Electric Field due to a point charge q placed in an Infinite Dielectric - Energy in the Electric field in a Dielectric - Corona Discharge.	12	Chalk & Talk, Videos and PPT
IV	***Electric Current In Conductors*** Electric Current and current Density - Drift speed - Ohm's Law - Temperature Dependence of Resistivity - Battery and e.m.f - Energy Transfer in an Electric Circuit - Kirchhoff's Law - Combination of Resistors in Series and Parallel - Grouping of Batteries - Wheatstone Bridge - Desauty's Bridge Ammeter and Voltmeter - Stretched-wire potentiometer - Charging and discharging of Capacitors.	12	Chalk & Talk, Videos and PPT
V	***Alternating Current*** Alternating Current - AC Generator or Ac Dynamo - Instantaneous and RMS Current - Simple AC Circuits - Vector Method to Find the Current in an AC Circuit - More AC Circuits - Power in AC Circuits -	12	Chalk & Talk, Videos and PPT

	Choke Coil - Hot-wire Instruments.		

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K – Level**		
CI AI	**CO1**	Up to K3	2	K1,K2	1	K1	2(K2&K2)	1 K2
	CO2	Up to K3	2	K1,K2	2	K2	2(K3&K3)	1 K3
CI AII	**CO3**	Up to K4	2	K1,K2	1	K1	2(K3&K3)	1K3
	CO4	Up to K4	2	K1,K2	2	K2	2(K4&K4)	1 K4
Question Pattern CIA I & II	No. of Questions to be asked		**4**		**3**		**4**	**2**
	No. of Questions to be answered		**4**		**3**		**2**	**1**
	Marks for each question		**1**		**2**		**5**	**10**
	Total Marks for each section		**4**		**6**		**10**	**10**

***Note:** It is the decision of the course teacher to ask 2 Questions in any unit under section-B (short answer questions)

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	K5							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	K5							
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
SI.No	**COs**	**K - Level**	**MCQs**		**Short Answers**		**Section C (Either / or Choice)**	**Section D (Open Choice)**
			No. of Questions	**K – Level**	**No. of Question**	**K – Level**		
1	CO1	**K2**	**2**	**K1,K2**	**1**	**K2**	**2(K2,K2)**	**1(K2)**
2	CO2	**K3**	**2**	**K1,K2**	**1**	**K2**	**2(K3,K3)**	**1(K3)**
3	CO3	**K3**	**2**	**K1,K2**	**1**	**K2**	**2(K3,K3)**	**1(K3)**
4	CO4	**K4**	**2**	**K1,K2**	**1**	**K2**	**2(K4,K4)**	**1(K4)**
5	CO5	**K4**	**2**	**K1,K2**	**1**	**K2**	**2(K4,K4)**	**1(K4)**
No. of Questions to be Asked			**10**		**5**		**10**	**5**
No.of Questions to be answered			**10**		**5**		**5**	**3**
Marks for each question			**1**		**2**		**5**	**10**
Total Marks for each section			**10**		**10**		**25**	**30**
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either/ or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	5		-	-	5	4	**33**
K2	5	10	10	10	35	29	
K3	-	-	20	20	40	33.5	**33**
K4	-	-	20	20	40	33.5	**34**
Marks	**10**	**10**	**50**	**50**	**120**	**100**	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**MAGNETISM**				
Course Code	**21UPHC32**		**L**	**P**	**C**
Category	**Core**		**4**	**-**	**4**
Nature of course:	**EMPLOYABILITY**	✓ SKILL ORIENTED	ENTREPRENEURSHIP		

COURSE OBJECTIVES:

The learners will be able to:
1. Remember the fundamental concepts of Magnetism.
2. Recall Bio-Savart Law and Ampere's law.
3. Analyze about permanent magnets and tangent galvanometer.
4. Understand the magnetic properties of matter and hysteresis
5. Reveal the properties of electromagnetic induction

Unit: I	***Magnetic Field***	**12**

Introduction - Definition of Magnetic Field B - Relation between Electric and Magnetic Fields - Motion of a Charged Particle in a Uniform Magnetic Field - Magnetic force on a current carrying Wire - Torque on a current loop .

Unit: II	***Magnetic Field due to a Current***	**12**

Biot-Savart Law - Magnetic Field due to a Current in a straight wire - Force between Parallel Currents - Field due to a Circular Current - Ampere's Law - Magnetic Field at a point due to a Long, Straight Current - Solenoid - Toroid.

Unit: III	***Permanent Magnets***	**12**

Magnetic poles and Bar Magnets - Torque on a Bar Magnet placed in a Magnetic Field - Magnetic field due to a Bar Magnet - Magnetic Scalar Potential - Terrestrial Magnetism - Determination of Dip at a Place - Neutral point - Tangent Galvanometer - Moving-coil Galvanometer - shunt - Tangent Law of Perpendicular Fields - Deflection Magnetometer - Oscillation Magnetometer – Determination of $M+B_H$

Unit: IV	***Magnetic properties of Matter***	**12**

Magnetization of Materials: Intensity of Magnetization - Paramagentism, Ferromagnetism and Diamagnetism - Magnetic Intensity H - Magnetic Susceptibility - Permeability - Curie's Laws - Properties of Dia- , Para- and Ferro- magnetic Substances - Hysteresis - Soft Iron and Steel- Superconductivity.

Unit: V	***Electromagnetic Induction***	**12**

Faraday's laws of Electromagnetic Induction - Lenz's Law - The origin of Induced e.m.f - Eddy current - Self-induction - Growth and Decay of current in an LR Circuit - Energy stored in an Inductor - Mutual Induction - Induction coil.

	Total Lecture Hours	**60**

Book for Study:
H.C.Verma, **"Concepts of Physics - Volume 2",** Bharati Bhawan (Publishers & Distributors), New Delhi, 2020

Unit – I: Chapter 34
Section – 34.1 to 34.6, Worked Out Examples
Unit – II: Chapter 35

Section – 35.1 to 35.8, Worked Out Examples
Unit – III: Chapter 36
Section – 36.1 to 36.14, Worked Out Examples
Unit – IV: Chapter 37
Section – 37.1 to 37.9, Worked Out Examples
Unit – V: Chapter 38
Section – 38.1 to 38.9, Worked Out Examples

Books for Reference:

1. Narayanamoorthy & Nagarathinam, **Electricity & Magnetism**, National Publishing Co.
2. Sehgal, Chopra & Sehgal, **Electricity & Magnetism**, Sultan Chand & Sons, New Delhi, 1998.
3. Brijlal & Subramaniyam, **Electricity & Magnetism**, S.Chand & Co. 20th Revised Edition, New Delhi, 2007.
4. R.Murugesan, **Electricity & Magnetism**, S.Chand & Co., 9th, Revised Edition, New Delhi, 2011.
5. D. Halliday Resnick, Jearl Walker, **Fundamental of physics,** Wiley India Pvt Ltd., 6th Edition

Web Resources:

https://youtu.be/kAOZZmMstX4
https://youtu.be/nGQbA2jwkWI
https://youtu.be/x1-SibwIPM4
https://youtu.be/Pd9HY8iLiCA
https://youtu.be/rtlJoXxlSFE?list=PLyQSN7X0ro2314mKyUiOILaOC2hk6Pc3j
https://youtu.be/Zu2gomaDqnM?list=PLyQSN7X0ro2314mKyUiOILaOC2hk6Pc3j
https://ocw.mit.edu/courses/physics/8-02-physics-ii-electricity-and-magnetism-spring-2007/readings/

COURSE OUTCOMES **On successful completion of the course, the students will be able to**		**K Level**
CO1:	Explain Magnetic Field B, Bio-Savart Law, Permanent Magnets, Magnetic properties, Faraday's laws of Electromagnetic Induction - Lenz's Law	**K2**
CO2:	Solve the Motion of a Charged Particle in a Uniform Magnetic Field, Magnetic Field due to a Current in a straight wire, Magnetic field due to a Bar Magnet, Intensity of Magnetization, Growth and Decay of current in an LR	**K3**
CO3:	Calculate Torque on a current loop, Filed due to a Circular Current, Tangent Law of Perpendicular Fields, Eddy current	**K3**
CO4:	Discuss about Torque on a current loop, Solenoid, Deflection Magnetometer, Properties of Dia, Para and Ferromagnetic Substances, Mutual Induction	**K4**
CO5:	Illustrate Motion of a Charged Particle in a Uniform Magnetic Field, Magnetic Field at a point due to a Long, Straight Current, Oscillation Magnetometer, Permeability, Energy stored in an Inductor	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	1	2	2	2
CO 2	3	3	2	3	2	2
CO 3	3	3	1	1	2	2
CO 4	3	3	1	1	2	1
CO5	3	3	2	1	2	2

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

UNIT	MAGNETISM	Hrs	Mode
I	***Magnetic Field*** Definition of Magnetic Field B - Relation between Electric and Magnetic Fields - Motion of a Charged Particle in a Uniform Magnetic Field - Magnetic force on a current carrying Wire - Torque on a current loop	12	Chalk & Talk, Videos and PPT
II	***Magnetic Field due to a Current*** Biot-Savart Law - Magnetic Field due to a Current in a straight wire - Force between Parallel Currents - Filed due to a Circular Current - Ampere's Law - Magnetic Field at a point due to a Long, Straight Current - Solenoid - Toroid.	12	Chalk & Talk, Videos and PPT
III	***Permanent Magnets*** Magnetic poles and Bar Magnets - Torque on a Bar Magnet placed in a Magnetic Field - Magnetic field due to a Bar Magnet - Magnetic Scalar Potential - Terrestrial Magnetism - Determination of Dip at a Place - Neutral point - Tangent Galvanometer - moving-oil Galvanometer - shunt - Tangent Law of Perpendicular Fields - Deflection Magnetometer - Oscillation Magnetometer– Determination of $M+B_H$	12	Chalk & Talk, Videos and PPT
IV	***Magnetic properties of Matter*** Magnetization of Materials: Intensity of Magnetization - Paramagnetism, Ferromagnetism and Diamagnetism - Magnetic Intensity H - Magnetic Susceptibility - Permeability - Curie's Laws - Properties of Dia-, Para-, and Ferromagnetic Substances - Hysteresis - Soft Iron and Steel- Superconductivity.	12	Chalk & Talk, Videos and PPT
V	***Electromagnetic Induction*** Faraday's laws of Electromagnetic Induction - Lenz's Law - The origin of Induced e.m.f. - Eddy current - Self-induction - Growth and Decay of current in an LR Circuit - Energy stored in an Inductor - Mutual Induction - Induction coil.	12	Chalk & Talk, Videos and PPT

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K – Level**		
CI AI	**CO1**	Up to K3	2	K1,K2	1	K1	2(K2&K2)	1 K2
	CO2	Up to K3	2	K1,K2	2	K2	2(K3&K3)	1 K3
CI AII	**CO3**	Up to K4	2	K1,K2	1	K1	2(K3&K3)	1K3
	CO4	Up to K4	2	K1,K2	2	K2	2(K4&K4)	1 K4
Question Pattern CIA I & II	No. of Questions to be asked		**4**		**3**		**4**	**2**
	No. of Questions to be answered		**4**		**3**		**2**	**1**
	Marks for each question		**1**		**2**		**5**	**10**
	Total Marks for each section		**4**		**6**		**10**	**10**

***Note:** It is the decision of the course teacher to ask 2 Questions in any unit under section-B (short answer questions)

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	K5							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	K5							
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
SI.No	**COs**	**K - Level**	**MCQs**		**Short Answers**		**Section C (Either / or Choice)**	**Section D (Open Choice)**
			No. of Questions	**K – Level**	**No. of Question**	**K – Level**		
1	CO1	**K2**	**2**	**K1,K2**	**1**	**K2**	**2(K2,K2)**	**1(K2)**
2	CO2	**K3**	**2**	**K1,K2**	**1**	**K2**	**2(K3,K3)**	**1(K3)**
3	CO3	**K3**	**2**	**K1,K2**	**1**	**K2**	**2(K3,K3)**	**1(K3)**
4	CO4	**K4**	**2**	**K1,K2**	**1**	**K2**	**2(K4,K4)**	**1(K4)**
5	CO5	**K4**	**2**	**K1,K2**	**1**	**K2**	**2(K4,K4)**	**1(K4)**
No. of Questions to be Asked			**10**		**5**		**10**	**5**
No.of Questions to be answered			**10**		**5**		**5**	**3**
Marks for each question			**1**		**2**		**5**	**10**
Total Marks for each section			**10**		**10**		**25**	**30**
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either/ or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	5		-	-	5	4	33
K2	5	10	10	10	35	29	
K3	-	-	20	20	40	33.5	33
K4	-	-	20	20	40	33.5	34
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) Answer All Questions			(10x1=10 marks)
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**MAJOR PHYSICS PRACTICAL – II**				
Course Code	**21UPHCP2**		**L**	**P**	**C**
Category	**Core**		-	2	-
Nature of Course:	**EMPLOYABILITY**	✓ SKILL ORIENTED	ENTREPRENEURSHIP		

COURSE OBJECTIVES:
The learners will be able to
1. Develop experimental knowledge by handling various apparatus
2. know the various components and its importance
3. Know the circuit connections and functioning of experiments
4. Analyse various types of measuring instruments
5.Gain knowledge in using of Spot Reflection Galvanometer ,Table Galvanometer, Polarimeter and Grating

LIST OF EXPERIMENTS
Any Fourteen Experiments

1. Tan C Position - Determination of m and B_H (Pole Strength of B_H)
2. Field along the axis of the coil - Determination of M horizontal intensity of earth's magnetic field (Magnetic moment of B_H)
3. Laurent's Half Shade Polarimeter - Specific rotatory power
4. Potentiometer - Temperature Coefficient of a coil
5. Potentiometer - Comparison of EMF's
6. Table Galvanometer - Voltage & Current sensitivity
7. Spot Reflection Galvanometer - Voltage & Current sensitivity
8. Spot Reflection Galvanometer - Charge sensitiveness
9. Spot Reflection Galvanometer - Comparison of EMF's
10. Spot Reflection Galvanometer - Comparison of capacities
11. Owen's Bridge - Determination of L
12. DeSauty's Bridge - C_1/C_2
13. Spectrometer - Dispersive Power of a Prism
14. Spectrometer - Grating N and λ (Normal Incidence)
15. Spectrometer - Refractive index of liquid using hollow prim
16. Newton's Rings - Radius of curvature of a convex Lens

Total Hours 120hrs

Book for Study:
1.Srinivasan.M.N., Balasubramanian.S., Ranganathan.R.**, A Text Book of Practical Physics,** 2017 Edition Sultan Chand & Sons

Books for Reference:
1. Ouseph.C**., Practical Physics and Electronics,**2013**.**S.Viswanathan.P.Ltd**.**
2.Hamam Singh Hemne, B.Sc.Practical Physics, 4/e **S. Chand and Co. New Delhi,** 2017
3.Shukla.R.K., Practical Physics, Second Edition **New Age International,2nd Edition.,New Delhi**
4.Gupta.S.L.,Kumar.V**.,** PRACTICAL PHYSICS (H/E) **Pragati Prakashan.M.,2016,New Delhi.**

Web Resources:
1. https://nptel.ac.in/course.html/physics/experimental physics I, II and III

2. https://nptel.ac.in/courses/115/105/115105110/ 3. https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK		
COURSE OUTCOMES		**K Level**
On successful completion of the course, the students will be able to		
CO1	Apply the concepts of Field along the axis of the coil .	**K3**
CO2	Acquire the knowledge of Physical optics using Spectrometer	**K4**
CO3	Gain Knowledge in principles and applications of Potentiometer, wheatstone's Bridge applications and Spot reflection Galvanometer .	**K2**
CO4	Understand the principles of Specific rotatory power in liquids	**K2**
CO5	Apply skill in the field of Interference and Diffraction of Light.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	1	2	3	2	2
CO 2	2	2	2	2	2	2
CO 3	3	2	3	2	2	1
CO 4	2	2	2	2	1	1
CO5	3	3	3	2	2	2

***3 –**Advanced Application; **2 –** Intermediate Development; **1 –** Introductory Level

LESSON PLAN

Semester	LIST OF EXPERIMENTS	Hrs	Mode
III	1. Tan C Position - Determination of m and B_H 2. Table Galvanometer - Voltage & Current sensitivity 3. Spot Reflection Galvanometer - Voltage & Current sensitivity 4. Owen's Bridge - Determination of L 5. Potentiometer - - Comparison of EMF's 6. Spot Reflection Galvanometer - Comparison of capacities 7. Spectrometer - Grating N and λ (Normal Incidence Method) 8. Spectrometer- Refractive index of liquid using hollow prim	**60**	**Demonstration**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**ALLIED CHEMISTRY – I**			
Course Code	**21UCHA31**	**L**	**P**	**C**
Category	**Allied**	4	-	4

Nature of course:	EMPLOYABILITY	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP

Course Objectives:

The objective of this course is

- To make the students to understand the concepts behind the properties of various elements.
- To enable the learners to determine the structure of various molecules.
- To envision the students on various types interactions and reactions in compounds.
- To highlight the importance of basic organic reactions.
- To make learn about the bonding in molecules.

Unit: I	**Periodic Table and Atomic Properties**	**12**

Modern periodic table – salient features –Periodicity- Periodic properties – Causes of recurrence of properties- classification of elements as s, p, d and f-block elements – definitions of atomic volume ,atomic and ionic radii, ionization potential, electron affinity and electronegativity and their variations along periods and groups – variation of metallic characters - Factors affecting the periodic properties- Periodic table anomalies.

Unit: II	**Chemical Bonding**	**12**

Ionic bond- Covalent bond- Fajan's rule- V.B. Theory – Postulates of V.B Theory – Application to the formation of simple molecules like H_2 and O_2 – overlap of atomic orbitals – VSEPR theory- s-s, p-p and s-p overlap – principle of hybridization – sp, sp^2 and sp^3 hybridization – examples and geometry. Molecular orbital theory –MO diagram of H_2, He_2, N_2, O_2 & F_2 molecules.

Unit: III	**Organic Compounds- Detection, Estimation and Isomerism**	**12**

Empirical formula – molecular formula – structural formula – calculation of empirical formula and molecular formula from percentage composition - Detection of nitrogen and halogens in organic compounds –Nomenclature of straight chain – mono and poly functional organic compounds. Inductive effect, mesomeric effect, resonance effect and hyper conjugation. Stereoisomerism – Chiral centre, optical activity of compounds containing one or two chiral centres, R–S notation – diastereoisomerism – racemisation – resolution- Geometrical isomerism of Maleic and Fumaric acids – E–Z notation of geometrical isomers.

Unit: IV	**Thermodynamics**	**12**

Importance of thermodynamics – terms used in thermodynamics – open and closed systems, state functions and path functions, extensive and intensive properties, reversible and irreversible processes- Statement and mathematical form of first law of thermodynamics – heat capacity at constant volume and pressure, relation between Cp and Cv.

Statement of second law of thermodynamics – entropy - entropy as a thermodynamic function – dependence of entropy on variables of the system (T and P alone)- Physical significance of entropy – Gibb's free energy and its significance.

Unit: V	**Electrolytes and Electrochemistry**	**12**

Arrhenius theory of electrolytes – strong electrolytes – weak electrolytes – Ostwald's dilution law and its applications – ionic product of water and its application - solubility product.

pH – definition – simple calculation of pH from molarity of acids and bases – buffer solution –

definition – theory of buffer action- application- Acid –base indicators – working range of indicators – choice of indicators. Commercial cells – primary and secondary cells – Weston cadmium cell – Lead storage cell – Electroplating - applications.		
	Total Lecture Hours	**60 Hrs**
Books for Study:		
1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry Mile Stone Publisher 31st Edition, New Delhi. 2. P.L. Soni, Text Book of Organic Chemistry, New Delhi.		
Books for References:		
1. R.D. Madan, S Chand, Modern Inorganic Chemistry band Co-Ltd., New Delhi. 2. J.D. Lee, Wiley India, Concise Inorganic Chemistry 5th Edition, New Delhi. 3. B.S Bahl and Arun Bahl S. Chand, Advanced Organic Chemistry. 4. B. Mehta and M. Mehta, Organic Chemistry E.E. Edition, New Delhi. 5. P.L. Soni and HM Chawla, Organic Chemistry 29th Edition, Sultan and Chand sons, New Delhi.		
Web Resources:		
https://nptel.ac.in/courses/104/103/104103071/ **https://nptel.ac.in/courses/104/101/104101121/**		

Course Outcomes		**K Level**
CO1:	Outline the concepts behind the properties of all the elements.	**K2**
CO2:	Describe the structure of many types of molecules.	**K2**
CO3:	Interpret numerous types of interactions in compounds.	**K3**
CO4:	Compare and contrast different types of reactions.	**K4**
CO5:	Demonstrate various types of properties of molecules.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	1	1	1
CO 2	3	3	2	1	1	-
CO 3	2	2	2	1	-	1
CO 4	3	2	2	2	-	-
CO5	2	3	2	1	1	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Modern periodic table – salient features –Periodicity- Periodic properties – Causes of recurrence of properties- classification of elements as s, p, d and f-block elements	3	Chalk & talk
	Variation of atomic volume ,atomic and ionic radii, ionization potential, electron affinity and electronegativity along period and groups – variation of metallic characters **Self Study Topic**: Factors affecting the periodic properties- Periodic table anomalies..	9	Chalk & talk , Ppt,
II	Ionic bond- Covalent bond- Fajan's rule- V.B. Theory – Postulates of V.B Theory – Application to the formation of simple molecules like H_2 and O_2 – overlap of atomic orbitals – VSEPR theory	6	Chalk & talk, videos
	s-s, p-p and s-p overlap – principle of hybridization – sp, sp^2 and sp^3 hybridization – examples and geometry. Molecular orbital theory –MO diagram of H_2, He_2, N_2, O_2 & F_2 molecules.	6	Chalk & talk
III	Empirical formula – molecular formula – structural formula – calculation of empirical formula and molecular formula from percentage composition - Detection of nitrogen and halogens in organic compounds –Nomenclature of straight chain – mono and poly functional organic compounds. Inductive effect, mesomeric effect, resonance effect and hyper conjugation. Stereoisomerism – Chiral centre, optical activity of compounds containing one or two chiral centres, R–S notation – diastereoisomerism – racemisation – resolution-– E–Z notation of geometrical isomers. **Self Study topic**: Geometrical isomerism of Maleic and Fumaric acids	12	Ppt, Chalk & talk
IV	Importance of thermodynamics – terms used in thermodynamics – open and closed systems, state functions and path functions, extensive and intensive properties, reversible and irreversible processes- Statement and mathematical form of first law of thermodynamics – heat capacity at constant volume and pressure, relation between Cp and Cv.	6	video, Chalk & talk,
	Statement of second law of thermodynamics – entropy - entropy as a thermodynamic function – dependence of entropy on variables of the system (T and P alone)- Physical significance of entropy – Gibb's free energy and its significance.	6	Ppt, video, demonstration with models
V	Arrhenius theory of electrolytes – strong electrolytes – weak electrolytes – Ostwald's dilution law and its applications – ionic product of water and its application - solubility product. pH – definition – simple calculation of pH from molarity of acids and bases – buffer solution – definition – theory of buffer action- application- Acid –base indicators – working range of indicators – choice of indicators. Commercial cells – primary and secondary cells – Weston cadmium cell – Lead storage cell – Electroplating - applications.	12	Assignments and Seminar

Course Designed by: **Ms. N. Lakshmi Kruthika**, Assistant Professor of Chemistry

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CIA I	**CO1**	K2	2	K1,K2	2	K1,K2	2	2
	CO2	K2	2	K1,K2	1	K2	2	1
CIA II	**CO3**	K3	2	K1,K2	1	K2	2	2
	CO4	K4	2	K1,K2	2	K3,K4	2	1
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2	10	10	24	48	**100**
	K2	2	4	10	10	26	52	
	K3							
	K4							
	Marks	**4**	**6**	**20**	**20**	**50**	**100**	**100**
CIA II	**K1**	2				2	4	12
	K2	2	2			4	8	
	K3		2	10	10	22	44	44
	K4		2	10	10	22	44	44
	Marks	4	6	20	20	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1, K2	1	K1	2 (K1&K1)	1 (K2)
2	CO2	Upto K2	2	K1, K2	1	K2	2 (K2&K2)	1 (K2)
3	CO3	Upto K3	2	K1, K2	1	K2	2 (K3&K3)	1 (K3)
4	CO4	Upto K4	2	K1, K2	1	K3	2 (K3&K3)	1 (K4)
5	CO5	Upto K3	2	K1, K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	2	10		17	14.66	**57**
K2	5	6	20	20	51	42.5	
K3		2	20	20	42	35	**35**
K4				10	10	8.33	**8**
Marks	10	10	50	50	120	100	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K2	
13	CO3	K2	
14	CO4	K3	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K2	
23	CO3	K3	
24	CO4	K4	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**ALLIED CHEMISTRY PRACTICAL - I**				
Course Code	**21UCHAP1**		**L**	**P**	**C**
Category	**Allied**		**-**	**2**	**-**
Nature of course:	EMPLOYABILITY	**SKILL ORIENTED** ✓	ENTREPRENURSHIP		

COURSE OBJECTIVES:

The objective of this course is to make students obtain skill in

1. Titrimetric analysis.
2. Quantitative estimation of substances.
3. Reproducible results.
4. Identification of the functional groups present in organic molecules.
5. Qualitative analysis of organic compounds.

Part - I	**VOLUMETRIC ANALYSIS** **1. Estimation of Sodium Hydroxide** (Na_2CO_3 X HCl X NaOH) **2. Estimation of Hydrochloric Acid** ($H_2C_2O_4$ X NaOH X HCl) **3. Estimation of Oxalic Acid** ($FeSO_4$ X KMnO4 X $H_2C_2O_4$) **4. Estimation of FAS** ($FeSO_4$ x $KMnO_4$ X FAS) **5. Estimation of Ferrous Sulphate** ($H_2C_2O_4$ X KMnO4 X FeSO4) **6. Estimation of KMnO4** ($K_2Cr_2O_7$ X FAS X $KMnO_4$) **7. Estimation of Sodium Hydroxide** ($KMnO_4$ X $H_2C_2O_4$ X NaOH) **8. Estimation of Iodine** ($KMnO_4$ x Thio x Iodine)	30
Part - II	**SYSTEMATIC ORGANIC QUALITATIVE ANALYSIS** A study of reactions of the following organic compounds: 1. Carbohydrate 2. Amide 3. Aldehyde 4. Ketone 5. Monocarboxylic acid 6. Dicarboxylic acid 7. Amine 8. Phenol 9. Nitro compound The students may be trained to perform the specific reaction like test for element (nitrogen only), Aliphatic or aromatic, saturated or unsaturated, colour reaction, functional group present and record their observation.	**30Hrs**

	Total Practical Hours	**60**
Books for Study: Material Given		
Book for Reference: 1. Practical Chemistry , Dr. O.P Pandey, D. N Bajpai, Dr. S. Giri, S Chand & Co Ltd		

COURSE OUTCOME		**K Level**
After completion of this course, the students will be able to		
CO1:	Develop skill in titrimetric analysis.	K1
CO2:	Interpret the redox reactions.	K2
CO3:	identify the functional groups present	K3
CO4:	distinguish properties of functional groups of same element	K4
CO5:	defend their results using confirmatory test	K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	1	2	1	1	1
CO 2	2	2	1	1	1	-
CO 3	2	2	1	1	1	-
CO 4	1	1	1	1	1	1
CO5	1	1	1	1	2	-

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	SUBJECT NAME	Hrs	Mode
Part - I	Volumertic analysis	30	Practical – lab experiments practical
Part - II	Systematic organic Analysis	30	

Course Designed by: **Ms. N. Lakshmi Kruthika,** Assistant Professor of Chemistry

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**PHYSICS APPLIANCES IN EVERYDAY LIFE**			
Course Code	**21UPHN31**	**L**	**P**	**C**
Category	**Non Major Elective**	2	-	2

Nature of course:	EMPLOYABILITY	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP

COURSE OBJECTIVES:

The learners will be able to:

1.Understand the basic concepts of direct and alternating current and transformer
2.Understand the working principles of household appliances
3.Remember the concepts of Solar panel ,Vacuum cleaner and Washing machine
4.Understand the Principles of Remote controller , LED and Smart TV
5.Analyse the work function of Electric cooker, Heater, Refrigerator and Air conditioner

Unit: I	Direct Current-Alternating Current-Fuse- Circuit breakers - Inverter	**6hrs**
Unit: II	Electric Cooker - Induction stove - Microwave oven - Toaster – Mixer and Grinder	**6hrs**
Unit: III	Vacuum cleaner - Water purifier - Washing machine – Iron box - Electric Heater	**6hrs**
Unit: IV	Fan - Tube light – LED bulb – Smart Television Principle - Remote controller.	**6hrs**
Unit: V	Speakers and Woofers- Refrigerator - Air conditioner – Solar Panel – Solar light	**6hrs**
	Total Lecture Hours	**30hrs**

Book for Study:

Material will be compiled by the department

Books for Reference :

1. Jose Robin & .G Ubald Raj.A,, **Maintenance of Electrical Equipment**, Indira Publication, 2016. Marthandam.
2. Sedha.R.S, **Applied Electronics**, S.Chand & Company Ltd, first Edition, 1990, New Delhi
3. Santiram Kal, **Basic Electronics: Devices, Circuits and It Fundamentals**, PHI Learning Pvt. Ltd, First Edition, 2002, New Delhi.
4. Harish C Roy, **Industrial and Power Electronics**, Umesh Publications, 10th edition, 2002, New Delhi

Web Resources:

1.https://www.askiitians.com/revision-notes/physics/phenomena/
2.https://www.askiitians.com/revision-notes/electrical/phenomena/

COURSE OUTCOMES		**K Level**
On successful completion of the course, the students will be able to		
CO1	Recalling types of electricity, fuse, toaster and Fan	**K2**
CO2	Explain the function of fuse, electric cooker, remote controller and inverter	**K2**
CO3	Uses of Direct current, Alternating current, wet grinder, vacuum cleaner , LED and Smart TV	**K3**
CO4	Distinguish ac and dc current, microwave oven and toaster, mixer and grinder, Table fan and ceiling fan	**K3**
CO5	Utilization and influence of refrigerator, water purifier, solar panel, LED, Air conditioner	**K2**

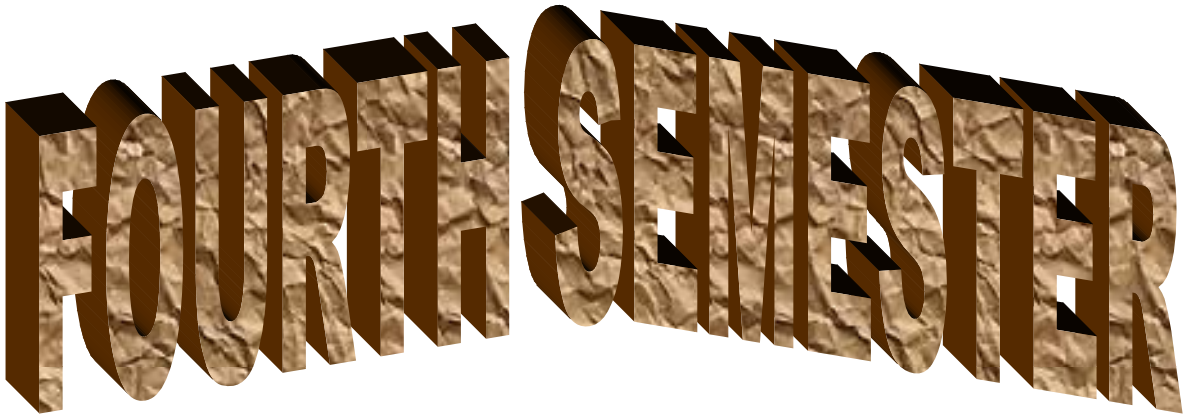
CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	3	3	3
CO 2	3	2	3	3	2	2
CO 3	3	3	2	1	3	3
CO 4	1	2	3	3	1	3
CO 5	2	2	3	3	3	3

***3 –**Advanced Application; **2 –** Intermediate Development; **1 –** Introductory Level

LESSON PLAN

UNIT	Physics Appliances in Everyday Life	Hrs	Mode
I	Direct Current-Alternating Current-Fuse- circuit breakers - Inverter	6	Lecture, Demonstration
II	Electric Cooker - Induction stove - Microwave oven - Toaster – Mixer and Grinder	6	Lecture, Demonstration
III	Vacuum cleaner - Water purifier - Washing machine – Iron box - Electric Heater	6	Lecture, Demonstration
IV	Fan - Tube light – LED bulb – Smart Television Principle - Remote controller	6	Lecture, Demonstration
V	Speakers and Woofers- Refrigerator - Air conditioner – Solar Panel –Solar light	6	Lecture, Demonstration


FOURTH SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**OPTICS AND PHOTOMETRY**			
Course Code	**21UPHC41**	**L**	**P**	**C**
Category	**Core**	**4**	**-**	**4**

Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓ ENTREPRENEURSHIP

Course Objectives:

The learners will be able to
1. Remember the basic concepts of light waves and interference
2. Recall the concepts of diffraction
3. Analyze about dispersion and spectra
4. Understand the basic concepts of Photometry
5. Understand the speed of light and optical instruments

Unit: I	**Light waves and Interference**	**12**

Waves-The nature of light waves-Huygen's Principle-Huygen's construction-Recti linear propagation of light -Reflection of light-Refraction of light-Young's Double Hole experiment-Young's Double slit experiment-Intensity variation-Fringe-width and determination of wavelength-Coherent and incoherent sources- Optical Path- Interference from thin films-Fresnel Biprism.

Unit: II	**Diffraction and Polarization**	**12**

Diffraction of light- Fraunhofer diffraction by a single slit-Fraunhofer diffraction by a circular aperture-Fresnel diffraction at a straight edge-Limit of resolution-Rayleigh criterion-Scattering of Light-Polarization of light-Polaroids-Polarization by reflection and refraction-Polarization by scattering-Laurent's half-shade polarimeter.

Unit: III	**Dispersion and Spectra**	**12**

Dispersion-Dispersive power-Dispersion without average deviation and average deviation without dispersion-Spectrum-Pure and Impure spectrum-Kinds of spectra-
Ultraviolet and Infrared spectrum-Spectrometer-Applications of spectrometer-Measuring the angle of a prism-Measuring the angle of minimum deviation for a prism for a given wavelength-Variation of refractive index with wavelength-Rainbow

Unit: IV	**Photometry**	**12**

Total radiant flux-Luminosity of radiant flux-Luminous flux: relative luminosity-Luminous efficiency-Luminous intensity- Illuminance- Inverse square law-Lambert's Cosine Law-Photometers

Unit: V	**Speed of light and Optical Instruments**	12

Michelson method -Simple microscope-Compound microscope-Telescopes-Astronomical telescope-Terrestrial telescope-Galilean Telescope-Resolving power of a microscope and a telescope.

	Total Lecture Hours	**60 Hrs**

Books for Study:

H.C.Verma, **"Concepts of Physics - Volume 1",** Bharati Bhawan (Publishers & Distributors), New Delhi, 2020

Unit – I: Chapter 17
Section – 17.1 - 17.9, Worked Out Examples
Unit – II: Chapter 17
Section – 17.10 - 17.16. Worked Out Examples
Unit – III: Chapter 20
Section – 20.1 - 20.8, Worked Out Examples
Unit – IV: Chapter 22
Section – 22.1 - 22.9, Worked Out Examples
Unit – V: Chapter 19 &21
Section – 19.3-19.6& 21.1, 21.4 and Worked Out Examples

Books for References:

1. Kakani & Bhandari – **Optics & Spectroscopy**, Sultan Chand & Sons, NewDelhi.
2. Brijlal & Subramanyam, (Reprint 2018)-**A text book of optics**, S.Chand & Co. NewDelhi.
Murugeshan. R ,KiruthigaSivaprasath - **Optics and Spectroscopy**, S.Chand & Company Ltd. 9 th Edition reprint 2020, New Delhi.

Web Resources:

1. https://nptel.ac.in/courses/122/105/122105023/
2. https://nptel.ac.in/courses/115/105/115105083/
3. https://nptel.ac.in/courses/115/105/115105120/
4. https://nptel.ac.in/courses/108/105/108105060/
5. https://onlinecourses.nptel.ac.in/noc22_bt05/preview

Course Outcomes		K Level
On successful completion of the course, the students will be able to		
CO1:	Understand the basic concepts in light waves, Interference, Diffraction, Polarisation, Dispersion and Spectra, Photometry, Speed of light and Optical Instruments.	**K2**
CO2:	Apply the optical Path, interference from thin films, Fraunhofer Diffraction by a single slit, Fraunhofer Diffraction by a circular aperture, Fresnel Diffraction at a straight edge, Dispersion without average deviation and average deviation without dispersion, luminosity of radiant flux-Luminous flux, Relative luminosity, Luminous Efficiency, Luminous Intensity.	**K3**
CO3:	Illustrate Intensity variation, fringe-width, the angle of a prism, the angle of minimum deviation for a prism for a given wavelength, variation of refractive index with wavelength, Inverse square law, Lambert's Cosine law, Scattering of Light and Polarization of light.	**K4**
CO4:	Discuss about Huygen's Principle ,Young's Double Hole experiment ,Young's Double slit experiment, Fresnel Biprism, Scattering of light, Polarisation of light, Spectrum, kinds of spectra, Ultraviolet and Infrared spectrum, Rainbow, Photometers, Michelson method , Spectrometer, Resolving power of a microscope and a telescope	**K4**
CO5:	Compare Fraunhofer and Fresnel diffraction, Coherent and incoherent sources, Simple microscope and Compound microscope, Astronomical telescope, Terrestrial telescope and Galilean Telescope.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	1	3
CO 2	3	2	1	1	1	3
CO 3	3	3	2	1	2	2
CO 4	3	3	1	1	2	2
CO5	3	3	1	1	2	3

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	**Light waves and Interference** Waves-The nature of light waves-Huygens's Principle-Huygens's construction- Rectilinear propagation of light- Reflection of light-Refraction of light-Young's Double Hole experiment-Young's Double slit experiment-Intensity variation-Fringe-width and determination of wavelength- Coherent and incoherent sources- Optical Path-Interference from thin films-Fresnel Biprism.	12	Chalk and talk, ppt
II	**Diffraction and Polarization** Diffraction of light- Fraunhofer diffraction by single slit-Fraunhofer diffraction by circular aperture-Fresnel diffraction at a straight edge-Limit of resolution-Rayleigh criterion-Scattering of Light-Polarization of light-Polaroids-Polarization by reflection and refraction-Polarization by scattering- Laurent's half-shade polarimeter.	12	Chalk and talk, ppt
III	**Dispersion and Spectra** Dispersion-Dispersive power-Dispersion without average deviation and average deviation without dispersion-Spectrum-Pure and Impure spectrum-Kinds of spectra-Ultraviolet and Infrared spectrum-Spectrometer-Applications of spectrometer-Measuring the angle of a prism-Measuring the angle of minimum deviation for a prism for a given wavelength-Variation of refractive index with wavelength-Rainbow.	12	Chalk and talk, ppt
IV	**Photometry** Total radiant flux-Luminosity of radiant flux-Luminous flux: relative luminosity-Luminous efficiency-Luminous intensity- Illuminance-Inverse square law-Lambert's Cosine Law-Photometers.	12	Chalk and talk, ppt
V	**Speed of light and Optical Instruments** Michelson method -Simple microscope-Compound microscope-Telescopes-Astronomical telescope-Terrestrial telescope-Galilean Telescope-Resolving power of a microscope and a telescope.	12	Chalk and talk, ppt

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K – Level**		
CI AI	**CO1**	Up to K3	2	K1,K2	1	K1	2(K2&K2)	1 K2
	CO2	Up to K3	2	K1,K2	2	K2	2(K3&K3)	1 K3
CI AII	**CO3**	Up to K4	2	K1,K2	1	K1	2(K3&K3)	1K3
	CO4	Up to K4	2	K1,K2	2	K2	2(K4&K4)	1 K4
Question Pattern CIA I & II	No. of Questions to be asked		**4**		**3**		**4**	**2**
	No. of Questions to be answered		**4**		**3**		**2**	**1**
	Marks for each question		**1**		**2**		**5**	**10**
	Total Marks for each section		**4**		**6**		**10**	**10**

***Note:** It is the decision of the course teacher to ask 2 Questions in any unit under section-B (short answer questions)

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CI A I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	K5							
	Marks	4	6	20	20	50	100	100
CI A II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	K5							
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	**COs**	**K - Level**	**MCQs**		**Short Answers**		**Section C (Either / or Choice)**	**Section D (Open Choice)**
			No. of Questions	**K – Level**	**No. of Question**	**K – Level**		
1	**CO1**	**K2**	**2**	**K1,K2**	**1**	**K2**	**2(K2,K2)**	**1(K2)**
2	**CO2**	**K3**	**2**	**K1,K2**	**1**	**K2**	**2(K3,K3)**	**1(K3)**
3	**CO3**	**K4**	**2**	**K1,K2**	**1**	**K2**	**2(K3,K3)**	**1(K3)**
4	**CO4**	**K4**	**2**	**K1,K2**	**1**	**K2**	**2(K4,K4)**	**1(K4)**
5	**CO5**	**K4**	**2**	**K1,K2**	**1**	**K2**	**2(K4,K4)**	**1(K4)**
No. of Questions to be Asked			**10**		**5**		**10**	**5**
No. of Questions to be answered			**10**		**5**		**5**	**3**
Marks for each question			**1**		**2**		**5**	**10**
Total Marks for each section			**10**		**10**		**25**	**30**
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either/ or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	-	-	-	-	5	4	33
K2	10	10	10	10	35	29	
K3	-	20	20	20	40	33.5	33
K4	-	20	20	20	40	33.5	34
Marks	10	50	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**MEDICAL INSTRUMENTATION**			
Course Code	**21UPHC42**	**L**	**P**	**C**
Category	**Core**	4	-	4

Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	ENTREPRENEURSHIP

COURSE OBJECTIVES:
The learners will be able to

1. Understand the different types of electrodes.
2. Remember the Bio-chemical and Non-Electrical parameter measurement**s.**
3. Understand the concepts of Pacemakers, Defibrallators and Dializers.
4. Understand the Diathermy Shortwave, Microwave, ultrasonic, and Electro Surgical Diathermy and Bio-Telemetry.
5. Analyze the Recent Trends in medical Instrumentation

Unit: I	**Electro–Physiology and Bio–Potential Recording Instruments**	12hrs

Origin of Bio–Potentials–Primary,Secondary active transport–Bio-electric potentials–Bio-potential Electrodes – Types of Electrodes – i) Metallic Electrode ii) Micropipet – Depth electrode – Needle electrode – Surface electrode – Chemical electrodes – Basic components of Bio Medical system – Types of amplifiers – Electro Cardiography (ECG) – Electro Encephalography (EEG)- Electromyography (EMG) – Electro Oculography (EOG) – Electro Retinography (ERG)

Unit: II	**Bio-chemical and Non-Electrical parameter measurement**	12hrs

Colorimeter and Photometer – Auto analyzer – Blood flow measurement – Cardiac output measurement – Respiratory rate measurement – Blood pressure measurement – Temperature measurement – Pulse measurement – Blood cell counter.

Unit: III	**Cardiac Assist Devices**	12hrs

Pacemakers – Types, Components, methods of stimulation, Difference between Internal and External – Defibrallators – AC Defibrillation, DC Defibrillation, Dual peak and Synchronizer DC Defribriattor - Dializers – Haemodialysis, Peritoneal Dialysis - Difference between Extracorporeal and Intracorporeal Dialysis – Heart Lung Machine Model, - Cardio vascular Circulation, Blood pumps and oxygenators

Unit: IV	**Diathermy and BioTelemetry**	12hrs

Diathermy – Shortwave, Microwave, Ultrasonic and Electro Surgical Diathermy – Bio Telemetry – Design of Bio Telemetry – Radio Telemetry systems – Single channel, Multichannel telemetry system – Problems in implant Telemetry – Advantages of Bio Telemetry – Physiological monitoring system in space station – E Health – Electrical safety.

Unit: V	**Recent Trends in Medical Instrumentation**	12hrs

Thermograph – Endoscopes – Lasers in Medicine – Cryogenics Applications - Nuclear imaging techniques – Computer Tomography – Principle, working, applications – Telemedicine- Ultrasound scanning-Magnetic Resonance Image(MRI) Scan.

	Total Lecture Hours	60hrs

Books for Study:

1.R.LakshmiRekha, C.Ravikumar, **Medical Electronics**, Suchitra Publications, Second Edition 2016.

Unit –I Chapter 1.1.1, - 1.1.1.1, 1.1.1.2, 1.1.2.6, 1.2-1.9 Unit –II Chapter 2.4 – 2.12 Unit –III Chapter 3 – 3.1 – 3.4. Unit –IV Chapter : 4.1 – 4.3 Unit –V Chapter: 5.1 – 5.5. 2. M.Arumugam, **Bio-Medical Instrumentation**, Anuradha Publications, Reprint 2014. Unit-III Problems Page.No.-215-217 Unit-V Problems Chapter- 5 10.6,10.7(Page.No.-359-367)
Books for Reference: 1. R.S. Khandpur, **Hand Book of Biomedical Instrumentation**, Tata McGraw-Hill, First Edition, New Delhi, 1999. **2.** L.Cromwell, F.J. Welbell, E.J. Pfeiffer, **Biomedical Instrumentations and Measurements,** PHI Ltd, New Delhi , Second Edition, 2006. 3. John G. Webster, Editor**, Medical Instrumentation Application and Design.** John Willey and Sons. INC, Third Edition, Singapore, 1998.
Web Resources : 1. **Medical Image Analysis online course video lectures by IIT Kharagpur (freevideolectures.com)** 2. **Free Online Course: Medical Technology and Evaluation from Coursera | Class Central**

COURSE OUTCOMES		**K Level**
On successful completion of the course, the students will be able to		
CO1	Recalling and Understanding concepts of the basics of electrodes, Colorimeter, Shortwave, Microwave and Ultrasonic waves	**K2**
CO2	Differentiate the Electrode types, Internal and External Defibrillators , Single channel and Multichannel telemetry system, Thermograph , Endoscopes ,Lasers in Medicine and Computer Tomography	**K3**
CO3	Build the knowledge in the field of Electro Cardiography , Electromyography , Respiratory Rate Measurement , Dializers , Nuclear imaging Techniques and Physiological monitoring system in space station	**K3**
CO4	Utilization of Micropipet , Blood cell counter, Pacemakers, Electro Surgical Diathermy and Telemedicine	**K4**
CO5	Influence of Electro Oculography , oxygenators , Cryogenics Applications , Design of Bio Telemetry and Pulse measurement	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	1	2	1	2
CO 3	3	2	2	2	2	2
CO 4	3	2	1	1	1	3
CO5	3	1	2	2	1	3

***3** –Advanced Application; **2 –** Intermediate Development; **1 –** Introductory Level

LESSON PLAN

UNIT	SUBJECT NAME	Hrs	Mode
I	Origin of Bio–Potentials–Primary, Secondary active transport– Bio-electric potentials–Bio-potential Electrodes – Types of Electrodes – i) Metallic Electrode ii) Micropipet – Depth electrode – Needle electrode – Surface electrode – Chemical electrodes – Basic components of Bio Medical system – Types of amplifiers – Electro Cardiography (ECG) – Electro Encephalography (EEG)-Electromyography (EMG) – Electro Oculography (EOG) – Electro Retinography (ERG)	12	PPT, Lecture, Chalk & Talk, Demonstration
II	Colorimeter and Photometer – Auto analyzer – Blood flow measurement – Cardiac output measurement – Respiratory rate measurement – Blood pressure measurement – Temperature measurement – Pulse measurement – Blood cell counter.	12	PPT, Lecture, Chalk & Talk, Demonstration
III	Pacemakers – Types, Components, Oxygenators, methods of stimulation, Difference between Internal and External – Defibrallators – AC Defibrillation, DC Defibrillation, Dual peak and Synchronizer DC Defribriattor - Dializers – Haemodialysis, Peritoneal Dialysis - Difference between Extracorporeal and Intracorporeal Dialysis – Heart Lung Machine Model, - Cardio vascular Circulation, Blood pumps and oxygenators	12	PPT, Lecture, Chalk & Talk, Demonstration
IV	Diathermy – Shortwave, Microwave, Ultrasonic and Electro Surgical Diathermy – Bio Telemetry – Design of Bio Telemetry – Radio Telemetry systems – Single channel, Multichannel telemetry system – Problems in implant Telemetry – Advantages of Bio Telemetry – Physiological monitoring system in space station – E Health – Electrical safety	12	PPT, Lecture, Chalk & Talk, Demonstration,
V	Thermograph – Endoscopes – Lasers in Medicine – Cryogenics Applications - Nuclear imaging techniques – Computer Tomography – Principle, working, applications – Telemedicine- Ultrasound scanning- Magnetic Resonance Image(MRI) Scan.	12	PPT, Lecture, Chalk & Talk, Demonstration and Field visit

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K – Level**		
CI AI	**CO1**	Up to K3	2	K1,K2	1	K1	2(K2&K2)	1 K2
	CO2	Up to K3	2	K1,K2	2	K2	2(K3&K3)	1 K3
CI AII	**CO3**	Up to K4	2	K1,K2	1	K1	2(K3&K3)	1K3
	CO4	Up to K4	2	K1,K2	2	K2	2(K4&K4)	1 K4
Question Pattern CIA I & II	No. of Questions to be asked		**4**		**3**		**4**	**2**
	No. of Questions to be answered		**4**		**3**		**2**	**1**
	Marks for each question		**1**		**2**		**5**	**10**
	Total Marks for each section		**4**		**6**		**10**	**10**

***Note:** It is the decision of the course teacher to ask 2 Questions in any unit under section-B (short answer questions)

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CI A I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	K5							
	Marks	4	6	20	20	50	100	100
CI A II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	K5							
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
SI.No	**COs**	**K - Level**	**MCQs**		**Short Answers**		**Section C (Either / or Choice)**	**Section D (Open Choice)**
			No. of Questions	**K – Level**	**No. of Question**	**K – Level**		
1	CO1	**K2**	**2**	**K1,K2**	**1**	**K2**	**2(K2,K2)**	**1(K2)**
2	CO2	**K3**	**2**	**K1,K2**	**1**	**K2**	**2(K3,K3)**	**1(K3)**
3	CO3	**K3**	**2**	**K1,K2**	**1**	**K2**	**2(K3,K3)**	**1(K3)**
4	CO4	**K4**	**2**	**K1,K2**	**1**	**K2**	**2(K4,K4)**	**1(K4)**
5	CO5	**K4**	**2**	**K1,K2**	**1**	**K2**	**2(K4,K4)**	**1(K4)**
No. of Questions to be Asked			**10**		**5**		**10**	**5**
No. of Questions to be answered			**10**		**5**		**5**	**3**
Marks for each question			**1**		**2**		**5**	**10**
Total Marks for each section			**10**		**10**		**25**	**30**
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either/ or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	5		-	-	5	4	33
K2	5	10	10	10	35	29	
K3	-	-	20	20	40	33.5	33
K4	-	-	20	20	40	33.5	34
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**MAJOR PHYSICS PRACTICAL – II**				
Course Code	**21UPHCP2**		**L**	**P**	**C**
Category	**Core**		-	2	2
Nature of course:	**EMPLOYABILITY**	✓ SKILL ORIENTED	ENTREPRENEURSHIP		

COURSE OBJECTIVES:
The learners will be able to
1. Develop experimental knowledge by handling various apparatus
2. Know the various components and its importance
3. Know the circuit connections as functioning of experiments.
4. Analyse various types of measuring instruments.
5.Gain knowledge in using of Spot Reflection Galvanometer ,Table Galvanometer, Polarimeter, Grating

LIST OF EXPERIMENTS
Any Fourteen Experiments

	1. Tan C Position - Determination of m and B_H (Pole Strength of B_H) 2. Field along the axis of the coil - Determination of M horizontal intensity of earth's magnetic field (Magnetic moment of B_H) 3. Laurent's Half Shade Polarimeter - Specific rotatory power 4. Potentiometer - Temperature Coefficient of a coil 5. Potentiometer - Comparison of EMF's 6. Table Galvanometer - Voltage & Current sensitivity 7. Spot Reflection Galvanometer - Voltage & Current sensitivity 8. Spot Reflection Galvanometer - Charge sensitiveness 9. Spot Reflection Galvanometer - Comparison of EMF's 10. Spot Reflection Galvanometer - Comparison of capacities 11. Owen's Bridge - Determination of L 12. DeSauty's Bridge - C_1/C_2 13. Spectrometer - Dispersive Power of a Prism 14. Spectrometer - Grating N and λ (Normal Incidence) 15. Spectrometer - Refractive index of liquid using hollow prim 16. Newton's Rings - Radius of curvature of a convex Lens	**120hrs**

Book for Study:

1. Srinivasan. M.N.,Balasubramanian.S.,Ranganathan.R., **A Text Book of Practical Physics,** 2017 Edition Sultan Chand & Sons

Books for Reference:

1. Ouseph.C**., Practical Physics and Electronics,**2013.S.Viswanathan.P.Ltd**.**
2. Hamam Singh Hemne, B.Sc.Practical Physics, 4/e **S.Chand and Co.New Delhi,**2017
3. Shukla.R.K., Practical Physics, Second Edition, **New Age International,2nd Edition.,New Delhi.**
4. Gupta.S.L.,Kumar.V**.,** PRACTICAL PHYSICS (H/E) **Pragati Prakashan.M.,2016,New Delhi.**

Web Resources:

1. **https://nptel.ac.in/course.html/physics/experimental physics I, II and III**
2. **https://nptel.ac.in/courses/115/105/115105110/**
3. **https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK**

COURSE OUTCOMES		K Level
CO1:	Apply the concepts of Field along the axial coil .	K3
CO2:	Acquire the knowledge of Physical optics using Spectrometer	K4
CO3:	Gain Knowledge in principles and applications of Potentiometer, wheatstone's Bridge and Spot Reflection Galvanometer .	K2
CO4:	Understand the principles of Specific rotatory power in liquids	K2
CO5:	Apply skill in the field of Interference and Diffraction of Light.	K3

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**1**	**2**	**3**	**2**	**2**
CO 2	**2**	**2**	**2**	**2**	**2**	**2**
CO 3	**3**	**2**	**3**	**2**	**2**	**1**
CO 4	**2**	**2**	**2**	**2**	**1**	**1**
CO5	**3**	**3**	**3**	**2**	**2**	**2**

***3 –**Advanced Application; **2 –** Intermediate Development; **1 –** Introductory Level

LESSON PLAN

SEMESTER	LIST OF EXPERIMENTS	Hrs	Mode
IV	**1.** Laurent's Half Shade Polarimeter - Specific rotatory power **2.** Field along the axis of the coil - Determination of M of B_H **3.** Potentiometer - Temperature Coefficient of a coil **4.** Spot Reflection Galvanometer - Charge sensitiveness **5.** DeSauty's Bridge - C1/C2 **6.** Spot Reflection Galvanometer - Comparison of EMF's **7.** Spectrometer- Dispersive Power of a Prism **8.** Newton's Rings - Radius of curvature of a convex Lens	**60**	**Demonstration**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**ALLIED CHEMISTRY – II**			
Course Code	**21UCHA41**	**L**	**P**	**C**
Category	**Allied**	4	-	3

Nature of course:	EMPLOYABILITY	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP

Course Objectives:

The Objective of the course is

- To make students learn about the feasibility and rate of reactions occurring in all three mediums.
- To make learners understand the electrochemical, catalytic and thermodynamic transformations.
- To impart knowledge on various chemical processes and their applications in daily life.
- To educate the students on significance of physical chemistry.
- To enhance the knowledge on many day to day applications of chemistry.

Unit: I	**Coordination Compounds**	**12**

Coordination compounds –Coordination complexes and complex ions- Coordination number – ligands- Werner's theory –Nomenclature- Effective Atomic Number (EAN) –Factors affecting stability of complex ion- isomerism of coordination complexes- VB theory and crystal field theories of octahedral, tetrahedral and square planar complexes- magnetic properties. Chelation and its industrial applications.

Unit: II	**ORGANIC REACTIONS**	**12**

Nucleophiles – Electrophiles: definition- types and examples - specific reactions involving these species - Substitution reactions- Mechanism of aliphatic substitution S_N1, S_N2 illustration with examples – differences; Addition reactions – Markonikov's and anti- Markonikov's rule; Elimination reactions- Saytzeff and Hoffmann rule; rearrangement and polymerization reactions.

Unit: III	**Reaction Kinetics**	**12**

Adsorption**:** Definition – differences between adsorption and absorption – adsorbate, adsorbent – types of adsorption – factors influencing adsorption- Adsorption isotherm – Langmuir isotherm (no derivation statement only) – adsorption of gases on solid surface.

Catalysis: Definition – characteristics - types – acid- base catalysis – surface catalysed reactions – definition and examples – auto catalyst – catalytic poisoning – promoters- Enzyme catalysis enzyme catalysis.

Chemical Kinetics: Reaction rate –order and molecularity of a reaction – zero order – first order. First order rate equation and half-life period – derivation-units- Examples of first order reactions – second order reactions – Carbon dating.

Unit: IV	**Polymers**	**12**

Definition – Classification of polymers – properties of polymers – addition and condensation polymerization reactions with examples – natural rubber – isoprene unit –vulcanization of rubber- preparation and applications of polystyrene, urea – formaldehyde resin, Teflon and buna – S - rubber.

Amino Acids and Proteins, Classification, Synthesis, properties of amino acids- Polypeptides, Proteins- structure- Classification and biological functions.

Unit: V	Photochemistry	12

Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grotthus-Draper law- Quantum efficiency – reasons for low and high quantum yields with examples.

Consequences of light absorption by atoms and molecules- Jablonski diagram – fluorescence – phosphorescence – photosensitization- chemiluminescene–bioluminescence- Applications of photochemistry.

	Total Lecture Hours	60 Hrs

Books for Study:

1. Arun Bahl, B.S Bahl & G.D. Tuli, Essentials of Physical Chemistry, S.Chand and Co, New Delhi, 2014.
2. B.R. Puri, L.R. Sharma and S.Pathania, Principles of Physical Chemistry, Shoban Lal Nagin chand and Co, 47th edition, 2017.

Books for References:

1. Polymer Science, Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, New Age International, 1986.
2. P.W. Atkins, Physical Chemistry, 7th edition, Oxford university press, 2001.

Web Resources:

https://nptel.ac.in/courses/104/106/104106107/

Course Outcomes		K Level
CO1:	Describe the feasibility and rate of reactions occurring in solids, solutions and gases.	K2
CO2:	Explain the electrochemical, catalytic and thermodynamic transformations and can illustrate their scope to wider areas.	K2
CO3:	Interpret various chemical processes taking place in all the three phases.	K3
CO4:	Analyze the significances of various compounds in daily life.	K4
CO5:	Implement the applications of physical chemistry	K3

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	1	-	1
CO 2	3	2	2	1	1	-
CO 3	2	2	2	2	-	1
CO 4	3	2	2	2	-	-
CO5	2	3	2	1	1	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Coordination compounds –Coordination complexes and complex ions- Coordination number – ligands- Werner's theory – Nomenclature- Effective Atomic Number (EAN) –Factors affecting stability of complex ion- isomerism of coordination complexes	6	Chalk & talk
	VB theory and crystal field theories of octahedral, tetrahedral and square planar complexes- magnetic properties. Chelation and its industrial applications.	6	Chalk & talk, powerpoint
II	Nucleophiles – Electrophiles: definition- types and examples - specific reactions involving these species - Substitution reactions- Mechanism of aliphatic substitution S_N1, S_N2 illustration with examples – differences; Addition reactions – Markonikov's and anti- Markonikov's rule; Elimination reactions- Saytzeff and Hoffmann rule; rearrangement and polymerization reactions.	12	Chalk & talk
III	Adsorption**:** Definition – differences between adsorption and absorption – adsorbate, adsorbent – types of adsorption – factors influencing adsorption- Adsorption isotherm – Langmuir isotherm (no derivation statement only) – adsorption of gases on solid surface.	4	Chalk & talk
	Catalysis: Definition – characteristics - types – acid- base catalysis – surface catalysed reactions – definition and examples – auto catalyst – catalytic poisoning – promoters- Enzyme catalysis enzyme catalysis Michaelis and Menton mechanism – Line weaver-Burk plot – Significance of Km.	4	Chalk & talk, ppt, videos
	Chemical Kinetics: Reaction rate –order and molecularity of a reaction – zero order – first order. First order rate equation and half-life period – derivation-units- Examples of first order reactions – second order reactions – **Self study Topic**: Carbon dating.	4	Chalk & talk
IV	Definition – Classification of polymers – properties of polymers – addition and condensation polymerization reactions with examples – natural rubber – isoprene unit –vulcanization of rubber- preparation and applications of polystyrene, urea – formaldehyde resin, Teflon and buna – S - rubber.	12	Chalk & talk, ppt
V	Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grotthus-Draper law- Quantum efficiency – reasons for low and high quantum yields with examples. Consequences of light absorption by atoms and molecules- Jablonski diagram – fluorescence – phosphorescence – photosensitization- chemiluminescene–bioluminescence- Applications of photochemistry.	12	Assignments and Seminar

Course Designed by: **Ms. N. Lakshmi Kruthika**, Assistant Professor of Chemistry

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	**K2**	2	K1, K2	2	K1,K2	2	2
	CO2	**K2**	2	K1,K2	1	K2	2	1
CI AII	**CO3**	**K3**	2	K1,K2	1	K2	2	2
	CO4	**K4**	2	K1,K2	2	K3,K4	2	1
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2	10	10	24	48	100
	K2	2	4	10	10	26	52	
	K3							
	K4							
	Marks	**4**	**6**	**20**	**20**	**50**	**100**	**100**
CIA II	**K1**	2				2	4	12
	K2	2	2			4	8	
	K3		2	10	10	22	44	44
	K4		2	10	10	22	44	44
	Marks	**4**	**6**	**20**	**30**	**50**	**100**	**100**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K2	2	K1, K2	1	K1	2 (K1&K1)	1 (K2)
2	CO2	Up to K2	2	K1, K2	1	K2	2 (K2&K2)	1 (K2)
3	CO3	Up to K3	2	K1, K2	1	K2	2 (K3&K3)	1 (K3)
4	CO4	Up to K4	2	K1, K2	1	K3	2 (K3&K3)	1 (K4)
5	CO5	Up to K3	2	K1, K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	2	10		17	11.66	**54**
K2	5	6	20	20	51	42.5	
K3		2	20	20	42	35	**35**
K4				10	10	8.33	**8**
Marks	**10**	**10**	**50**	**50**	**120**	**100**	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K2	
13	CO3	K2	
14	CO4	K3	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K2	
23	CO3	K3	
24	CO4	K4	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**ALLIED CHEMISTRY PRACTICAL - I**				
Course Code	**21UCHAP1**		**L**	**P**	**C**
Category	**Allied**		**-**	**2**	**1**
Nature of course:	EMPLOYABILITY	**SKILL ORIENTED** ✓	ENTREPRENURSHIP		

COURSE OBJECTIVES:

The objective of this course is to make students obtain skill in

1. Titrimetric analysis.
2. Quantitative estimation of substances.
3. Reproducible results.
4. Identification of the functional groups present in organic molecules.
5. Qualitative analysis of organic compounds.

Part - I	**VOLUMETRIC ANALYSIS** **1. Estimation of Sodium Hydroxide** (Na_2CO_3 X HCl X NaOH) **2. Estimation of Hydrochloric Acid** ($H_2C_2O_4$ X NaOH X HCl) **3. Estimation of Oxalic Acid** ($FeSO_4$ X KMnO4 X $H_2C_2O_4$) **4. Estimation of FAS** ($FeSO_4$ x $KMnO_4$ X FAS) **5. Estimation of Ferrous Sulphate** ($H_2C_2O_4$ X KMnO4 X FeSO4) **6. Estimation of KMnO4** ($K_2Cr_2O_7$ X FAS X $KMnO_4$) **7. Estimation of Sodium Hydroxide** ($KMnO_4$ X $H_2C_2O_4$ X NaOH) **8. Estimation of Iodine** ($KMnO_4$ x Thio x Iodine)	**30**
Part - II	**SYSTEMATIC ORGANIC QUALITATIVE ANALYSIS** A study of reactions of the following organic compounds: 1. Carbohydrate 2. Amide 3. Aldehyde 4. Ketone 5. Monocarboxylic acid 6. Dicarboxylic acid 7. Amine 8. Phenol 9. Nitro compound The students may be trained to perform the specific reaction like test for element (nitrogen only), Aliphatic or aromatic, saturated or unsaturated, colour reaction, functional group present and record their observation.	**30Hrs**
	Total Practical Hours	60

Books for Study: Material Given		
Book for Reference: 1. Practical Chemistry , Dr. O.P Pandey, D. N Bajpai, Dr. S. Giri, S Chand & Co Ltd		
COURSE OUTCOME		**K Level**
After completion of this course, the students will be able to		
CO1:	Develop skill in titrimetric analysis.	**K1**
CO2:	Interpret the redox reactions.	**K2**
CO3:	identify the functional groups present	**K3**
CO4:	distinguish properties of functional groups of same element	**K4**
CO5:	defend their results using confirmatory test	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	1	2	1	1	1
CO 2	2	2	1	1	1	-
CO 3	2	2	1	1	1	-
CO 4	1	1	1	1	1	1
CO5	1	1	1	1	2	-

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	SUBJECT NAME	Hrs	Mode
Part - I	Volumetric analysis	30	Practical – lab experiments practical
Part - II	Systematic organic Analysis	30	

Course Designed by: **Ms. N. Lakshmi Kruthika,** Assistant Professor of Chemistry

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**NON CONVENTIONAL ENERGY RESOURCES**			
Course Code	**21UPHN41**	**L**	**P**	**C**
Category	**Non Major Elective**	2	-	2

Nature of course:	EMPLOYABILITY	**SKILLORIENTED**	✓	ENTREPRENEURSHIP

COURSE OBJECTIVES:
The learners will be able to:

1. Remember the common sources of energy.
2. Understand the concepts of Solar radiation.
3. Understand and apply the solar heaters in different fields.
4. Understand the functions of Ocean energy and Biomass energy.
5. Reveal the Production and applications of wind energy.

Unit: I	**Fundamentals of Energy**	6hrs

Energy ,Economy and Social Development - Classification of energy sources-Common forms of energy- Advantages and Disadvantages of conventional energy sources- Salient features of Non-conventional energy sources -Environmental aspects of energy

Unit: II	**Basics of Solar energy**	6hrs

The Sun as a source of Energy- Sun, Earth radiation- Extraterrestrial and terrestrial radiations-Spectral power distribution of solar radiation-Measurements of solar radiation

Unit: III	**Applications of Solar Systems**	6hrs

Solar Collectors-Solar water heater -Solar industrial heating systems- Solar cookers-
Solar photovoltaic systems -Solar cell fundamentals- Solar cell classification - Solar photovoltaic applications

Unit: IV	**Ocean energy and Biomass energy**	6hrs

Tidal energy -Wave energy -Photosynthesis process-Usable forms of biomass, their composition and fuel properties-Biomass resources- Biomass conversion technologies

Unit: V	**Wind energy**	6hrs

Origin of winds- Global winds- Local winds-Factors affecting the distribution of wind energy on the surface of the earth- Major applications of wind power

	Total Lecture Hours	30hrs

Book for Study:

Khan B.H, 2017,**Non conventional energy resources** ,3rd edition, Tata McGraw Hill Education Private Limited, New Delhi.
Unit- I : 1.2,1.4,1.8-1.10,1.12.
Unit –II: 4.2, 4.4 - 4.6,4.8.
Unit-III: 5.2, 5.3, 5.5,5.7,6.2,6.4,6.11.
Unit- IV: 10.2, 10.3,8.2-8.5.
Unit-V: 7.2,7.5.

Books for Reference :

1.Alimuddin khan, 2009,**Basics of Energy**, Anmol publications, New Delhi.
2.Rai G.D, 2010,Non – **Conventional Energy Sources**,4th edition, KHANNA Publishers, New Delhi.

3.Singh M.K, 2009,**Renewable Sources of Energy**, ALP Books, New Delhi.

Web Resources:

1. https://www.askiitians.com/revision-notes/physics/heat-phenomena/
2. https://www.askiitians.com/revision-notes/physics/thermodynamics/
3. NPTEL :: General - NOC:Non-Conventional Energy Resources

COURSE OUTCOMES		K Level
On successful completion of the course, the students will be able to		
CO1:	Define energy, Earth radiation, Solar radiation, Solar cell, Wind power, Biomass	**K1,K2**
CO2:	Classify energy resources, Extraterrestrial and terrestrial radiations, Solar cell-Solar photovoltaic, Biomass resources, Origin of winds	**K1,K2**
CO3:	Apply conventional and non-conventional energy sources, Spectral energy distribution, Solar industrial heating systems, Biomass conversion technologies, Wind power	**K3**
CO4:	Distinguish conventional and non-conventional energy sources, Earth radiation and solar radiation, Solar air heater and solar water heater, tidal energy and biomass energy, global winds and local winds	**K3**
CO5:	Justify environmental aspects of energy ,Sun as a source of Energy, Solar photovoltaic systems, Usable forms of biomass, Factors affecting the distribution of wind energy on the surface of the earth	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**2**	**2**	**3**	**3**	**3**	**3**
CO 2	**2**	**3**	**2**	**3**	**2**	**3**
CO 3	**3**	**2**	**3**	**2**	**3**	**3**
CO 4	**3**	**2**	**3**	**2**	**2**	**3**
CO5	**2**	**3**	**3**	**3**	**2**	**2**

***3** –Advanced Application; **2 –** Intermediate Development; **1 –** Introductory Level

LESSON PLAN

UNIT	SUBJECT NAME	Hrs	Mode
I	Introduction- Energy consumption and standard of living- classification of energy resources-common forms of energy- merits and demerits of conventional and non-conventional energy sources-environmental aspects of energy.	6	PPT, Lecture, Chalk & Talk, Demonstration
II	Introduction- The Sun as a source of Energy- Sun, Earth radiation- extraterrestrial and terrestrial radiations-spectral energy distribution of solar radiation-measurements of solar radiation	6	PPT, Lecture, Chalk & Talk, Demonstration
III	Solar air heater-solar air collector-solar water heater-solar industrial heating systems- box type solar cooker-Solar photovoltaic systems Introduction- solar cell fundamentals- classification of solar cell- solar photovoltaic applications	6	PPT, Lecture, Chalk& Talk, Demonstration
IV	Introduction of Tidal energy-Origin and nature of tidal energy-Limitations of tidal energy-Wave energy .Photosynthesis process-usable forms of biomass, their composition and fuel properties-biomass resources- biomass conversion technologies.	6	PPT, Lecture, Chalk & Talk, Demonstration
V	Introduction to origin of winds- Global winds- Local winds- Factors affecting the distribution of wind energy on the surface of the earth- Major applications of wind power	6	PPT, Lecture, Chalk & Talk, Demonstration Field visit

FIFTH SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**ATOMIC PHYSICS AND QUANTUM MECHANICS**			
Course Code	**21UPHC51**	**L**	**P**	**C**
Category	**CORE**	6	-	6

Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENEURSHIP		

Course Objectives:
The learners will be able to
1. Describe the various theories of atomic model
2. Explain Pauli's exclusion principle, Electronic Configurations and Zeeman Effect
3. Gain knowledge about X - ray spectra and Compton effects
4. Understand the basic concepts of Matter waves and dual nature of matter and radiation
5. Utilize and solve Schrodinger equations to obtain wave function for some basic, physically important types of potential

Unit: I	**Atom Models** Introduction – Rutherford nuclear atom model - Bohr atom model (no derivation) – application of Bohr's theory (Spectral series of hydrogen atom) – critical potentials – atomic excitation – experimental determination of critical potentials-Frank and Hertz experiment - Drawbacks of Bohr atom model - Sommerfeld's relativistic atom model – elliptical orbits – Sommerfeld's relativistic theory – application to fine structure of the H_α line – vector atom model – spatial quantization – spinning electron hypothesis – quantum numbers – coupling schemes.	**18**
Unit: II	**Electronic configuration and effect of magnetic field on atomic spectra** The Pauli's exclusion principle – Electronic Configurations - Magnetic dipole moment due to orbital and spin motion of the electron - Stern and Gerlach experiment - Optical Spectra - Fine structure H_α line - Zeeman effect – normal Zeeman effect – expression for Zeeman shift – Larmor's theorem - Paschen back effect - Stark effect	**18**
Unit: III	**X-ray Diffraction** Production of X rays – Absorption of X-rays – Bragg's law – Bragg's X-ray spectrometer – X-ray spectra – Continuous spectra – Characteristics X-rays spectrum – Moseley's law and its importance - Compton effect – Theory and experiment.	**18**

Unit: IV	**Dual Nature of Matter Particles** Matter waves – De Broglie's hypothesis of matter waves - De Broglie's wave length – phase velocity (or wave velocity) of De Broglie's waves – Expression for group velocity – relation between them – experimental study of matter waves G.P.Thomson Experiment – Heisenberg's uncertainty principle with the illustration of diffraction of electron through a single slit - Energy-time uncertainty relation - Applications of uncertainty principle.	**18**
Unit: V	**Basic of Quantum mechanics** Derivation of time dependent and time independent form of Schrodinger wave equation - its Eigen function and Eigen value - Properties of wave function - Application of Schrodinger wave equation - The free particle - The particle in a box: infinite square well potential - Finite square potential well – Linear Harmonic oscillator.	**18**
	Total Lecture Hours	**90 Hrs**

Books for Study:

1. Murugesan.R, Er.Kiruthiga Sivaprasath, **Modern Physics**, S.Chand, 18th Edition, Reprint 2018, New Delhi.

UNIT I: Chapter 4 (4.1, 4.3, 4.7, 4.8, 4.9, 4.10, 4.11, 4.12, 4.13, 4.14)
UNIT II: Chapter 4 (4.15, 4.17, 4.18, 4.19, 4.20, 4.21, 4.22, 4.23, 4.24, 4.27, 4.28)
UNIT III: Chapter 5 (5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.9, 5.13)
UNIT IV: Chapter 7 (7.2, 7.2.1, 7.2.2, 7.2.3, 7.2.4, 7.2.5, 7.3, 7.5, 7.5.1, 7.5.2)

Books for References:

1. Rajam.J.B, **Atomic Physics**, S.Chand and Co, 2004, New Delhi.
2. Seghal Chopra and Seghal Sultan **Modern Physics**, S.Chand and Co, 1998, New Delhi.
3. Saxena.A.K **Principles of Modern Physics,** Narosa Publishing House Pvt, Ltd., Fourth.

Web Resources:

1. **https://archive.nptel.ac.in/courses/115/105/115105100/#watch**
2. **https://archive.nptel.ac.in/courses/115/105/115105100/#watch**
3. **https://archive.nptel.ac.in/courses/115/105/115105100/#watch**

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Infer the relativistic corrections for the energy levels of the hydrogen atom and their effect on optical spectra	**K2**
CO2:	State and explain the key properties of many electron atoms, the importance of the Pauli exclusion principle and quantum mechanical operaters	**K3**
CO3:	Interpret the observed dependence of atomic spectral lines on externally applied electric and magnetic fields	**K4**
CO4:	Discuss and explain the key concepts and principles of quantum physics	**K4**
CO5:	Examine Schrodinger wave equation and find Eigen function and Eigen value for standard systems with both analytical and numerical methods, and then interpret the results.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	2	2	2
CO 3	3	3	2	2	2	1
CO 4	3	3	2	1	2	1
CO 5	3	2	2	2	2	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Introduction – Rutherford nuclear atom model - Bohr atom model (no derivation) – application of Bohr's theory (Spectral series of hydrogen atom) – critical potentials – atomic excitation – experimental determination of critical potentials-Frank and Hertz experiment - Drawbacks of Bohr atom model - Sommerfeld's relativistic atom model – elliptical orbits – Sommerfeld's relativistic theory – application to fine structure of the H_α line – vector atom model – spatial quantization – spinning electron hypothesis – quantum numbers – coupling schemes.	18	Chalk & Talk, Videos and PPT
II	The Pauli's exclusion principle – Electronic Configurations - Magnetic dipole moment due to orbital and spin motion of the electron - Stern and Gerlach experiment - Optical Spectra - Fine structure H_α line - Zeeman effect – normal Zeeman effect – expression for Zeeman shift – Larmor's theorem - Paschen back effect - Stark effect	18	Chalk & Talk, Videos and PPT
III	Production of X rays – Absorption of X-rays – Bragg's law – Bragg's X-ray spectrometer – X-ray spectra – Continuous spectra – Characteristics X-rays spectrum – Moseley's law and its importance - Compton effect – Theory and experiment	18	Chalk & Talk, Videos and PPT
IV	Matter waves – De Broglie's hypothesis of matter waves - De Broglie's wave length – phase velocity (or wave velocity) of De Broglie's waves – Expression for group velocity – relation between them – experimental study of matter waves G.P.Thomson Experiment – Heisenberg's uncertainty principle with the illustration of diffraction of electron through a single slit - Energy-time uncertainty relation - Applications of uncertainty principle.	18	Chalk & Talk, Videos and PPT
V	Derivation of time dependent and time independent form of Schrodinger wave equation - its Eigen function and Eigen value - Properties of wave function - Application of Schrodinger wave equation - The free particle - The particle in a box: infinite square well potential - Finite square potential well – Linear Harmonic oscillator.	18	Chalk & Talk, Videos and PPT

Course Designed by: Dr.P.Kavitha & Mrs.A.Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	**Up to K2**	2	K1	1	K1	2	1
	CO2	**Up to K3**	2	K1	2	K2	2	1
CI AII	**CO3**	**Up to K4**	2	K2	1	K1	2	1
	CO4	**Up to K4**	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**	**2**	**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K2	2	K1 & K2	1	K1	2 (K1 & K1)	1(K2)
2	CO2	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1(K3)
3	CO3	Up to K4	2	K1 & K2	1	K2	2 (K3 & K3)	1(K4)
4	CO4	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1(K3)
5	CO5	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**ANALOG ELECTRONICS**							
Course Code	**21UPHC52**					**L**	**P**	**C**
Category	CORE					6	-	6
Nature of course:	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENEURSHIP			

Course Objectives:

The learners will be able to

1.Recollect Semiconductors , diodes ,transistors , amplifiers transmitters , receivers
2.Understand feedback principle
3.Gain knowledge about different types of Oscillators
4.Recall types of transistor connection and biasing
5.Understand types of modulation

Unit: I	**Semiconductors** Thevenin's Theorem – Norton's Theorem – Thevenin – Norton Conversion - Two port Network Analysis – 'h'Parameter only - Semiconductors – Types of semiconductor diodes – p-n junction diode – Biasing a p-n junction – Zener diode characteristics – Voltage regulator using Zener diode.	**18**
Unit: II	**Transistor** Junction transistor –Transistor action- Relation connecting α and β of a transistor- Three modes of transistor connection – Relation between α, β, γ – Load line (DC & AC) and Operating Point (Q point) – Biasing circuits – Base bias - Emitter Feedback bias –Voltage divider bias – Collector feedback bias – Field effect transistor.	**18**
Unit: III	**Amplifier** Principle of amplification -Transistor amplifier CE mode –frequency response of transistor amplifier – Analysis of transistor CE amplifier using h-parameter– Power amplifier –Classification of power amplifiers - Push Pull amplifier (class B power amplifier)- Operational Amplifier – characteristics of an ideal op-amp –Slew rate – Virtual ground – Summing amplifier, Subtracting amplifier – Op-amp as differentiator and Integrator.	**18**
Unit: IV	**Oscillator** Feedback principle – Positive and Negative feedback – Transistor oscillators- Barkhausen criterion –Hartley, Colpitt and Phase Shift Oscillator with mathematical analysis – Astable multivibrator using transistors with mathematical derivation.	**18**

Unit: V	**Modulation** Modulation – Different kinds of modulation – Amplitude modulation – Modulation index - Modulated power output – Frequency Modulation– Expression for frequency modulated voltage - Block diagram of AM & FM transmitters - Block diagram of FM receivers.	**18**
	Total Lecture Hours	**90 Hrs**

Books For Study:

1. G.Joserobin and A.Ubald Raj, **Analog Electronics and Digital Electronics**, Indira Publication, New Delhi, First edition, 2008.

Unit I
Page No: 5-29, 38- 45, 52-45
Unit II
Page No: 88, 92 , 93, 95, 97, 101-128
Unit III
Page No: 139 - 146, 150 - 158, 161-168,171, 72, 174, 177, 183-187, 189

Unit IV

Page No: 207 - 241

Unit V

3. Page No: 250 - 262, 264-269, 279-282

Books For Reference:

1. V.K.Metha, **Principles of Electronics**, S.Chand and co., New Delhi, 2002.
2. B.L.Theraja ,**Basic Electronics,** S.Chandand co., New Delhi, 2003
3. Salivahanan, Sureshkumar, Vallavaraj, **Electronics Devices and Circuits**, Tata Mc. Graw Hill, New Delhi,2004
4. Ambrose & Vincent Devaraj, **Elements of Solid State Electronics,** Indra Publications, New Delhi, 1994.

6. J.J.Bophy, **Basic Electronics**, Tata Mc Graw Hill, New Delhi, IV edition, 1983.

Web Resources:

1. **https://nptel.ac.in/course.html/Electronics/Basic electronics**
2. **https://www.askiitians.com/revision-notes/physics/solid-and-electronic-device/**
3. **https://nptel.ac.in/course.html/electronics/operational amplifier**

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Understand Thevenin's and Norton's Theorem, , N type and P type semiconductors, NPN and PNP transistors, CE Amplifier, Hartley, Colpitt and Phase Shift Oscillator, Multivibrator , Modulation	**K2**
CO2:	Apply twoport netwrk analysis, h parameter, Derive current ,voltage and power gain, input and output impedance of CE amplifier 'Op-Amp for making adder, subtractor , differentiator and integrator	**K3**
CO3:	Analyse biasing of diodes and transistors ,Relation between current gains , characteristics of various electronic devices like Zener diode , transistors and FET , frequency response of amplifier	**K4**
CO4:	Apply feedback principle and Barkhausen criterion for oscillations	**K4**
CO5:	Construct Hartley , Colpitt oscillators and Astable multivibrator using discrete components	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**3**	**3**	**3**	**3**	**2**
CO 2	**3**	**3**	**3**	**2**	**3**	**1**
CO 3	**3**	**2**	**3**	**2**	**3**	**1**
CO 4	**3**	**2**	**2**	**2**	**3**	**1**
CO 5	**3**	**2**	**3**	**3**	**3**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Thevenin's Theorem – Norton's Theorem – Thevenin – Norton Conversion - Two port Network Analysis – 'h'Parameter only - Semiconductors – Types of semiconductor diodes – p-n junction diode – Biasing a p-n junction – Zener diode characteristics – Voltage regulator using Zener diode.	18	Lecture, PPT, Demonstration
II	Junction transistor –Transistor action- Relation connecting α and β of a transistor-Three modes of transistor connection – Relation between α, β, γ – Load line (DC & AC) and Operating Point (Q point) – Biasing circuits – Base bias - Emitter Feedback bias –Voltage divider bias – Collector feedback bias – Field effect transistor.	18	Lecture, PPT, Demonstration
III	**Principle of amplification -Transistor amplifier CE mode – frequency response of transistor amplifier – Analysis of transistor CE amplifier using h-parameter– Power amplifier – Classification of power amplifiers - Push Pull amplifier (class B power amplifier)- Operational Amplifier – characteristics of an ideal op-amp –Slew rate – Virtual ground – Summing amplifier, Subtracting amplifier – Op-amp as differentiator and Integrator**.	18	Lecture, PPT, Demonstration
IV	Feedback principle – Positive and Negative feedback – Transistor oscillators- Barkhausen criterion –Hartley, Colpitt and Phase Shift Oscillator with mathematical analysis – Astable multivibrator using transistors with mathematical derivation.	18	Lecture, PPT, Demonstration
V	Modulation – Different kinds of modulation – Amplitude modulation – Modulation index - Modulated power output – Frequency Modulation– Expression for frequency modulated voltage - Block diagram of AM & FM transmitters - Block diagram of FM receivers.	18	Lecture, PPT

Course Designed by: Mrs.A.Lakshmi & Dr.P.Kavitha

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**		**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Up to K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Up to K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Up to K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Up to K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**NON – ELECTRONICS PRACTICAL**			
Course Code	**21UPHCP3**	**L**	**P**	**C**
Category	**CORE**	-	3	-

Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP	

Course Objectives:

The learners will be able to

1.Understand the function of instruments like spectrometer and spot galvanometer

2.Relate analyse angle of incidence and emergence

3.Find wavelength of light and particle size using laser

4. Compare the impedance and power factor of LR and CR circuits

5. Justify, Bridge circuits, Grating, LCR circuits

LIST OF EXPERIMENTS
Any Fourteen Experiments

1. Spectrometer	-	i-d curve
2. Spectrometer	-	i – i’
3. Grating	-	Minimum deviation method
4. Spectrometer	-	Cauchy’s Constants
5. Spectrometer	-	Hartmann’s Interpolation formula
6. L.C.R	-	Series resonance circuit
7. L.C.R	-	Parallel resonance circuit
8. Spot Galvanometer	-	Determination of (M) Mutual induction
9. Spot Galvanometer	-	Comparison of (M) Mutual inductances
10. Anderson’s Bridge (AC Method)	-	Self inductance
11. Maxwell’s Bridge (AC Method)	-	Self inductance
12. Light Intensity	-	Inverse Square Law
13. Spot Galvanometer	-	Absolute Capacity of a Condenser
14. Potentiometer	-	Calibration of Ammeter
15. Impedance and Power factor	-	L.R.circuit
16. Laser	-	Determination of wavelength of and particle size

	Total Lecture Hours	**180 Hrs**

Books For Study:

1.Srinivasan.M.N.,Balasubramanian.S.,Ranganathan.R.,A Text Book of Practical

Physics,2017 Edition Sultan Chand & Sons

Books For Reference:

1. Ouseph.C., Practical Physics and Electronics,2013.S.Viswanathan.P.Ltd.

2.Hamam Singh Hemne,S.Chand and Co.New Delhi,2017

3.Shukla.R.K.,New Age International,2nd Edition.,New Delhi

4. Gupta.S.L. Kumar.V. Pragati Prakashan.M., 2016, New Delhi.

Web Resources:

1 https://www.slideshare.net/mobile/sunilrathore77398/basicanalogelectronics

2 https://www.slideshare.net/mobile/PatruniChidanandaSas/basics-of-electronics-53962342

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Analyze the different types of spectra and its applications	**K4**
CO2:	Realize the applications of LCR circuits.	**K2**
CO3:	Update the knowledge of Spot Galvanometer	**K2**
CO4:	Analyze the knowledge of Bridge circuits	**K4**
CO5:	Gain knowledge of applying Laser Beam	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**3**	**2**	**2**	**3**
CO 2	**2**	**3**	**2**	**3**	**3**	**2**
CO 3	**2**	**3**	**2**	**2**	**2**	**3**
CO 4	**3**	**3**	**2**	**2**	**2**	**3**
CO 5	**3**	**2**	**1**	**3**	**3**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

SEM	Name of the Experiments	Hrs	Mode
I	1.Spectrometer - i-d curve 2.Grating - Minimum deviation method 3.L.C.R - Series resonance circuit 4. Spot Galvanometer -Determination of (M) Mutual induction. 5.Anderson's Bridge (AC Method) -Self inductance 6.Potentiometer - Calibration of Ammeter 7.Laser-Determination of wavelength and particle size 8.Spot Galvanometer - Comparison of (M) Mutual inductances	45	Demonstration
II	1. Spectrometer - i – i'curve 2. Spectrometer - Cauchy's Constants 3.Spectrometer - Hartmann's Interpolation formula 4.Maxwell's Bridge (AC Method) - Self inductance 5.Light Intensity - Inverse Square Law 6.Spot Galvanometer - Absolute Capacity of a Condenser 7.L.C.R - Parallel resonance circuits 8.Impedance and Power factor - L.R.circuit	45	Demonstration

Course Designed by: Dr. P. Kavitha & Dr. S. S. Jayabalakrishnan

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**ELECTRONICS PRACTICAL**			
Course Code	**21UPHCP4**	**L**	**P**	**C**
Category	**CORE**	-	3	-

Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP	

Course Objectives:

The learners will be able to

1.Understand the principles and applications of Digital Electronics

2. Understand the principles and applications of Analog Electronics

3. Gain knowledge about the development of the Microprocessors.

4. Motivate the students to apply the principles of Digital Electronics in their day–to–day life.

5. Motivate the students to apply the principles of Analogl Electronics in their day–to–day life.

LIST OF EXPERIMENTS
Any Fourteen Experiments

1.Determination Band gap	-	Semiconductor
2.Zener Diode	-	Characteristics
3.Transistor	-	Characteristics CE mode
4.Zener Diode	-	Voltage Regulator
5.Single Stage Amplifier	-	Voltage Gain
6.Hartley Oscillator	-	Inductance of pair of coils
7.Astable Multivibrator	-	Discrete components
8.Logic Gates	-	Discrete Components (OR,AND,NOT,NOR and NAND)
9.Logic Gates	-	IC(7432, 7408, 7404, 7402, 7400 and 7486)
10. Adder and Subtractor	-	OPAMP - IC 741
11. Astable Multivibrator	-	TIMER - IC 555
12. NOR as Universal Gate	-	IC 7402
13. NAND as Universal Gate	-	IC 7400
14. Half Adder, Full Adder	-	IC 7486, IC 7408 and IC 7432
15. Four Bit Binary Adder	-	IC 7483
16. Four Bit Binary Subtractor	-	IC 7483 and IC 7404

	Total Lecture Hours	**180 Hrs**

Books For Study:

1.Srinivasan.M.N.,Balasubramanian.S.,Ranganathan.R.,A Text Book of Practical Physics,2017 Edition Sultan Chand & Sons

Books For Reference:

1.Ouseph.C., Practical Physics and Electronics,2013.S.Viswanathan.P.Ltd.

2.Hamam Singh Hemne,S.Chand and Co.New Delhi,2017

3.Shukla.R.K.,New Age International,2nd Edition.,New Delhi

4. Gupta.S.L. Kumar.V. Pragati Prakashan.M., 2016, New Delhi.

Web Resources:

1 https://www.slideshare.net/mobile/sunilrathore77398/basicanalogelectronics
2 https://www.slideshare.net/mobile/PatruniChidanandaSas/basics-of-electronics-53962342
3.http://www.sircrrengg.ac.in/images/Others/CSE/MP-LAB-MANUAL.pdf
4. https://www.youtube.com/playlist?list=PL_pGb42kre_QXwuaizYb21tSYpoHyXsCQ

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Analyze the different types of digital circuits and their applications	**K4**
CO2:	Realize the applications of registers in computers	**K3**
CO3:	Update the knowledge of Microprocessor programming	**K2**
CO4:	Analyze the knowledge of Oscillators function	**K4**
CO5:	Gain knowledge of applying various IC's	**K2**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**3**	**3**	**3**	**1**
CO 2	**2**	**1**	**3**	**2**	**2**	**2**
CO 3	**3**	**2**	**2**	**3**	**2**	**3**
CO 4	**2**	**2**	**2**	**2**	**3**	**2**
CO 5	**1**	**2**	**2**	**2**	**2**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

SEM	Name of the Experiments	Hrs	Mode
I	1. Determination Band gap - Semiconductor 2. Zener Diode - Characteristics 3. Single Stage Amplifier - Voltage Gain 4. Astable Muitivibrator - Discrete Components 5. Logic Gates - Discrete Components (OR, AND, NOT, NOR and NAND) 6. NAND as Universal Gate - IC 7400 7. Half Adder, Full Adder - IC 7486, IC 74O8 and IC 7432 8. Four Bit Binary Adder - IC 7483	90	Demonstration
II	1. Zener Diode - Voltage Regulator 2. Transistor - Characteristics CE mode 3. Hartley Oscillator - Inductance of pair of coils 4. Logic Gates - IC(7432, 7408, 7404, 7402, 7400 and 7486) 5. NOR as Universal Gate - IC 7402 6. Adder and Subtractor - OPAMP - IC 741 7. Astable Multivibrator - TIMER - IC 555 8. Four Bit Binary Subtractor - IC 7483 and IC 7404	90	Demonstration

Course Designed by: Dr.P.Kavitha & Dr.S.S.Jayabalakrishnan

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**CONCEPTS OF NUCLEAR PHYSICS**								
Course Code	**21UPHE51**						**L**	**P**	**C**
Category	**Elective**						5	-	5
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENEURSHIP				

Course Objectives:

The learners will be able to

1. Understand the structure of the nucleus and nuclear forces.
2. Understand working of particle accelerators and detectors.
3. Remember the laws and properties of radioactivity , Alpha and Beta decay
4. Understand the nuclear transmutations, photo disintegration, nuclear fission and fusion.
5. Apply the nuclear energy to the production of electricity using different reactors.

Unit: I	**Nuclear Structure** **General Properties of atomic nucleus – Nuclear Binding energy – Nuclear stability -– Yukawa's theory (No. derivation) – Theories of nuclear composition – Proton Electron hypothesis – Nuclear forces - Models of nuclear structure – Liquid drop model – Binding energy formula – Shell model**	**15**
Unit: II	**Nuclear Accelerators and Detectors** **Particle accelerators – Synchrocyclotron – Betatron–Detectors – Wilson cloud chamber – Bubble chamber – Elementary particles – Particles and AntiParticles – Conservation laws and symmetry.**	**15**
Unit: III	**Radioactivity** Laws of radioactivity – Half life period – Mean life – Radio carbon dating – Alpha rays – Properties - Range – Geiger Nuttal law – Experimental determination of range – Alpha disintegration energy – Gamow's Theory of alpha decay – Beta rays – Neutrino theory of beta decay – Gamma rays – Origin – Internal conversion.	**15**
Unit: IV	**Nuclear Reactions** Nuclear transmutations by alpha particles , protons, deuterons, neutrons and electrons – Photo disintegration – Q value calculation in Photo disintegration – Nuclear fission – Explanation for release of energy - Nuclear fusion – (C- N cycle and P-P Cycle).	**15**
Unit: V	**Nuclear Energy** Production of electricity from Nuclear energy – Nuclear reactors – General features of nuclear reactor – Different types of nuclear reactors – Pressurized water reactors – Boiling water reactors – Fast Breeder reactors – Radiation hazards- Radio isotopes and their applications.	**15**
	Total Lecture Hours	**75 Hrs**

Books For Study:

R.Murugesan and Kiruthiga Sivaprasath, **Modern Physics,** S.Chand and Co., New Delhi Sixteenth Edition, 2012.

Unit I : Chapter: 27 (Section: 27.1 - 27.12)

Unit II: Chapter: 29 (Section: 29.7, 29.9 and 29.11)

Chapter: 30 (Section: 30.5, 30.6, 30.8)

Chapter: 38 (Section 38.1, 38.2 and 38.6)
Unit III: Chapter: 31 (Section: 31.4, 31.10 - 31.12, 31.16, 31.22 - 31.25, 31.30, 31.31 and 31.35)
Unit IV: Chapter: 34 (Section: 34.7)
Chapter 35 (Section 35.2 - 35.4, 35.7 - 35.9)
Chapter 37 (Section 37.1, 37.5, 37.6 and 37.10)
Unit V: Chapter 35 (Section: 35.5 and 35.6)
Chapter 36 (Section 36.1 - 36.3)

4. Chapter 32 (Section 32.1 - 32.5)

Books For References :

1. D.C.Thayal, **Nuclear Physics**, Himalaya Publishing House, NewDelhi, 2004.
2. I. Kaplan,**Nuclear Physics,** Tata McGraw Hill, NewDelhi,1995.
3. ArtherBeiser, **Perspective of Modern Physics**, Tata McGraw Hill, NewDelhi, 1997.
4. D.I.Sehgal, K.I.Chopra, and N.K.Sehgal, **Modern Physics,** Sultan Chand and Sons Publications, 7th Edition, New Delhi, 1993.

Web Resources:

https://nptel.ac.in/courses/115/104/115104043/
https://nptel.ac.in/courses/115/104/115104043/
https://nptel.ac.in/content/syllabus_pdf/115103101.pdf

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Understand the nuclear forces, models of nuclear structure, elementary particles, and laws of radio activity fission and fusion reactions, Types of nuclear reactors.	**k2**
CO2:	Application of nuclear binding energy, Synchrotron, synchrocyclotron, wavelength of crystal spectrometer, Thermo nuclear reaction, Radio isotopes .	**K3**
CO3:	Analyze nuclear models, chamber, internal conversion of energy, C-N cycle and P-P cycle, nuclear reactor.	**K4**
CO4:	Evaluate liquid drop model, photographic emulsion technique, neutrino theory and β decay, van Allen belts, electricity from nuclear energy.	**K4**
CO5:	Determine the particle accelerators, disintegration energy, nuclear transmutations, varies types, radio isotopes.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**3**	**3**	**3**	**3**	**2**
CO 2	**3**	**2**	**2**	**2**	**3**	**3**
CO 3	**3**	**3**	**3**	**2**	**3**	**2**
CO 4	**3**	**2**	**2**	**3**	**3**	**3**
CO 5	**3**	**3**	**1**	**3**	**3**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	General Properties of atomic nucleus – Nuclear Binding energy – Nuclear stability -– Yukawa's theory (No. derivation) – Theories of nuclear composition – Proton Electron hypothesis – Nuclear forces - Models of nuclear structure – Liquid drop model – Binding energy formula – Shell model	15	PPT, Lecture, Chalk & Talk
II	Particle accelerators – Synchrocyclotron – Betatron–Detectors – Wilson cloud chamber – Bubble chamber – Elementary particles – Particles and AntiParticles – Conservation laws and symmetry.	15	PPT, Lecture, Chalk & Talk
III	Laws of radioactivity – Half life period – Mean life – Radio carbon dating – Alpha rays – Properties - Range – Geiger Nuttal law – Experimental determination of range – Alpha disintegration energy – Gamow's Theory of alpha decay – Beta rays – Neutrino theory of beta decay – Gamma rays – Origin – Internal conversion.	15	PPT, Lecture, Chalk & Talk
IV	Nuclear transmutations by alpha particles , protons, deuterons, neutrons and electrons – Photo disintegration – Nuclear fission – Explanation for release of energy - Nuclear fusion – (C- N cycle and P-P Cycle) - Thermo nuclear reactions – Controlled thermo nuclear reactions.	15	PPT, Lecture, Chalk & Talk
V	Production of electricity from Nuclear energy – Nuclear reactors – General features of nuclear reactor – Different types of nuclear reactors – Pressurized water reactors – Boiling water reactors – Fast Breeder reactors – Radiation hazards- Radio isotopes and their applications.	15	PPT, Lecture, Chalk & Talk

Course Designed by: Dr. R. Sangeetha & Mrs. A. Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**		**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K4	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**CONDENSED MATTER PHYSICS**			
Course Code	**21UPHE52**	**L**	**P**	**C**
Category	**Elective**	5	-	5

Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENEURSHIP	

Course Objectives:

The learners will be able to

1.Understand the arrangements of atoms in the crystalline materials and specific heat theories of solids.

2Understand the electrical and thermal conductivities of metal, properties and applications superconductors.

3.Remember the different types of magnetism, properties and applications of magnetic materials.

4.Understand the different types of polarization, dielectric loss, dielectric strength and breakdown

5.Understand the general properties of semiconductors, carrier concentration for intrinsic and extrinsic semiconductors.

Unit: I	**Crystal Structures** Crystal lattice – Unit cell – Bravais lattice –Miller indices– Crystal structures and calculation of packing factor (SC,BCC,FCC) –Structure of diamond and Zinc blende – Einstein's theory of specific heat– Debye's theory of specific heat	**15**
Unit: II	**Conducting and Superconducting Materials** Free electron theory of metals – Electron drift, mobility, mean free path, relaxation time, electrical and thermal conductivities of metals – Widemann Franz law – Super conductivity – Properties of Superconductors - BCS theory – Applications of super conductors (Squids, Magnetic levitation)	**15**
Unit: III	**Magnetic Materials** Different types of magnetism – Dia, Para, Ferro, Anti ferro and Ferrimagnetisms – Langevin's theory of dia and para magnetism – Weiss theory of ferro magnetism – Magnetic materials – Properties and applications – Hard and soft magnetic materials – Ferrites.	**15**
Unit: IV	**Dielectrics** Dielectrics – Polarization – Polar and non polar dielectrics – Dielectric constant – Polarisability – Clausius - Mosotti relation - Different types of polarization – electronic, ionic, orientational, space charge polarizations – Dependence of polarization on frequency and temperature – Dielectric loss – Dielectric strength and breakdown.	**15**
Unit: V	**Semiconducting materials** Semiconducting materials-General properties of the semiconductors-Classification of semiconductors-Intrinsic semiconductor-Carrier concentration -derivation-Extrinsic semiconductor-Carrier concentration in n-type and p-type semiconductor and impurity concentration-Direct and Indirect band gap semiconductors	**15**
	Total Lecture Hours	**75 Hrs**

Books for Study: 1. Dr. M. Arumugam, **Material Science, Anuradha** Publications, III Revised Edition, Reprint 2016.

Unit –I : Page No., 3.1 – 3.2, 3.4-3.5, 3.7-3.8, 3.18-3.21, 3.24, 3.26,4.41-4.47
Unit – II: Page No., 4.2, 5.5 – 5.9, 5.16 – 5.20, 8.1- 8.5, 8.12, 8.15.
Unit – III: Page No., 7.1 – 7.14, 7.23 –7.29
Unit – IV: Page No., 6.1 – 6.14, 6.17 –6.20

2 Dr. M. Arumugam, Solid State Physics, Anuradha Publication, First Edition,2004.
Unit – V: Page No., 9.1 - 9.17

Books For Reference:

1. R. K. Puriand V.K. Babbar, **Solid state physics**, S.Chandand Co, I Edition,1997.
2. HallidayResnick, Jearl Walker, **Principles of physics** (9th Edition), Wiley India Pvt. Ltd., New Delhi,2012.
3. Dr. P. Mani, **Engineering Physics– II**, Dhanam Publications, Nineth Edition, Reprint November20

Web Resources:

https://www.youtube.com/channel/UCcW7z2pE37Z4I1koTwahBfA
https://www.britannica.com/science/condensed-matter-physics
https://sciencesprings.wordpress.com/tag/condensed-matter-physics/

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Understand crystal structure, free electron theory of metals, types of magnetism, polar and non polar dielectrics, properties of semiconductor**.**	**K2**
CO2:	Application of Miller indices, conductivities of metals, Langevin's theory of dia and para magnetism, Intrinsic and Extrinsic semiconductor	**K3**
CO3:	Analyse the structure of diamond and zinc blende, Widemannfranz law, magnetic materials, types of polarization, carrier concentration.	**K4**
CO4:	Analyse specific heat theories of solids, BCS theory, hard and soft magnetic materials, frequency and temperature dependence, variation of Femi level.	**K4**
CO5:	Determine the crystal structure, Application of superconductors, Magnetic material, Dielectric material, Semiconducting Material.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**3**	**3**	**3**	**3**	**3**
CO 2	**3**	**3**	**3**	**2**	**3**	**3**
CO 3	**3**	**2**	**2**	**3**	**3**	**3**
CO 4	**3**	**3**	**1**	**2**	**3**	**1**
CO 5	**3**	**3**	**2**	**2**	**3**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Crystal lattice – Unit cell – Bravais lattice –Miller indices– Crystal structures and calculation of packing factor (SC,BCC,FCC) –Structure of diamond and Zinc blende – Specific heat theories of solids – Einstein's theory of specific heat– Debye's theory of specific heat	15	Lecture, Chalk & Talk, Demonstration
II	Free electron theory of metals – Electron drift, mobility, mean free path, relaxation time, electrical and thermal conductivities of metals – Widemann Franz law – Super conductivity – Properties of Superconductors - BCS theory – Applications of super conductors (Squids, Magneticlevitaion)	15	Lecture, Chalk & Talk, Demonstration
III	Different types of magnetism – Dia, para, ferro, anti ferro and ferimagnetism – Langevin's theory of dia and para magnetism – Weiss theory of ferro magnetism – Magnetic materials – Properties and applications – Hard and soft magnetic materials – Ferrites.	15	Lecture, Chalk & Talk, Demonstration
IV	Dielectrics – Polarization – Polar and non polar dielectrics – Dielectric constant – Polarisability – Clausius - Mosotti relation - Different types of polarization –electronic, ionic, orientational, space charge polarizations – Dependence of polarization on frequency and temperature – Dielectric loss – Dielectric strength and breakdown.	15	Lecture, Chalk & Talk, Demonstration
V	Semiconducting materials-General properties of the semiconductors-Classification of semiconductors-Intrinsic semiconductor-Carrier concentration derivation-Variation of Fermi level with temperature-Extrinsic semiconductor-Carrier concentration in n-type and p-type semiconductor-Variation of Fermi level with temperature and impurity concentration-Direct and Indirect band gap semiconductors	15	Lecture, Chalk & Talk, Demonstration

Course Designed by: Dr. R. Sangeetha & Mrs. A. Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**		**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K4	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q. No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q. No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q. No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**BASICS OF ASTROPHYSICS**			
Course Code	**21UPHE53**	**L**	**P**	**C**
Category	**Elective**	5	-	5

Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP

Course Objectives:
The learners will be able to
1. Understand the Understanding the Sky and Constellation.
2. Understand the Special Theory of Relativity and Telescopes.
3. Remember the Planets, Kepler's Laws, Comets and Asteroids.
4. Understand the sun structure and nuclear fusion.
5. Apply the concepts of astrophysics to the Astronomy and cosmology.

Unit: I	**Sky** Understanding the Sky-Constellation – Birth of Modern Astronomy – Geocentric Theory– Heliocentric Theory.	**15**
Unit: II	**Light and Telescopes** The Speed of Light – The Constancy of the Speed of Light – The Special Theory of Relativity – Telescopes – Aperture – Focal length – Magnification or Power – Radio Telescopes – Infrared Telescopes – Ultraviolet, X- Ray and Gamma Telescopes.	**15**
Unit: III	**Our Solar system** Planets – Terrestrial Planets – The Jovian Planets – Mercury – Venus – Earth and the Moon – Mars – Jupiter – Saturn – Uranus – Neptune – Dwarf Planets and Kuiper Belt – Kepler's Laws – Comets – Asteroids – Meteoroids – Meteors – PHOs. Stars: Star Formation – The Hertzsprung – Russell (HR) Diagram – Chandrasekhar's Limit – Distance Determination. Parallax Method of Stars – Limitation of Distance Measurement Using Stellar Parallax – Absolute and Apparent Magnitude – Star Death.	**15**
Unit: IV	**SUN** Sun Structure – Temperature at Various Zones – Sunspots, Solar Flares and Evershed Effect – Differential Rotation of Sun – Prominences – Granules – Nuclear Fusion – Seasons – Moon – Lunar eclipse – Solar Eclipse – Binary Stars.	**15**
Unit: V	**Cosmology** Astronomy and cosmology – Expansion of the Universe – Cosmic Ray Background – The Steady State alternative – Dark Matter and Dark Energy – Big Bang and Big Crunch– Pulsating Theory – Galaxies – Closed, Open and Flat universe – Future of Universe – Cosmology, Philosophy and Theology.	**15**
	Total Lecture Hours	**75 Hrs**

Books for Study:

Dr. S. Stephen Rajkumar Inbanathan, **Introduction to Astronomy for Beginners**, 2019.

UNIT –I : Chapter–1 & 2
UNIT–II : Chapter –3
UNIT–III : Chapter –4 & 5 (5.1 to 5.5)
UNIT–IV : Chapter –5 (5.6 to 5.10)
UNIT–V : Chapter –6

Books for Reference:

1. Jay M. Pasachoff, **ASTRONOMY From the earth to the universe**, saunders college publishing, 2006.
2. DianahL. Moche, **ASTRONOMY A self- teaching guide**, John Wiley & sons, Inc, 2015

Web Resources:

1. http://map.gsfc.nasa.gov/universe/WMAP_Universe.pdf
or http://map.gsfc.nasa.gov/universe/
2.https://archive.nptel.ac.in/courses/115/105/115105046/#watch
3. https://www.youtube.com/watch?v=6zUsYkRfhiM

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Understand basic concepts of positional astronomy like astronomical coordinate system, astronomical techniques, various types of optical telescopes and telescope mountings, various types of detectors and their use with telescopes and Physics of sun and our solar system.	**K2**
CO2:	Measure distances, time, temperature and radius of star	**K3**
CO3:	Analysis of speed of light, Chandrasekhar's Limit and differential Rotation of Sun	**K4**
CO4:	Evaluate aperture, focal length and magnification or power of telescopes.	**K4**
CO5:	Develop ideas on Future of Universe	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**3**	**2**	**3**	**2**
CO 2	**2**	**3**	**2**	**1**	**3**	**2**
CO 3	**2**	**1**	**2**	**2**	**2**	**2**
CO 4	**3**	**2**	**2**	**3**	**2**	**3**
CO 5	**3**	**3**	**1**	**2**	**3**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Understanding the Sky-Constellation – Birth of Modern Astronomy – Geocentric Theory– Heliocentric Theory.	15	Lecture, Chalk & Talk, Demonstration
II	The Speed of Light – The Constancy of the Speed of Light – The Special Theory of Relativity – Telescopes – Aperture – Focal length – Magnification or Power – Radio Telescopes – Infrared Telescopes – Ultraviolet, X- Ray and Gamma Telescopes.	15	Lecture, Chalk & Talk, Demonstration
III	Planets – Terrestrial Planets – The Jovian Planets – Mercury – Venus – Earth and the Moon – Mars – Jupiter – Saturn – Uranus – Neptune – Dwarf Planets and Kuiper Belt – Kepler's Laws – Comets – Asteroids – Meteoroids – Meteors – PHOs. Stars: Star Formation – The Hertzsprung – Russell (HR) Diagram – Chandrasekhar's Limit – Distance Determination. Parallax Method of Stars – Limitation of Distance Measurement Using Stellar Parallax – Absolute and Apparent Magnitude – Star Death.	15	Lecture, Chalk & Talk, Demonstration
IV	Sun Structure – Temperature at Various Zones – Sunspots, Solar Flares and Evershed Effect – Differential Rotation of Sun – Prominences – Granules – Nuclear Fusion – Seasons – Moon – Lunar eclipse – Solar Eclipse – Binary Stars.	15	Lecture, Chalk & Talk, Demonstration
V	Astronomy and cosmology – Expansion of the Universe – Cosmic Ray Background – The Steady State alternative – Dark Matter and Dark Energy – Big Bang and Big Crunch– Pulsating Theory – Galaxies – Closed, Open and Flat universe – Future of Universe – Cosmology, Philosophy and Theology.	15	Lecture, Chalk & Talk, Demonstration

Course Designed by: Dr.G.Dhanalakshmi & Mrs.A.Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**		**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K4	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**FUNDAMENTALS OF MOLECULAR SPECTROSCOPY**							
Course Code	**21UPHE54**					**L**	**P**	**C**
Category	**Elective**					5	-	5
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENEURSHIP			

Course Objectives:

The learners will be able to

1. The general features of spectroscopy.
2. The principle and applications of spectroscopy.
3. The instrumentation of spectrophotometers
4. The interaction of radiation with molecules

5.Structural analysis of organic compounds using spectroscopy

Unit: I	**General Features of Spectroscopy** Units and conversion factors - Introduction to spectroscopy- Nature of radiation- Energies corresponding to various kinds of radiation- interaction of electromagnetic radiation with matter- absorption, emission, transmission, reflection, dispersion, polarization and scattering. Uncertainty relation & natural line width and natural line broadening, rotational, vibrational & electronic energy levels.	**15**
Unit: II	**IR Spectroscopy** Vibrational energy of diatomic molecule – Selection rules – vibrating diatomic molecule- diatomic vibrating rotator – asymmetry of rotation – vibration band – vibrations of polyatomic molecules – Rotation – vibration spectra of poly atomic molecules – Interpretation of vibrational spectra – IR spectrophotometer – sample handling techniques – Fourier transform IR spectrometer – applications	**15**
Unit: III	**UV and Visible Spectroscopy** The Nature of Electronic Excitations - Principles of Absorption Spectroscopy - Instrumentation- Chromosomes and Auxochromes – Electronic transition in organic molecules – types; Solvent effect; selection rule for electronic transition, Frank condon principle- Woodward-Fieser rule for polyenes and ⟨-® unsaturated carbonyl compounds, application of UV-visible spectroscopy.	**15**
Unit: IV	Mass Spectrometry Sample Introduction, Ionization methods: Electronic Ionisation (EI) & Chemical Ionisation (CI), Desorption Ionization Techniques :FAB, SIMS, MALDI. Mass Analysis- The Magnetic Sector Mass Analyzer- Double-Focusing Mass Analyzers- Quadrupole Mass Analyzers, isotope abundance, Metastable ions, general rules predicting the fragmentation patterns-determination of molecular ion peak, fragmentation patterns for aliphatic compounds, amines, aldehydes, Ketones alone.	**15**

Unit: V	**NMR Spectroscopy** Nuclear Spin States- Nuclear Magnetic Moments- The Mechanism of Absorption (Resonance) - Population Densities of Nuclear Spin States- The Chemical Shift and Shielding- The Nuclear Magnetic Resonance Spectrometer- The Continuous-Wave (CW) Instrument- The Pulsed Fourier Transform (FT) Instrument- Chemical Equivalence—A Brief Overview-Chemical Environment and Chemical Shift-Magnetic Anisotropy-Spin–Spin Splitting (n +1) Rule-Pascal's Triangle- Proton NMR spectrum of ethanol.	**15**
	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Unit - I - study material given
2. Pavia, Lampman & Kriz, Introduction to Spectroscopy.5th edition, Cengage Learning.
   Unit II - chapter 2
   Unit - III - chapter 10
   Unit - IV - chapter 3 & 4
   Unit - V - chapter 5

Books for Reference:

1. C.N Banwell "**Fundamentals of Molecular Spectroscopy**", 4th edition ,McGraw Hill Education
2. R. M. Silverstein, G.C.Bassler, T.C. Morrill, "**Spectrometic Identification of Organic Compounds**.6th edition, wiley

3.W. Kemp, "**Organic Spectroscopy**" 3rd edition, Red Globe Press

Web Resources:

https://archive.nptel.ac.in/courses/104/106/104106122
https://www.britannica.com/science/spectroscopy/Molecular-spectroscopy
https://nptel.ac.in/courses/104101099

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	state the general features of spectroscopy	**K2**
CO2:	demonstrate the principle and applications of vibrational spectroscopy	**K3**
CO3:	make use of the theory of electronic spectroscopy in analyzing compounds	**K4**
CO4:	analyse the structure of organic compounds using NMR spectroscopic techniques	**K4**
CO5:	Explain the applications of mass spectrometry in identifying various types of molecules	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	2	3	1	2
CO 2	1	2	2	1	1	1
CO 3	2	2	2	3	1	1
CO 4	2	2	2	2	1	1
CO 5	3	2	2	2	2	1

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Units and conversion factors - Introduction to spectroscopy- Nature of radiation- Energies corresponding to various kinds of radiation- interaction of electromagnetic radiation with matter- absorption, emission, transmission, reflection, dispersion, polarization and scattering. Uncertainty relation & natural line width and natural line broadening, rotational, vibrational & electronic energy levels.	15	Ppt,Lecture, Chalk & Talk, Demonstration
II	Vibrational energy of diatomic molecule – Selection rules – vibrating diatomic molecule– diatomic vibrating rotator – asymmetry of rotation – vibration band – vibrations of polyatomic molecules – Rotation – vibration spectra of poly atomic molecules Interpretation of vibrational spectra – IR spectrophotometer – sample handling techniques – Fourier transform IR spectrometer – applications- problems (simple hydrocarbons-alcohols, aldehydes, ketones, carboxylic acids)	15	Ppt,Lecture, Chalk & Talk, Demonstration
III	The Nature of Electronic Excitations - Principles of Absorption Spectroscopy - Instrumentation- Chromosomes and Auxochromes – Electronic transition in organic molecules – types; Solvent effect; selection rule for electronic transition, Frank condon principle- Woodward-Fieser rule for polyenes and ⟨-® unsaturated carbonyl compounds	15	Ppt,Lecture, Chalk & Talk, Demonstration
IV	Sample Introduction, Ionization methods : Electronic Ionisation (EI) & Chemical Ionisation (CI), Desorption Ionization Techniques :FAB, SIMS, MALDI. Mass Analysis- The Magnetic Sector Mass Analyzer- Double-Focusing Mass Analyzers- Quadrupole Mass Analyzers- Time-of-Flight Mass Analyzers isotope abundance, Metastable ions, general rules predicting the fragmentation patterns-determination of molecular ion peak, fragmentation patterns for aliphatic compounds, amines, aldehydes, Ketones alone	15	Ppt,Lecture, Chalk & Talk, Demonstration
V	Nuclear Spin States- Nuclear Magnetic Moments- The Mechanism of Absorption (Resonance) - Population Densities of	15	Ppt,Lecture,

	Nuclear Spin States- The Chemical Shift and Shielding- The Nuclear Magnetic Resonance Spectrometer- The Continuous-Wave (CW) Instrument- The Pulsed Fourier Transform (FT) Instrument Chemical Equivalence—A Brief Overview-Chemical Environment and Chemical Shift-Magnetic Anisotropy-Spin–Spin Splitting (n +1) Rule-Pascal's Triangle- Proton NMR spectrum of ethanol.		**Chalk & Talk, Demonstration**

Course Designed by: Ms. N. Lakshmi Kruthika & Mrs.A.Lakshmi

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of. Questions	K - Level	No. of. Questions	K - Level		
CI AI	CO1	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	CO3	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**		**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	**COs**	**K - Level**	**MCQs**		**Short Answers**		**Section C (Either / or Choice)**	**Section D (Open Choice)**
			No. of Questions	**K – Level**	**No. of Question**	**K – Level**		
1	CO1	**Upto K2**	**2**	**K1& K2**	**1**	**K1**	**2(K1 & K1)**	**1(K2)**
2	CO2	**Upto K3**	**2**	**K& K2**	**1**	**K1**	**2(K3 & K3)**	**1(K3)**
3	CO3	**Upto K4**	**2**	**K& K2**	**1**	**K2**	**2(K3 & K3)**	**1(K4)**
4	CO4	**Upto K4**	**2**	**K1& K2**	**1**	**K2**	**2(K4 & K4)**	**1(K3)**
5	CO5	**Upto K4**	**2**	**K1 & K2**	**1**	**K2**	**2(K2 & K2)**	**1(K3)**
No. of Questions to be Asked			**10**		**5**		**10**	**5**
No.of Questions to be answered			**10**		**5**		**5**	**3**
Marks for each question			**1**		**2**		**5**	**10**
Total Marks for each section			**10**		**10**		**25**	**30**
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either/ or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**SENSORS AND ORGANIC ELECTRONICS**								
Course Code	**21UPHE55**						**L**	**P**	**C**
Category	**Elective**						5	-	5
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENEURSHIP				

Course Objectives:
The learners will be able to
1. Fundamentals and types of sensors.
2. The principles of electromagnetic sensors.
3. Remember the theory of temperature sensors
4. Understand the components and working of OLEDs
5.Apply the novel organic electronic materials

Unit: I	**Sensor based measurement systems** General concepts - principles and terminology - sensor classification - Parameters - static characteristics - dynamic characteristics - Environmental parameters - characterisation- electrical - mechanical and thermal- optical - chemical or biological characterization	**15**
Unit: II	**Mechanical and Electromechanical Sensors** Potentiometers - Strain Gages - Inductive Sensors : Ferromagnetic plunger type transducers, Electromagnetic transducer, magnetostrictive transducer - Capacitive sensors: the parallel plate capacitive sensor, Electrostatic transducer, Piezoelectric elements, Force sensors, Ultrasonic sensors	**15**
Unit: III	**UV and Visible Spectroscopy** Acoustic Temperature Sensors - Nuclear Thermometer - Magnetic Thermometer- Semiconductor Types - Thermal Radiation sensors - Quartz Crystal thermoelectric sensors - Spectroscopic Thermometry - Noise Thermometry - Heat Flux Sensors.- Magnetoresistive sensors - Inductance and Eddy current sensors- stitching magnetic sensors	**15**
Unit: IV	**Organic Light emitting Diodes** Luminescence in organic Semiconductors - HOMO and LUMO - charge transport - organic vs inorganic luminescent materials- artificial lighting- electrically powered incandescent and luminescent lamps- solid state lighting - CSL ith OLEDs - LEDs Vs OLEDs	**15**
Unit: V	**Novel Organic electronic materials** Organic Photovoltaic Devices (OPDs) using Polymer-Fullerene Bulk heterojunction thin films. Interface effects and improvement in Polymer Solar Cells (PSCs) efficiency. Introduction to some other advanced concepts viz. Organic electro chromic materials and devices, multiphoton absorbing materials and devices and	**15**

	Nonvolatile Organic Thin Film Memory Device	
	Total Lecture Hours	**75 Hrs**

Books for Study:

1. Patranabis D., "**Sensors and Transducers**", Prentice-Hall India, 2nd Ed., 2004.
   Unit I - chapter - 1
   Unit II - chapter 2
   Unit III - chapter 3 & 4
2. Thejo kalyani, "Principles and applications of OLEDs" oodhead Publishing

Unit IV - chapter 2, 4, 5

Books for Reference:

1. Ramon Pallas & John G. Webster, "**Sensors and Signal Conditioning**", John Wiley & Sons, 2nd Ed., 2001.
2. K. Morigaki, **Physics of amorphous semiconductors**, Imperial College Press, 1999, ISBN: 981-02-1381-6. 4. G. Hadziioannou and G. Malliaras, Semiconducting Polymers: Chemistry, Physics and Engineering, Wiley Interscience, 2007.

3.Christof Woll, **Physical and Chemical aspects of Organic electronics**, wiley publications

Web Resources:

https://nptel.ac.in/courses/108108147
https://archive.nptel.ac.in/courses/115/107/115107122/
https://archive.nptel.ac.in/courses/113/104/113104012/

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	define theterms and characteristics of sensors.	**K2**
CO2:	compare and contrastvarious types of sensors.	**K3**
CO3:	outline the principles of temperature sensors.	**K4**
CO4:	interpret and relate the structure and properties of OLEDs.	**K4**
CO5:	construct various organic electronic materials.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**1**	**2**	**2**	**1**	**1**
CO 2	**2**	**2**	**1**	**2**	**1**	**1**
CO 3	**2**	**2**	**2**	**2**	**1**	**1**
CO 4	**2**	**1**	**2**	**2**	**1**	**1**
CO 5	**2**	**2**	**1**	**2**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	General concepts and terminology, sensor classification, general input- output configuration, static characteristics of measurement systems, Dynamic characteristics, primary sensor, materials for sensor, Microsensor Technology.	15	Ppt,Lecture, Chalk & Talk, Demonstration
II	Potentiometers, Strain Gages, Resistive Temperature Detectors (RTDs), Thermistors, Magnetoresistors, Light-Dependent Resistors (LDRs), Resistive Hygrometers, Resistive Gas Sensors, Liquid Conductivity Sensors, Signal Conditioning for Resistive Sensors: Resistance Measurement, Voltage Dividers, Dynamic Measurements, Capacitive Sensors, Inductive Sensors, Electromagnetic Sensors.	15	Ppt,Lecture, Chalk & Talk, Demonstration
III	Thermoelectric Sensors: Thermocouples, Piezoelectric Sensors, Pyroelectric Sensors, Electrochemical Sensors, Acoustic Temperature Sensors, Nuclear Thermometer, Magnetic Thermometer, Semiconductor Types, Thermal Radiation, Quartz Crystal, NQR, Spectroscopic Noise Thermometry, Heat Flux Sensors.	15	Ppt,Lecture, Chalk & Talk, Demonstration
IV	Materials and Interface Engineering in Organic Light Emitting Diodes (OLEDs). OLED materials and device architecture for full colour displays and solid state lighting. Theory and operation principle of Organic Field Effect Transistors (OFETs). Interface Characterization, Threshold Voltage and subthreshold swing and charge carrier mobility in OFETs. Application of OFETs in Displays.	15	Ppt,Lecture, Chalk & Talk, Demonstration
V	Organic Photovoltaic Devices (OPDs) using Polymer-Fullerene Bulk heterojunction thin films. Interface effects and improvement in Polymer Solar Cells (PSCs) efficiency. Introduction to some other advanced concepts viz. Organic electrochromic materials and devices, multiphoton absorbing materials and devices and Nonvolatile Organic Thin Film Memory Device.	15	Ppt,Lecture, Chalk & Talk, Demonstration

Course Designed by: Ms. N. Lakshmi Kruthika & Mrs.A.Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CIA I	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CIA II	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**		**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K4	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**PARTICLE PHYSICS**								
Course Code	**21UPHE56**						**L**	**P**	**C**
Category	**Elective**						5	-	5
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENEURSHIP				

Course Objectives:

The learners will be able to

1. Basics of fundamental particles.
2. Discrete symmetries of particles.
3. Illustration of Gauge Symmetries and Quantum chromodynamics.
4. Symmetry breaking.
5. Categorization of Standard Model electroweak interactions.

Unit: I	**Insight on Particles** Fundamental particles and their searches- Accelerators and colliders- Basic interactions- Relativity, antiparticles- Rotation, Isospin, Addition of Angular momentum- Conservation laws in decays and scattering.	**15**
Unit: II	**Discrete Symmetries** Charge Conjugation (C) , Parity (P) and Time reversal (T) - Transformation of spinor bilinears under C, P, T - CP Violation in Kaon system - CPT invariance and its consequences- Feynman Diagrams ,Cross-section and decay widths .	**15**
Unit: III	**Gauge Symmetries and Quantum chromo dynamics** U(1), SU(2) and SU(3) local gauge invariance - Yang Mills Lagrangian - Production of hadrons in electron positron scattering - Deep inelastic scattering - Parton Model and Bjorken scaling.	**15**
Unit: IV	**Symmetry Breaking** Explicit and spontaneous - Goldstone Theorem - Higgs Mechanism	**15**
Unit: V	**Standard Model of electroweak interactions** Gauge , Fermion and Higgs interactions - Spontaneous symmetry breaking and masses of particles - Yukawa interactions, Fermion masses, CKM Matrix - Physical processes involving charged and neutral current.	**15**
	Total Lecture Hours	**75 Hrs**

Books for Study:

D. Griffiths, **Introduction to Particle Physics**, J. Wiley and Sons
Unit I - chapter 1
Unit II - chapter IV
Unit III - chapter 11
Unit IV & V- chapter 10

Books for Reference:

1. S. Eidelman, et al., **The Review of Particle Physics**, Phys. Lett. B592, 1 (2004), as updated for edition 2006.

2. R. A Dunlap, **Introduction to physics of nuclei and particles** (Thomson Asia, 2004)
3. Surinder Kaur, **Textbook on Particle Physics**, Med tech publication

Web Resources:

1.https://nptel.ac.in/courses/115103101
2.https://www.damtp.cam.ac.uk/user/tong/particle.html
3.https://ocw.mit.edu/courses/8-701-introduction-to-nuclear-and-particle-physics-fall-2020/pages/video-lectures/

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	List the fundamental particles	**K2**
CO2:	Explain the discrete symmetries	**K3**
CO3:	Illustrate the Gauge Symmetries and Quantum chromodynamics	**K4**
CO4:	Categorize the Symmetry Breaking	**K4**
CO5:	Identify the Standard Model of electroweak interactions	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**1**	**2**	**2**	**1**	**1**	**2**
CO 2	**2**	**2**	**2**	**2**	**1**	**1**
CO 3	**2**	**1**	**2**	**1**	**2**	**1**
CO 4	**2**	**2**	**1**	**2**	**1**	**2**
CO 5	**2**	**1**	**1**	**2**	**1**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Fundamental particles and their searches- Accelerators and colliders- Basic interactions- Relativity, antiparticles- Rotation, Isospin, Addition of Angular momentum- Conservation laws in decays and scattering.	**15**	**Chalk & talk**
II	Charge Conjugation (C) , Parity (P) and Time reversal (T) - Transformation of spinor bilinears under C, P, T - CP Violation in Kaon system - CPT invariance and its consequences- Feynman Diagrams ,Cross-section and decay widths .	**15**	**Chalk & talk**
III	U(1), SU(2) and SU(3) local gauge invariance - Yang Mills Lagrangian - Production of hadrons in electron positron scattering - Deep inelastic scattering - Parton Model and Bjorken scaling.	**15**	**Chalk & talk**
IV	Explicit and spontaneous - Goldstone Theorem - Higgs Mechanism.	**15**	**Chalk & talk**
V	Gauge , Fermion and Higgs interactions - Spontaneous symmetry breaking and masses of particles - Yukawa interactions, Fermion masses, CKM Matrix - Physical processes involving charged and neutral current.	**15**	**Chalk & talk**

Course Designed by: Ms. N. Lakshmi Kruthika & Mrs.A.Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**		**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K4	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**GEMOLOGY**							
Course Code	**21UPHS51**					**L**	**P**	**C**
Category	**Skill**					2	-	2
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

The learners will be able to

1. Recall the basic concepts, types , physical properties and Identification of Gems.
2. Determine the formation of Gems.
3. Remember the classification of Gems and minerals.
4. Analysing the different cuts in Gems

5.Applications of gems in Laser and various medical treatments.

Unit: I	**Identification of Gems,Hardness and wearability** Definitions - gemology, gemologist, Gem– different type of tests on gems-quality scratch test, acid test-Polariscope-Dichroscope-Refractive index-specific gravity (definition and formula), Hardness definition, Moh scale of hardness, Moh scale for different crystals, durability of crystals, wearing and worn of crystals, hardness and scratching (with quartz as example), cleavage.	**6**
Unit: II	**Gem formation** Definition of gem, pearl, amber, opal, emerald.- Making of crystals-five requirements of crystallization-Mineral crystallization-igneous, metamorphic, and sedimentary- rock formation(rock cycle)- Magma crystallization-Gas crystallization-Environmental Changes-Contact Metamorphism-Regional Metamorphism-Surface Water-Gems Formed in the Earth's Mantle.	**6**
Unit: III	**Classification of Gems** Precious and Semiprecious-Diamonds and Colored Stones- Natural and Man Made- Organics and Inorganics-Crystalline and Amorphous Materials-Aggregates, Rocks, Minerals-Species and Varieties-Series and Blends-Mineral Groups.	**6**
Unit: IV	**Types of gem cutting** Tumbling-Cabochon cutting-Faceting- Carving- cleavage-Gem nomenclature, Shapes-Faceting styles- round cut-Brilliant cut-step cut- cushion shaped - barion cut, Portuguese cut-Fantasy cut.	**6**
Unit: V	**Physical Properties and Medical applications of gems** Chalcedony-Diamond- Pearl-choosing a diamond-weights and measure-Gem structure chart-standard gem sizes- gem stone size chart- lap materials Medical applications of various gems-seven Chakras of human body and chakra healing using gems.	**6**
	Total Lecture Hours	**30 Hrs**

Books for Study:

1.Jayabalakrishnan.S.S. **Gemology**, Shanlax Publications, Madurai, 1st Edition June 2020.

Books for References: E-Books from Library N –List

1. Anderson, Basil W. (1990) ***Gem Testing***. Rev. by E. A. Jobbins.10th ed., Butterworth, London.
2. Anderson, Basil W., and James Payne. (1998) ***The Spectroscope and Gemmology.***GemStone Press, Woodstock, VT.

Field, J.E., ed. (1992) ***Properties of natural and synthetic diamond.*** Academic Press**,** London, New York.

Web Resources:

1.**https://www.udemy.com/course/easygemology/?utm_source=adwords&utm_medium=udemyads&utm_campaign**

2.**Online Gemology Classes - International Gem Society**

3.**Optical Properties of Gemstones (bwsmigel.info)**

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Define Scratch test, Hardness, Gem, crystalline and Amorphous materials, carving, lap materials	**K2**
CO2:	Explain Polariscope, Dichroscope, mineral crystallization, Mineral groups, Gem nomenclature, gem structure chart	**,K2**
CO3:	Apply Moh scale for crystals, Gas crystallization, natural and manmade gems, Faceting style, medical field	**K2**
CO4:	Distinguish types of tests on gems ,pearl, emerald, diamond and coloured stones, round cut and step cut, weights and measure	**K3**
CO5:	Justify acid test, durability of crystal, rock formation, organic and inorganic cushion shapes, standard gem sizes	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**3**	**3**	**3**	**3**
CO 2	**2**	**2**	**3**	**3**	**2**	**2**
CO 3	**2**	**1**	**3**	**3**	**2**	**3**
CO 4	**2**	**1**	**2**	**3**	**3**	**3**
CO 5	**2**	**2**	**3**	**2**	**3**	**3**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Definitions - gemology, gemologist, Gem– different type of tests on gems- quality scratch test, acid test.Polariscope Dichroscope, Refractive index, specific gravity (definition and formula), Hardness definition, Moh scale of hardness, Moh scale for different crystals, durability of crystals, wearing and worn of crystals, hardness and scratching (with quartz as example), cleavage.	6	Ppt,Lecture, Chalk & Talk, Demonstration
II	Definition of gem, pearl, amber, opal,emerald.- Making of crystals-five requirements of crystallization-Mineral crystallization- igneous, metamorphic, and sedimentary- rock formation(rock cycle)- Magma crystallization-Gas crystallization-Environmental Changes-ContactMetamorphism-Regional Metamorphism-Surface Water-Gems Formed in the Earth's Mantle	6	Ppt,Lecture, Chalk & Talk, Demonstration
III	Precious and Semiprecious, Diamonds and Colored Stones, Natural and Man Made, Organics and Inorganics, Crystalline and Amorphous Materials,Aggregates, Rocks, Minerals, Species and Varieties, Series and Blends, Mineral Groups.	6	Ppt,Lecture, Chalk & Talk, Demonstration
IV	Tumbling, Cabochon cutting, Faceting, Carving, cleavage, Gem nomenclature,Shapes, Faceting styles- round cut, Brilliant cut, step cut, cushion shaped , barion cut, Portugese cut, Fantasy cut.	6	Ppt,Lecture, Chalk & Talk, Demonstration
V	Chalcedony, Diamond, Pearl, choosing a diamond, weights and measure, Gem structure chart, standard gem sizes,gem stone size chart,lap materials Medical applications of various gems, seven Chakras of human body and chakra healing using gems.	6	Ppt,Lecture, Chalk & Talk, Demonstration

Course Designed by: Dr.S.S.Jayabalakrishnan & Mrs.A.Lakshmi

SIXTH SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**PRINCIPLES OF CLASSICAL AND STATISTICAL MECHANICS**							
Course Code	**21UPHC61**					**L**	**P**	**C**
Category	**CORE**					6	-	6
Nature of course:	**EMPLOYABILITY**	✓	**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

COURSE OBJECTIVES: The Learner will be able to :

1.Study the fundamental concepts in Classical Mechanics and apply the conservation laws and constraints for a system of particles
2.Understand the Lagrangian Formulation for a mechanical system
3.Apply the Hamiltonian Formulation for a mechanical system
4.Remember the importance of statistical Mechanics
5.Understand the postulates of wave mechanics, Maxwell–Boltzmann Statistics and Quantum Statistics

Unit: I	**Mechanics of a Particle** Space and Time (Frame of reference)-Newton's Laws of motion- Inertial frames- Gravitational Mass – Mechanics of particle- Conservation Laws- Conservation of linear momentum- Conservation of angular momentum- Conservation of energy – work, kinetic energy and work energy theorem- Conservative force and potential energy. Mechanics of a System of particles - External and internal forces- Centre of mass- Conservation of linear momentum- Centre of mass of frame of reference- Conservation of angular momentum- Conservation of energy –Kinetic energy- Potential energy- Conservation theorem.	**18 hrs**
Unit: II	**Lagrange's Formulation of Mechanics** Basic concepts, coordinate systems-Degrees of freedom—configuration space.Constraints- Holonomic constraints- Non holonomic constraints, Examples.Forces of constraints.Genaralised coordinates – Principle of virtual work – D'Alembert's principle- Langrangian's equations from D'Alembert's principle- Procedure for formation of Langrangian's equation.	**18 hrs**
Unit: III	**Hamiltonian Mechanics** Generalised momentum and cyclic coordinates- significance of translation and rotation cyclic coordinates – symmetry properties – Hamilton's Equations - Hamilton's Equations in different Coordinate systems. Examples of Hamiltonian dynamics – (Harmonic oscillator, motion of a particle in central force field)	**18 hrs**
Unit: IV	**Some Universal laws in Statistical Mechanics** Macrostate and microstate systems-Ensembles- phase space - Probability- Thermo dynamic probability-Boltzmann's theorem on entropy and probability- Fundamental postulates of statistical mechanics-Statistical equilibrium- Quantum statistics - Maxwell-Boltzmann statistics-Maxwell-Boltzmann energy distribution law.	**18 hrs**
Unit: V	**Maxwell–Boltzmann Statistics & Quantum Statistics** Bose-Einstein statistics- Fermi-Dirac statistics - 'h'as a natural constant-Bose-Einstein distribution law- -Photon gas ,Fermi-Dirac distribution law-	**18 hrs**

	comparison of the three distribution laws.	
	Total Lecture Hours	**90 Hrs**

Books for Study: 1. Upadhyaya, **ClassicalMechanics, Himalaya Publishing House, Delhi** Edition, 2005

Unit 1- Chapter 1.1- 1.63, 1.7.1- 1.7.5, 1.7.7, 1.7.8
Unit 2-Chapter 2.1,2.2, 2.3.1-2.3.4, 2.4, 2.5,2.6,2.7,2.8,2.12
Unit 3 – Chapter 3.1, 3.2, 3.3.3, 3.5, 3.6, 3.7

Text Book-2:

1. Brijlal, N.Subrahmanyam, P.S.Hemne, **Heat Thermodynamics and statistical physics** S.Chand and Co, New Delhi, Revised Edition, 2014.

Unit 4- Chapter – 9.7, 10.10.1-10.10.3, 10.4, 9.8, 10.15, 10.8, 11.2, 11.3,

5. Unit 5-Chapter – 12.1,12.2, 12.3, 12.5, 12.6 ,12.8, 12.15,

Books for References:

1. G.Aruldhas, **Classical Mechanics**, PHI Pvt.Ltd, New Delhi, Fourth Edition, 2013
2. S.P.Kuila, **Fundamentals of Quantum mechanics statistical mechanics & solid state physics,** Books and Allied (P) Ltd, Kolkatta, First Edition, 2013.
7. R.Takwle and P.S.Puranik, **Introduction to Classical mechanics**, TMH Publishers, New Delhi, 2nd Edition, 20.

Web Resources:

1.https://nptel.ac.in/course.html/Physics/Introduction to classical mechanics
2. https://www.mooc-list.com/course/statistical-thermodynamics-molecules-machines
3. Classical Mechanics Free Online Courses and MOOCs
4.NPTEL :: Physics - NOC:Classical mechanics: from newtonian to lagrangian formulation

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Define Frame of reference, Degrees of freedom, coordinate systems, Phase space and energy distribution	**K2**
CO2:	Elaborate conservation laws, constraints, cyclic coordinates ensembles, Velocity distribution law.	**K3**
CO3:	Understand the concepts of microstate, macrostate, ensemble, phase space,thermodynamic probability and Fermi-Dirac statistics.	**K4**
CO4:	Examine centre of mass of frame of reference, Langrangians'sequations from D'Alembert's principle, Hamilton's equations in coordinate systems, Boltzmann theorem on entropy and probability, three distribution laws.	**K4**
CO5:	Importance of conservation of energy, principle of virtual work, momentum and cyclic coordinates, quantum statistics, Bose-Einstein statistics.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	3	2	3
CO 2	2	2	2	2	3	2
CO 3	3	3	1	3	1	3
CO 4	3	2	2	1	2	1
CO 5	3	3	2	1	2	2

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Space and Time (Frame of reference)-Newton's Laws of motion-Inertial frames- Gravitational Mass – Mechanics of particle-Conservation Laws-Conservation of linear momentum- Conservation of angular momentum- Conservation of energy – work, kinetic energy and work energy theorem- Conservative force and potential energy. Mechanics of a System of particles - External and internal forces- Centre of mass- Conservation of linear momentum- Centre of mass of frame of reference- Conservation of angular momentum- Conservation of energy –Kinetic energy- Potential energy- Conservation theorem.	18	Chalk & Talk, Videos and PPT
II	Basic concepts, coordinate systems-Degrees of freedom—configuration space.Constraints- Holonomic constraints- Non holonomic constraints, Examples.Forces of constraints.Genaralised coordinates – Principle of virtual work – D'Alembert's principle- Langrangian's equations from D'Alembert's principle- Procedure for formation of Langrangian's equation.	18	Chalk & Talk, Videos and PPT
III	Generalised momentum and cyclic coordinates- significance of translation and rotation cyclic coordinates – symmetry properties – Hamilton's Equations - Hamilton's Equations in different Coordinate systems. Examples of Hamiltonian dynamics – (Harmonic oscillator, motion of a particle in central force field)	18	Chalk & Talk, Videos and PPT
IV	Macrostate and microstate systems-Ensembles- phase space - Probability-Thermo dynamic probability-Boltzmann's theorem on entropy and probability-Fundamental postulates of statistical mechanics-Statistical equilibrium-Quantum statistics - Maxwell-Boltzmann statistics-Maxwell-Boltzmann energy distribution law.	18	Chalk & Talk, Videos and PPT
V	Bose-Einstein statistics-Bose-Einstein distribution law- Fermi-Dirac statistics-Fermi-Dirac distribution law- -comparison of the three distribution laws.	18	Chalk & Talk, Videos and PPT

Course Designed by: Dr.S.S.Jayabalakrishnan & Mrs.A.Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**	**2**	**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K4	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**NON – ELECTRONICS PRACTICAL**							
Course Code	**21UPHCP3**					**L**	**P**	**C**
Category	**CORE**					-	3	4
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

The learners will be able to

1.Understand the function of instruments like spectrometer and spot galvanometer

2.Relate analyse angle of incidence and emergence

3.Find wavelength of light and particle size using laser

4. Compare the impedance and power factor of LR and CR circuits

5. Justify, Bridge circuits, Grating, LCR circuits

LIST OF EXPERIMENTS

Any Fourteen Experiments

1. .Spectrometer	-	i-d curve
2. Spectrometer	-	i – i’
3. Grating	-	Minimum deviation method
4. Spectrometer	-	Cauchy’s Constants
5. Spectrometer	-	Hartmann’s Interpolation formula
6. L.C.R	-	Series resonance circuit
7. L.C.R	-	Parallel resonance circuit
8. Spot Galvanometer	-	Determination of (M) Mutual induction
9. Spot Galvanometer	-	Comparison of (M) Mutual inductances
10. Anderson’s Bridge (AC Method)	-	Self inductance
11. Maxwell’s Bridge (AC Method)	-	Self inductance
12. Light Intensity	-	Inverse Square Law
13. Spot Galvanometer	-	Absolute Capacity of a Condenser
14. Potentiometer	-	Calibration of Ammeter
15. Impedance and Power factor	-	L.R.circuit
16. Laser	-	Determination of wavelength of and particle size

Total Lecture Hours	**180 Hrs**

Books For Study:

1. Srinivasan.M.N.,Balasubramanian.S.,Ranganathan.R.,A Text Book of Practical Physics,2017 Edition Sultan Chand & Sons

Books For Reference:

1.Ouseph.C., Practical Physics and Electronics,2013.S.Viswanathan.P.Ltd.

2.Hamam Singh Hemne,S.Chand and Co.New Delhi,2017

3.Shukla.R.K.,New Age International,2nd Edition.,New Delhi

4.Gupta.S.L.,Kumar.V.,Pragati Prakashan.M.,2016,New Delhi.

Web Resources:

1. **https://www.slideshare.net/mobile/sunilrathore77398/basicanalogelectronics**
2. **https://www.slideshare.net/mobile/PatruniChidanandaSas/basics-of-electronics-53962342**

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Analyze the different types of spectra and its applications	**K4**
CO2:	Realize the applications of LCR circuits.	**K2**
CO3:	Update the knowledge of Spot Galvanometer	**K2**
CO4:	Analyze the knowledge of Bridge circuits	**K4**
CO5:	Gain knowledge of applying Laser Beam	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**3**	**2**	**2**	**3**
CO 2	**2**	**3**	**2**	**3**	**3**	**2**
CO 3	**2**	**3**	**2**	**2**	**2**	**3**
CO 4	**3**	**3**	**2**	**2**	**2**	**3**
CO 5	**3**	**2**	**1**	**3**	**3**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

SEM	Name of the Experiments	Hrs	Mode
I	1.Spectrometer - i-d curve 2.Grating - Minimum deviation method 3.L.C.R - Series resonance circuit 4.Spot Galvanometer -Determination of (M) Mutual induction. 5.Anderson's Bridge (AC Method) -Self inductance 6.Potentiometer - Calibration of Ammeter 7.Laser-Determination of wavelength and particle size 8.Spot Galvanometer - Comparison of (M) Mutual inductances	90	Demonstration
II	1.Spectrometer - i – i'curve 2.Spectrometer - Cauchy's Constants 3.Spectrometer - Hartmann's Interpolation formula 4.Maxwell's Bridge (AC Method) - Self inductance 5.Light Intensity - Inverse Square Law 6.Spot Galvanometer - Absolute Capacity of a Condenser 7.L.C.R - Parallel resonance circuits 8.Impedance and Power factor - L.R.circuit	90	Demonstration

Course Designed by: Dr.P.Kavitha & Dr.S.S.Jayabalakrishnan

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**ELECTRONICS PRACTICAL**							
Course Code	**21UPHCP4**					**L**	**P**	**C**
Category	**CORE**					-	3	5
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

Course Objectives:

The learners will be able to

1.Understand the principles and applications of Digital Electronics

2. Understand the principles and applications of Analog Electronics

3. Gain knowledge about the development of the Microprocessors.

4. Motivate the students to apply the principles of Digital Electronics in their day–to–day life.

5. Motivate the students to apply the principles of Analogl Electronics in their day–to–day life.

LIST OF EXPERIMENTS

Any Fourteen Experiments

1.Determination Band gap	-	Semiconductor
2.Zener Diode	-	Characteristics
3.Transistor	-	Characteristics CE mode
4.Zener Diode	-	Voltage Regulator
5.Single Stage Amplifier	-	Voltage Gain
6.Hartley Oscillator	-	Inductance of pair of coils
7.Astable Multivibrator	-	Discrete components
8.Logic Gates NAND)	-	Discrete Components (OR,AND,NOT,NOR and
9.Logic Gates	-	IC(7432, 7408, 7404, 7402, 7400 and 7486)
10.Adder and Subtractor	-	OPAMP - IC 741
11.Astable Multivibrator	-	TIMER - IC 555
12.NOR as Universal Gate	-	IC 7402
13.NAND as Universal Gate	-	IC 7400
14.Half Adder, Full Adder	-	IC 7486, IC 7408 and IC 7432

15.Four Bit Binary Adder	-	IC 7483	
16.Four Bit Binary Subtractor	-	IC 7483 and IC 7404	
		Total Lecture Hours	**180 Hrs**

Books For Study:

1. Srinivasan.M.N.,Balasubramanian.S.,Ranganathan.R.,A Text Book of Practical Physics,2017 Edition Sultan Chand & Sons

Books For Reference:

1.Ouseph.C., Practical Physics and Electronics,2013.S.Viswanathan.P.Ltd.

2.Hamam Singh Hemne,S.Chand and Co.New Delhi,2017

3.Shukla.R.K.,New Age International,2nd Edition.,New Delhi

4.Gupta.S.L.,Kumar.V.,Pragati Prakashan.M.,2016,New Delhi.

Web Resources:

1. **https://www.slideshare.net/mobile/sunilrathore77398/basicanalogelectronics**
2. **https://www.slideshare.net/mobile/PatruniChidanandaSas/basics-of-electronics-53962342**
3. **http://www.sircrrengg.ac.in/images/Others/CSE/MP-LAB-MANUAL.pdf**
4. **https://www.youtube.com/playlist?list=PL_pGb42kre_QXwuaizYb21tSYpoHyXsCQ**

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Analyze the different types of digital circuits and their applications	**K4**
CO2:	Realize the applications of registers in computers	**K3**
CO3:	Update the knowledge of Microprocessor programming	**K2**
CO4:	Analyze the knowledge of Oscillators function	**K4**
CO5:	Gain knowledge of applying various IC's	**K2**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**3**	**3**	**3**	**1**
CO 2	**2**	**1**	**3**	**2**	**2**	**2**
CO 3	**3**	**2**	**2**	**3**	**2**	**3**
CO 4	**2**	**2**	**2**	**2**	**3**	**2**
CO 5	**1**	**2**	**2**	**2**	**2**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

SEM	Name of the Experiments	Hrs	Mode
I	1.Determination Band gap - Semiconductor 2.Zener Diode - Characteristics 3.Single Stage Amplifier - Voltage Gain 4.Astable Muitivibrator - Discrete Components 5.Logic Gates - Discrete Components (OR, AND, NOT, NOR and NAND) 6.5NAND as Universal Gate - IC 7400 7.Half Adder, Full Adder - IC 7486, IC 74O8 and IC 7432 8.Four Bit Binary Adder - IC 7483	90	Demonstration
II	1.Zener Diode - Voltage Regulator 2. Transistor - Characteristics CE mode 3. Hartley Oscillator - Inductance of pair of coils 4. Logic Gates - IC(7432, 7408, 7404, 7402, 7400 and 7486) 5. NOR as Universal Gate - IC 7402 6. Adder and Subtractor - OPAMP - IC 741 7. Astable Multivibrator - TIMER - IC 555 8. Four Bit Binary Subtractor - IC 7483 and IC 7404	90	Demonstration

Course Designed by: Dr.P.Kavitha & Dr.S.S.Jayabalakrishnan

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**PROJECT AND VIVA - VOCE**			
Course Code	**21UPHPR1**	**L**	**P**	**C**
Category	**CORE**	-	6	4

Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP	

Course Objectives:

The learners will be able to

1.To identify, describe the problem and scope of project
2.To collect, analyse and present data into significant form using appropriate tools
3.To choose, plan and implement a proper approach in problem solving
4.To work with team and ethically
5.To present the findings in both oral and written form

Course Description

The Project is conducted by the following Course Pattern.

Internal

Presentation Submission	**40**

External

Project Report Viva Voce	**60**
Total	**- 100**

	Total Lecture Hours	**180 Hrs**

COURSE OUTCOMES		**K Level**
On the successful completion of the course , the students will be able to		
CO1:	Apply the skill of presentation and communication techniques	**K3**
CO2:	Motive as an individual or in a team in development of projects.	**K4**
CO3:	Analyze the available resources and to select most appropriate one	**K4**
CO4:	Make use of the fundamentals of Physics to search the related literature survey	**K3**
CO5:	Explain the real life problems by using Physics and its Application.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	3	3	3	1	3
CO 2	1	2	2	1	2	1
CO 3	2	2	3	3	2	1
CO 4	3	2	3	2	1	2
CO 5	3	3	3	3	3	3

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

Course Designed by: Mrs.A.Lakshmi Dr.S.S.Jayabalakrishnan

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**DIGITAL PRINCIPLES AND APPLICATIONS**							
Course Code	**21UPHE61**					**L**	**P**	**C**
Category	**ELECTIVE**					5	-	5
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENEURSHIP			

COURSE OBJECTIVES: The Learner will be able to :

1. Review the fundamental concepts in number systems and codes.
2. Recall the properties of Boolean algebra.
3. Analyze and apply the basic concepts of Logic Gates and Arithmetic Circuits.
4. Understand the operation of Flip flops and apply it to Counters and Registers.
5. Gain the knowledge about Combinational Circuits like Multiplexers, Decoders and Encoders.

Unit: I	**Number System and Codes** Number system - Binary, decimal, octal, hexadecimal - Conversion from one to other - Binary addition, subtraction, multiplication, division - 1's and 2's complement subtraction – Binary coded decimal(BCD) - Weighted course-8421 code - Non-weighted codes - gray code.	**15hrs**
Unit: II	**Boolean Algebra and Minimization Technique** Boolean logic operations (OR, AND and NOT) - Basic laws of Boolean algebra (Boolean addition, subtraction, multiplication and division) - Properties of Boolean algebra (commutative, associative, distribution, absorption and consensus laws) - Principle of duality - De Morgan's theorems - Simplification of Boolean expressions - Sum of products K-map.	**15hrs**
Unit: III	**Logic Gates and Arithmetic Circuits** Positive and negative logic - Logic gates - OR, AND, NOT, NOR, NAND, EXOR and EX-NOR - Universal gates - NOR and NAND - Realization of logic expression using logic gates - Introduction to arithmetic circuits - Half adder - Full adder - Half subtractor - Full subtractor - 4 bit binary adder - 4 bit binary subtractor.	**15 hrs**
Unit: IV	**Flip flop and its applications** Flip flops - Types of flip flops - RS flip flop- D flip flop - JK flip flop - edge triggering -Applications of flip flop - Counters - Types of counters - 4 bit binary ripple counter - Shift register - 6-bit shift register SIPO - Timer IC555 (Block diagram and Astable Multivibrator). .	**15 hrs**
Unit: V	**Combinational Circuits** Multiplexer - 4 to 1 multiplexer - De-multiplexer - 1 to 4 de-multiplexer - Decoder - 3 to 8 decoder - BCD to decimal decoder - Encoder - Decimal to BCD encoder- Ladder type D / A Converter- Successive approximation A/D converter.	**15hrs**
	Total Lecture Hours	**75 Hrs**

Books for Study:

S.Salivahanan, S.Arivazhagan, **Digital Circuits and Design**, Oxford University Press, New Delhi, 5th Edition, 2018, Second Impression 2019.

Unit – I: Chapter-1 (1.1, 1.2, 1.2.1 to 1.2.7, 1.4, 1.4.1, 1.5, 1.5.1, 1.5.2, 1.6, 1.7, 1.8, 1.9, 1.9.1, 1.9.2, 1.9.5).
Unit – II: Chapter-2 (2.1, 2.2, 2.3, 2.3.1, 2.3.2, 2.3.3, 2.4, 2.4.1 to 2.4.4, 2.5, 2.6, 2.6.1 to 2.6.4).
Unit – III: Chapter-3 (3.1, 3.2, 3.3, 3.3.1 to 3.3.8), Chapter-5 (5.1, 5.2, 5.3, 5.4, 5.6, 5.7, 5.8, 5.8.1, 5.8.2).
Unit – IV: Chapter-7 (7.3, 7.3.1, 7.4, 7.5, 7.6, 7.7, 7.8.2, 7.10.2, 7.12), Chapter-8 (8.1, 8.2, 8.5.1), Chapter-9 (9.1, 9.1.1, 9.2, 9.2.1, 9.4, 9.4.1).
Unit – V: Chapter-6 (6.1, 6.2, 6.2.1, 6.4, 6.4.1, 6.5, 6.5.2, 6.5.6, 6.5.9, 6.7, 6.7.2).

Books for References:

1. Malvino and Leach, Principles of Digital Electronics, Tata McGraw – Hill Edition, Fifth Edition, New York, 2004.
2. R.P.Jain, Modern Digital Electronics, Tata McGraw – Hill Edition, Fourth Edition, New Delhi, 2011.

Web Resources:

1. . https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
2. https://howtomechatronics.com/how-it-works/electronics/555-timer-ic-working-principle-block-diagram-circuit-schematics/
3. https://www.electronicshub.org/multiplexer-and-demultiplexer/

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Convert different type of codes and number systems which are used in digital communication and computer systems	**K2**
CO2:	Employ the codes and number systems in converting circuits	**K3**
CO3:	Construct logic circuits using boolean algebra	**K4**
CO4:	Analyze filp-flops, counters and registers	**K4**
CO5:	Examine Logic gates, sequential and combinational circuits	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**3**	**3**	**3**	**3**	**3**
CO 2	**3**	**3**	**3**	**3**	**2**	**2**
CO 3	**3**	**2**	**2**	**2**	**2**	**1**
CO 4	**3**	**2**	**2**	**2**	**2**	**1**
CO 5	**3**	**2**	**2**	**2**	**2**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Number system - Binary, decimal, octal, hexadecimal - Conversion from one to other - Binary addition, subtraction, multiplication, division - 1's and 2's complement subtraction – Binary coded decimal(BCD) - Weighted course-8421 code - Non-weighted codes - gray code.	**15**	Chalk & Talk, Videos and PPT
II	Boolean logic operations (OR, AND and NOT) - Basic laws of Boolean algebra (Boolean addition, subtraction, multiplication and division) - Properties of Boolean algebra (commutative, associative, distribution, absorption and consensus laws) - Principle of duality - De Morgan's theorems - Simplification of Boolean expressions - Sum of products and Product of sums.	**15**	Chalk & Talk, Videos and PPT
III	Positive and negative logic - Logic gates - OR, AND, NOT, NOR, NAND, EXOR and EXNOR - Universal gates - NOR and NAND - Realization of logic expression using logic gates - Introduction to arithmetic circuits - Half adder - Full adder - Half subtractor - Full subtractor - 4 bit binary adder - 4 bit binary subtractor.	**15**	Chalk & Talk, Videos and PPT
IV	Flip flops - Types of flip flops - RS flip flop- D flip flop - JK flip flop - edge triggering -Applications of flip flop - Counters - Types of counters - 4 bit binary ripple counter - Shift register - 6-bit shift register SIPO - Timer IC555 (Block diagram and Astable Multivibrator). .	**15**	Chalk & Talk, Videos and PPT
V	Multiplexer - 4 to 1 multiplexer - De-multiplexer - 1 to 4 de-multiplexer - Decoder - 3 to 8 decoder - BCD to decimal decoder - Encoder - Decimal to BCD encoder- Ladder type D / A Converter- Successive approximation A/D converter.	**15**	Chalk & Talk, Videos and PPT

Course Designed by: Dr.S.S.Jayabalakrishnan & Mrs.A.Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**	**2**	**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**BASICS IN MICROPROCESSORS**							
Course Code	**21UPHE62**					**L**	**P**	**C**
Category	**ELECTIVE**					5	-	5
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	ENTREPRENEURSHIP			

COURSE OBJECTIVES: The Learner will be able to :

1.Study the various parts of microprocessor in Architecture of 8085.
2. Examine the instruction set groups in Instruction set of 8085.
3. Apply and write simple programs for basic arithmetic and logical operations using the instruction set of 8085 in Programming of Microprocessor.
4. Understand interfacing techniques involved in 8085.
5. Review the applications of 8085 such as digital display, traffic control.

Unit: I	**Introduction in Architecture** Microprocessor architecture and its operations—Micrprocessors-initiated operations and 8085 Bus organization—Internal Data operations and the 8085 registers—Input and output(I/O) devices—I/Os with 16 bit addresses—8085 MPU—the 8085 microprocessor—Demultiplexing the bus AD7-AD0—Detailed look at the 8085 MPU and its applications.	**15hrs**
Unit: II	**Instruction Set** Data transfer operations—Addressing modes—arithmetic operations—Addition-Addition and increment—logic operations—logic AND – Data making with logic AND – OR, Exclusive OR and NOT—Branch operations—unconditional Jump-unconditional Jump to set up a continuous loop-Testing the Carry Flag	**15hrs**
Unit: III	**Assembly Language Program** Programming techniques:Looping,counting,AND indexing-continuous loop—conditional loop—additional Data transfer and 16 bit Arithmetic instructions – 16 Bit Data transfer to register pairs(LXI)-Data transfer from memory to the microprocessor arithmetic operations related to 16 bits-block transfer of data bytes-arithmetic related to memory.	**15 hrs**
Unit: IV	**Counters and Time Delays** Counter—Time delay -- using one register -- using a loop within a technique – counter design with time delay – Simple Programs(Example:-Debugging program, Delay calculations)	**15 hrs**
Unit: V	**Stack and Subroutine** Stack – subroutine—traffic signal control program—Documentation and parameter passing program- simple programs(Traffic signal controller)	**15hrs**
	Total Lecture Hours	**75Hrs**

Books for Study:

Ramesh S Gaonkar,**Microprocessor Architecture,programming, and Applications with the 8085**, , VIthEdn., Penram International publishing (India) private limited.2011.

Unit I:Sections 3.1,3.1.1, 3.1.2,3.3, 4.1, 4 .1.1-4.1.3, 4.1.5
Unit II:Sections 6.1, 6.1.1, 6.2, 6.2.1, 6.2.2, 6.3, 6.3.1-6.3.3, 6 .4, 6.4.1-6.4.4
Unit-III:Sections 7.1, 7.2, 7.2.1-7.2.4, 7.2.6, 7.3, 7.3.1, 7.4, 7.4.1, 7.5, 7.5.1, 7.5.3
Unit-IV:Sections 8.1, 8.1.1, 8.1.3, 8.1.5
Unit-V:Sections 9.1(Pages 296-302),9.2,9.2.1(Upto to page 314)

Books for References:

1. B.Ram, Dhanbath Rai **Fundamentals of microprocessors and microcomputers**, Publications,VIthEdn.,2006.
2. A.P. Mathur. "**Introduction to microprocessor**", III Edition, TMH 2004.

N.Mathivanan. "**Microprocessors, PC hardware and interfacing**", Prentice Hall of India,New Delhi, 2005.

Web Resources:

1. **https://www.tutorialspoint.com/microprocessor/microprocessor_overview.html**
2. **https://www.geeksforgeeks.org/introduction-of-microprocessor/**
3. **NPTEL :: Electrical Engineering - NOC:Microprocessors And Microcontrollers**

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Define address bus, instruction, looping,counters and time delays and stack	**K2**
CO2:	Describe Pins and signals, logic instruction,16 Bit arithmetic instruction, loop technic,traffic signal control program	**K3**
CO3:	Write Architecture of microprocessors ,Branch instruction. Arithmetic operations related to memory, time delay one register loop, subroutine	**K4**
CO4:	Functioning of bus organizations, addressing modes, looping counting and indexing,	**K4**
CO5:	Assess microprocessors operations, Data transfer instruction, Arithmetic operations, time delays and counters, subroutine program, Counter design with time delay	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**3**	**2**	**3**	**2**
CO 2	**2**	**3**	**2**	**1**	**3**	**2**
CO 3	**2**	**1**	**2**	**2**	**2**	**2**
CO 4	**3**	**2**	**2**	**3**	**2**	**3**
CO 5	**3**	**3**	**1**	**2**	**3**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Microprocessor architecture and its operations—Micrprocessors-initiated operations and 8085 Bus organization—Internal Data operations and the 8085 registers—Input and output(I/O) devices—I/Os with 16 bit addresses—8085 MPU—the 8085 microprocessor—Demultiplexing the bus AD7-AD0—Detailed look at the 8085 MPU and its applications.	15	Chalk & Talk, Videos and PPT
II	Data transfer operations—Addressing modes—arithmetic operations—Addition-Addition and increment—logic operations—logic AND – Data making with logic AND – OR, Exclusive OR and NOT—Branch operations—unconditional Jump-unconditional Jump to set up a continuous loop-Testing the Carry Flag	15	Chalk & Talk, Videos and PPT
III	Programming techniques:Looping,counting,AND indexing—continuous loop—conditional loop—additional Data transfer and 16 bit Arithmetic instructions –16 Bit Data transfer to register pairs(LXI)-Data transfer from memory to the microprocessor arithmetic operations related to 16 bits—Block transfer of data bytes—arithmetic operations realated to 16 bits—block transfer of data bytes—arithmetic related to memory—instructions –logic operations: rotate –instructions—logic operations: Compare instructions-sorting.	15	Chalk & Talk, Videos and PPT
IV	Counter—Time delay -- using one register -- using a loop within a technique – counter design with time delay-simple programs	15	Chalk & Talk, Videos and PPT
V	Stack – subroutine—traffic signal control program—Documentation and parameter passing program –Documentation and parameter passing-simple programs	15	Chalk & Talk, Videos and PPT

Course Designed by: Dr.S.S.Jayabalakrishnan & Mrs.A.Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**	**2**	**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences
CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**MATHEMATICAL PHYSICS**			
Course Code	**21UPHE63**	**L**	**P**	**C**
Category	**ELECTIVE**	5	-	5

Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		ENTREPRENEURSHIP	

COURSE OBJECTIVES: The Learner will be able to :
1. Recall and solve various types of vectors
2. Review the operations of matrices
3. Solve various types of differential equations
4. Explore various Fourier series and also to determine its transforms
5. Evaluate the functions of complex variables

Unit: I	**Vectors** Review of vector algebra – Addition of vectors – Product of two vectors – Physical applications of vector product – Differentiation of vectors.	**15hrs**
Unit: II	**Matrices** Introduction – Review of algebric operations on matrices – Special types of matrices – Transpose of matrix – The conjugates of matrix – Symmetric and Asymmetric matrices – Hermitian and Skew Hermitian matrices – Determinant of matrix – Singular and Non-singular matrices – Adjoint of a matrix.	**15hrs**
Unit: III	**Differential Equations** Introduction – Order and degree of a differential equation – Solution of first order differential equation by separation of variables - Solution of first order differential equation by method of integrating factor - Solution of first order differential equation reducible to linear form.	**15 hrs**
Unit: IV	**Fourier and Laplace Transform** Introduction – Fourier transform – Properties of fourier transform – Fourier sine and cosine transform of a derivative – Laplace transform – Properties of Laplace transform – Laplace transform of periodic functions.	**15 hrs**
Unit: V	**Complex Variables** Complex numbers – Review of algebric operations of complex numbers – Complex conjugate – Modulus and argument of complex numbers – Function of complex variable – Limit, continuity and differentiability – Analytic function – Cauchy-Riemann differential equation – Laplace equation – Harmonic functions.	**15hrs**
	Total Lecture Hours	**75Hrs**

Books for study:
Satya Prakash, **Mathematical Physics with Classical Mechanics**, Sulthan Chand and Sons, Educational Publicaters, New Delhi.

Unit – I: Chapter – 1 – 1.1, 1.1 (a), 1.1 (e), 1.1 (f), 1.1 (j).
Unit – II: Chapter – 2 – 2.1, 2.2, 2.5, 2.6, 2.7, 2.9, 2.10, 2.11, 2.14, 2.15.

Unit – III: Chapter – 7 – 7.1, 7.2, 7.3, 7.4 (a) and 7.4 (b).
Unit – IV: Chapter – 10 – 10.1, 10.2, 10.3, 10.5, 10.9, 10.10, 10.11.
Unit – V: Chapter – 6 – 6.1, 6.2, 6.3, 6.4, 6.7, 6.8, 6.9, 6.11.

Books for Reference:

1. H.K. Dass, Dr. Rama Varma, **Mathematical Physics**, Revised Edition, S.Chand and Co, New Delhi.
2. George B. Arfken, Hans J. Weber, Frank E. Harris, **Mathematical Methods for Physicists,** 7th Edition, Academic Press, Elsevier.
3. Louis A. Pipes, Lawrence R. Harvill, **Applied Mathematics for Engineers and Physicists,** 3rd Edition, Dover Publication, Inc. New York, 2014.

Web Resources:

1.https://www.google.com/url?sa=t&source=web&rct=j&url=http://ndl.ethernet.edu.et/bitstream/123456789/79541/4/Mathematical%2520Physics%2520%2528Gupta%2529.pdf&ved=2ahUKEwjbuKaWsKv-AhVHS2wGHTJFAc0QFnoECDwQAQ&usg=AOvVaw0tnCcRf_7DLOr0BzAVoAYJ
2. https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/pages/1.-vectors-and-matrices/
3.https://www.google.com/url?sa=t&source=web&rct=j&url=http://ndl.ethernet.edu.et/bitstream/123456789/79541/4/Mathematical%2520Physics%2520%2528Gupta%2529.pdf&ved=2ahUKEwjbuKaWsKv-AhVHS2wGHTJFAc0QFnoECDwQAQ&usg=AOvVaw0tnCcRf_7DLOr0BzAVoAYJ

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Review vector algebra, differential equation, complex numbers, properties of fourier transform	**K2**
CO2:	Solve ordinary and partial differential equations of second order that are common in the physical sciences	**K3**
CO3:	Solve physical problems using complex analysis and fourier transform	**K4**
CO4:	Explain about special type of matrices that are relevant in physics	**K4**
CO5:	Analyze Cauchy-Riemann differential equation, laplace equation, harmonic functions.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**3**	**3**	**3**	**3**	**3**
CO 2	**3**	**3**	**2**	**1**	**2**	**2**
CO 3	**3**	**3**	**2**	**1**	**2**	**2**
CO 4	**3**	**2**	**2**	**1**	**1**	**1**
CO 5	**3**	**2**	**2**	**1**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Review of vector algebra – Addition of vectors – Product of two vectors – Physical applications of vector product – Differentiation of vectors.	**15**	Chalk & Talk, Videos and PPT
II	Introduction – Review of algebric operations on matrices – Special types of matrices – Transpose of matrix – The conjugates of matrix – Symmetric and Asymmetric matrices – Hermitian and Skew Hermitian matrices – Determinant of matrix – Singular and Non-singular matrices – Adjoint of a matrix.	**15**	Chalk & Talk, Videos and PPT
III	Introduction – Order and degree of a differential equation – Solution of first order differential equation by separation of variables - Solution of first order differential equation by method of integrating factor - Solution of first order differential equation reducible to linear form.	**15**	Chalk & Talk, Videos and PPT
IV	Introduction – Fourier transform – Properties of fourier transform – Fourier sine and cosine transform of a derivative – Laplace transform – Properties of Laplace transform – Laplace transform of periodic functions.	**15**	Chalk & Talk, Videos and PPT
V	Complex numbers – Review of algebric operations of complex numbers – Complex conjugate – Modulus and argument of complex numbers – Function of complex variable – Limit, continuity and differentiability – Analytic function – Cauchy-Riemann differential equation – Laplace equation – Harmonic functions.	**15**	Chalk & Talk, Videos and PPT

Course designed by: Dr.P.Kavitha & Mrs.A.Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**	**2**	**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**NANOTECHNOLOGY**							
Course Code	**21UPHE64**					**L**	**P**	**C**
Category	**ELECTIVE**					5	-	5
Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	SKILL ORIENTED			

COURSE OBJECTIVES: The Learner will be able to :

1. The basics of nanoscience and Nanotechnology.
2. The methods of synthesis
3. The methods of characterisation of nanomaterials.
4. The practical applications of nanomaterials.
5. Usefulness of nanotechnology in daily life

Unit: I	**Nanoscience** Introduction-Nano and Nature- understanding Nanoscience and Nanotechnology- Types of nano materials - Chemical reduction - catalysis on nano particles – oxide reactions- reaction of rare earth elements.	**15hrs**
Unit: II	**Synthetic methods** Top-down vs bottom up technique-lithographic process and its limitations-nonlithographic techniques- plasma arc discharge- sputtering-evaporation-chemical vapour deposition- sol-gel technique-eletectro-deposition-other process.	**15hrs**
Unit: III	**Electron microscopy** Basic principles of electron microscopy – scanning electron microscope (SEM) –energy dispersive X-ray analysis (EDX)- Transmission electron microscope (TEM)- Scanning Tunneling Microscope (STM) - Atomic Force Microscope (AFM) (Qualitative analysis only)	**15 hrs**
Unit: IV	**X-Ray crystallography** Structure of nanomaterials- X-ray diffraction-(XRD)- the laue method- rotating crystal method- powder method -determination of grain size (Scherrer's formula) -.X-ray line shape analysis –analysis of some commercially important oxides – small angle X-ray scattering (SAXS)	**15 hrs**
Unit: V	**Applications of nanoscience** Applications of nanomaterials – medicine-energy sector- next generation computer- high sensitivity sensors- water purification- communication- food – fabric industry – environment- automobiles – ceramic industry – molecular machine –nanobiometrics	**15hrs**
	Total Lecture Hours	**75Hrs**

1.Rajesh kumar T, langeswaran V K, Sangeetha R, **Nano Physics**, New Century book house

Books for Reference:

1. M.A. Shah , Tokeer Ahmad **Principles of Nanoscience and nanotechnology** Naroa publishing house Pvt.Ltd., 2013
2. K.K. Chattopadhyay,A.N. Banerjee**, Introduction to Nanoscience and Nanotechnology**,

PHI learning Private , 2012.
3.Edward L. Wolf, **Nanophysics and Nanotechnology**, Wiley VCH, 2nd edition, 2006

Web Resources:

https://nptel.ac.in/courses/113106093
https://ocw.mit.edu/courses/2-57-nano-to-macro-transport-processes-spring-2012/resources/lecture-1-intro-to-nanotechnology-nanoscale-transport-phenomena/
http://www.phys.nthu.edu.tw/~spin/course/102S/102-2-21_nanophysics-introduction-Kwo-English.pdf

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	State the basics of nanoscience and Nanotechnology	**K2**
CO2:	Demonstrate the methods of synthesis of nanomaterials	**K3**
CO3:	Explain the principles of various characterization techniques	**K4**
CO4:	Analyse the properties of nanomaterials practically	**K4**
CO5:	Make use of the properties of nanomaterials and their possible applications	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**2**	**2**	**1**	**1**
CO 2	**2**	**2**	**2**	**2**	**1**	**2**
CO 3	**2**	**2**	**1**	**1**	**1**	**2**
CO 4	**2**	**2**	**2**	**2**	**1**	**2**
CO 5	**2**	**1**	**1**	**2**	**1**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Introduction-Nano and Nature- understanding Nanoscience and Nanotechnology- Types of nano materials - Chemical reduction - catalysis on nano particles – oxide reactions- reaction of rare earth elements.	**15**	Chalk & Talk, and PPT
II	Top-down vs bottom up technique-lithographic process and its limitations-nonlithographic techniques- plasma arc discharge-sputtering-evaporation-chemical vapour deposition- sol-gel technique-eletectrodeposition-other process.	**15**	Chalk & Talk, and PPT
III	Basic principles of electron microscopy – scanning electron microscope (SEM) –energy dispersive X-ray ananlysis (EDX)- Transmission electron microscope (TEM)- Scanning Tunneling Microscope (STM) - Atomic Force Microscope (AFM) (Qualitative analysis only)	**15**	Chalk & Talk, and PPT
IV	Structure of nanomaterials- X-ray diffraction-(XRD)- the laue method-rotating crystal method- powder method -determination of grain size (Scherrer's formula) -.X-ray line shape analysis –analysis of some commercially important oxides – small angle X-ray scattering (SAXS)	**15**	Chalk & Talk, and PPT
V	Applications of nanomaterials – medicine-energy sector- next generation computer- high sensitivity sensors- water purification- communication-food – fabric industry – environment- automobiles – ceramic industry – molecular machine –nanobiometrics	**15**	Chalk & Talk, and PPT

Course designed by: Dr.R.Sangeetha & Mrs. N. Lakshmi Kruthika

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**	**2**	**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**NON-RENEWABLE ENERGY PHYSICS**							
Course Code	**21UPHE65**					**L**	**P**	**C**
Category	**ELECTIVE**					5	-	5
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		SKILL ORIENTED			

COURSE OBJECTIVES: The Learner will be able to :

1. List the various types of non- conventional energy sources.
2. Describe methods of harvesting solar energy.
3. Develop newer ideologies for utilizing ind and biomass energy.
4. Analyze geothermal and ocean energy
5. Apply newer technologies in energy conservation

Unit: I	**Energy Conservation and storage** Salient Feature of "Energy Conservation Act, 2001"- Various aspects of Energy Conservation- Principles of Energy Conservation- General Electrical Energy Conservation opportunities - combined cycle plants- necessity of Energy Storage – Energy Storage Methods.	**15hrs**
Unit: II	**Solar Energy** Spectral Energy Distribution of Solar Radiation- Measurement of Solar Radiation- Solar Thermal Systems- Solar water heaters- Solar Refrigeration and Air-conditioning systems- Solar cookers and furnaces – solar cells- classification- solar PV systems- applications.	**15hrs**
Unit: III	**Wind energy and Biomass energy** Origin and nature of winds- Wind Turbine siting – Major applications of wind power- wind turbine types and their construction- Wind energy conservation systems (WECS) – Wind energy storage. Usable forms of Biomass - composition and fuel properties – biomass conservation technologies – urban waste to Energy Conversion – Biomass Gasification and Liquefaction- Biogas production from waste Biomass- Energy farming.	**15 hrs**
Unit: IV	**Geothermal Energy and Ocean Energy** Origin and Distribution of Geothermal Energy – types of Geothermal resources- analysis of Geothermal resources - Exploration and Development of Geothermal Resources. Tidal Energy- Wave Energy- Ocean thermal Energy.	**15 hrs**
Unit: V	**Emerging Technologies** Fuel Cell- Hydrogen Energy- Magneto Hydrodynamic power conservation – Thermoelectric Power Conservation – Thermionic Power Conversion.	**15hrs**
	Total Lecture Hours	**75Hrs**

Books for Study:

1. B. H. Khan, **Non- Conventional Energy Resources,** The McGraw Hill Publications
   Unit I - chapter 2
   Unit II- chapter 4
   Unit III - chapter 7 & 8
   Unit IV - chapter 9 & 10
   Unit V - Chapter 12

Books for Reference:

1. Gilbert M. Masters, **Renewable and Efficient Electric Power systems**, Prentice – Hall.
2. G.D. Ray, **Non- Conventional Energy Sources**, Khanna Publications.
3. **Bansal N. K. Non- Conventional Energy Sources**, Vikas Publishing house

Web Resources:

https://nptel.ac.in/courses/121106014
http://www.nitttrc.edu.in/nptel/courses/video/121106014/lec4.pdf
https://ocw.mit.edu/courses/15-031j-energy-decisions-markets-and-policies-spring-2012/resources/lecture-15-non-renewable-energy-resources/

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Relate various sources of non-conventional energy	**K2**
CO2:	Outline the solar energy harvesting and storage	**K3**
CO3:	Explain the principle behind wind energy and biomass energy	**K4**
CO4:	Develop the concept of geothermal and ocean energy	**K4**
CO5:	Analyze newer technologies in energy conversion	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**2**	**2**	**2**	**2**
CO 2	**2**	**2**	**2**	**2**	**1**	**2**
CO 3	**2**	**2**	**1**	**2**	**1**	**2**
CO 4	**2**	**1**	**1**	**2**	**1**	**2**
CO 5	**2**	**2**	**1**	**2**	**1**	**2**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Salient Feature of "Energy Conservation Act, 2001"- Various aspects of Energy Conservation- Principles of Energy Conservation- General Electrical Energy Conservation oppurtunities- combined cycle plants- necessity of Energy Storage – Energy Storage Methods.	15	Chalk & Talk, and PPT
II	Spectral Energy Distribution of Solar Radiation- Measurement of Solar Radiation- Solar Thermal Systems- Solar water heaters- Solar Refrigeration and Air-conditioning systems- Solar cookers and furnaces – solar cells- classification- solar PV systems- applications.	15	Chalk & Talk, and PPT
III	Origin and nature of winds- Wind Turbine siting – Major applications of wind power- wind turbine types and their construction- Wind energy conservation systems (WECS) – Wind energy storage.Usable forms of Biomass, their composition and fuel properties – biomass conservation technologies – urban waste to Energy Conversion – Biomass Gasification and Liquefaction- Biogas production from waste Biomass- Energy farming.	15	Chalk & Talk, and PPT
IV	Origin and Distribution of Geothermal Energy – types of Geothermal resources- analysis of Geothermal resources - Exploration and Development of Geothermal Resources. Tidal Energy- Wav Energy- Ocean thermal Energy.	15	Chalk & Talk, and PPT
V	Fuel Cell- Hydrogen Energy- Magneto Hydrodynamic power conservation – Thermoelectric Power Conservation – Thermoionic Power Conversion.	15	Chalk & Talk, and PPT

Course designed by: Dr.R.Sangeetha & Mrs. N. Lakshmi Kruthika

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**	**2**	**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**COMMUNICATION ELECTRONICS**							
Course Code	**21UPHE66**					**L**	**P**	**C**
Category	**ELECTIVE**					5	-	5
Nature of course:	**EMPLOYABILITY**	✓	SKILL ORIENTED		SKILL ORIENTED			

COURSE OBJECTIVES: The Learner will be able to :

1. Understand concepts of communication process.
2. Remember the principles of analog modulations.
3. Application of Digital pulse modulation
4. Develop the communication systems.

5.Apply the modern communication systems for betterment

Unit: I	**Electronic communication** Means and modes of communication -Need for modulation- Block diagram of an electronic communication system-Brief idea of frequency allocation for radio communication system in India (TRAI)- Electromagnetic communication spectrum-band designations and usage-Channels and base-band signals-Concept of Noise, signal-to-noise (S/N) ratio.	**15hrs**
Unit: II	**Analog Modulation** Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation 58 (diode detector), Concept of Single side band generation and detection. Frequency Modulation (FM) and Generation of FM using VCO, FM detector (slope detector), Qualitative idea of Super heterodyne receiver.	**15hrs**
Unit: III	**Digital Pulse Modulation** Channel capacity, sampling theorem, Basic Principles- Phase Modulation (PM)- modulation index and frequency spectrum,-equivalence between FM and PM- PAM, PWM-PPM -modulation and detection technique for PAM only, Multiplexing. Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK).	**15 hrs**
Unit: IV	**Communication and Navigation systems – I** Satellite Communication Introduction, need, geosynchronous satellite orbits geostationary satellite advantages of geostationary satellites. Satellite visibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station. Uplink and downlink.	**15 hrs**
Unit: V	**Communication and Navigation systems – II** Mobile Telephony System Basic concept of mobile communication, frequency bands used in mobile communication, concept of cell sectoring and cell splitting, SIM number, IMEI number, need for data encryption, architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies, simplified block diagram of mobile phone handset, 2G, 3G and 4G concepts (qualitative only). GPS navigation system (qualitative idea only).	**15hrs**

	Total Lecture Hours	**75Hrs**

Books for Study:

1. D. Roddy and J. Coolen **Electronic Communications**, , Pearson Education India.

Books for Reference:

1. G. Kennedy, **Electronic Communication systems** , 3rd Edn, 1999, Tata McGraw Hill.
2. Frenzel, **Principles of Electronic communication systems** 3rd edition, McGraw Hill
3. Tomasi ,**Advanced Electronics Communication Systems**-, 6th edition, Prentice Hall.

Web Resources:

https://nptel.ac.in/courses/117101051
https://archive.nptel.ac.in/courses/117/105/117105144/
https://nptel.ac.in/courses/117102059

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Relate the communication process.	**K2**
CO2:	Outline the principles of analog modulation	**K3**
CO3:	Explain the working of analog and digital pulse modulation	**K4**
CO4:	Distinguish various concepts of communication systems.	**K4**
CO5:	Develop various types of communications.	**K3**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	**3**	**2**	**2**	**1**	**1**	**1**
CO 2	**1**	**2**	**1**	**2**	**1**	**2**
CO 3	**3**	**2**	**1**	**2**	**2**	**2**
CO 4	**2**	**2**	**2**	**2**	**1**	**2**
CO 5	**2**	**3**	**2**	**2**	**1**	**1**

***3 –** Advanced Application; **2 –** Intermediate Development; **1 -** Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Introduction to communication means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base-band signals. Concept of Noise, signal-to-noise (S/N) ratio.	15	Chalk & Talk, and PPT
II	Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation 58 (diode detector), Concept of Single side band generation and detection. Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector), Qualitative idea of Super heterodyne receiver.	15	Chalk & Talk, and PPT
III	Channel capacity, sampling theorem, Basic Principles- PAM, PWM, PPM, modulation and detection technique for PAM only, Multiplexing. Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK).	15	Chalk & Talk, and PPT
IV	Satellite Communication Introduction, need, geosynchronous satellite orbits geostationary satellite advantages of geostationary satellites. Satellite visibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station. Uplink and downlink.	15	Chalk & Talk, and PPT
V	Mobile Telephony System Basic concept of mobile communication, frequency bands used in mobile communication, concept of cell sectoring and cell splitting, SIM number, IMEI number, need for data encryption, architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies, simplified block diagram of mobile phone handset, 2G, 3G and 4G concepts (qualitative only). GPS navigation system (qualitative idea only).	15	Chalk & Talk, and PPT

Course designed by: Mrs. N. Lakshmi Kruthika & Mrs.A.Lakshmi

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	**Cos**	**K Level**	**Section A**		**Section B**		**Section C Either or Choice**	**Section D Open Choice**
			MCQs		**Short Answers**			
			No. of. Questions	**K - Level**	**No. of. Questions**	**K - Level**		
CI AI	**CO1**	Up to K2	2	K1	1	K1	2	1
	CO2	Up to K3	2	K1	2	K2	2	1
CI AII	**CO3**	Up to K4	2	K2	1	K1	2	1
	CO4	Up to K4	2	K2	2	K2	2	1
Question Pattern CIA I & II		No. of Questions to be asked	**4**		**3**		**4**	**2**
		No. of Questions to be answered	**4**		**3**	**2**	**2**	**1**
		Marks for each question	**1**		**2**		**5**	**10**
		Total Marks for each section	**4**		**6**		**10**	**10**

Distribution of Marks with K Level CIA I & CIA II								
	K Level	**Section A (Multiple Choice Questions)**	**Section B (Short Answer Questions)**	**Section C (Either / Or Choice)**	**Section D (Open Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	2	2			4	8	60
	K2	2	4	10	10	26	52	
	K3			10	10	20	40	40
	K4							
	Marks	4	6	20	20	50	100	100
CIA II	**K1**	2	2			4	8	20
	K2	2	4			6	12	
	K3			10	10	20	40	40
	K4			10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1& K2	1	K1	2(K1 & K1)	1(K2)
2	CO2	Upto K3	2	K& K2	1	K1	2(K3 & K3)	1(K3)
3	CO3	Upto K4	2	K& K2	1	K2	2(K3 & K3)	1(K4)
4	CO4	Upto K4	2	K1& K2	1	K2	2(K4 & K4)	1(K3)
5	CO5	Upto K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4			9	7.5	17
K2	5	6			11	9.17	
K3			25	20	45	37.5	37
K4			25	30	55	45.83	46
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions) **Answer All Questions**			**(10x1=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers) **Answer All Questions**			**(5x2=10 marks)**
Q.No	**CO**	**K Level**	**Questions**
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type) **Answer All Questions**			**(5 x 5 = 25 marks)**
Q.No	**CO**	**K Level**	**Questions**
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice) **Answer Any Three questions**			**(3x10=30 marks)**
Q.No	**CO**	**K Level**	**Questions**
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2021-2022 and after)

Course Name	**OPTO ELECTRONICS**			
Course Code	**21UPHS61**	**L**	**P**	**C**
Category	**Skilled**	2	-	2

Nature of course:	EMPLOYABILITY		**SKILL ORIENTED**	✓	SKILL ORIENTED	

COURSE OBJECTIVES: The Learner will be able to :

1.Understand the propagation of light waves in an optical fibre.
2. Understand losses and dispersion in optical fibres.
3. Remember the concepts of LED and semiconductor laser diode.
4. Understand the types of optical couplers.
5. Apply the concepts of fibre optics in communication system.

Unit: I	**Optical Fibres** Importance of optical fibres - propagation of light waves in an optical fibre - basic structure of an optical fibre and propagation of light wave through it- acceptance angle and acceptance cone of a fibre-numerical aperture.	**6hrs**
Unit: II	**Fibre losses and Dispersion** Losses in fibres- scattering losses-absorption losses-bending losses-Dispersion in an optical Fibre-Inter-modal dispersion-Material chromatic dispersion-Wave guide dispersion.	**6hrs**
Unit: III	**Light Sources and Detectors** LED (Light Emitting Diode)- structures of LED- LED materials-LASER and its advantages- Semiconductor LASER diode - Characteristics of photo-detectors- Avalanche photo-diode-Photo transistor.	**6hrs**
Unit: IV	**Optical couplers** Types of optical couplers-biconically tapered directional coupler- offset butt-joint directional coupler-beam splitting directional coupler	**6hrs**
Unit: V	**Measurements on Optical Fibres** Measurement of Numerical aperture and its related terms-Optical Time-Domain Reflectometer (OTDR)-Measurement of fibre attenuation-Measurement of Refractive index	**6hrs**
	Total Lecture Hours	**30Hrs**

Books for Study:

1. Subir Kumar Sarkar, **Optical Fibres and Fibre Optic Communication Systems**, S.Chand & CompanyLtd.

   Unit –I : Chapter 1.2, 1.3, 2.2-2.5
   Unit – II : Chapter 7.1,7.3,7.4,7.6, 8.3, 8.4, 8.6, 8.7
   Unit-III: Chapter 9.2, 9.2.1-9.2.3, 9.3.3, 10.2, 10.8,10.9
   Unit-IV : Chapter 12.2, 12.2.1-12.2.3, 13.6
2. Unit –V : Chapter 20.2-20.4, 20.8.20.9

Books for Reference:

1. G.Keiser, **Optical Fiber Communication**, TMH. Ltd, New Delhi, First Edition,2010.
2. P.K. Palanisamy, **Semicinductor Physics and optoelectronics**, Second edition ScitechPublications(india) PvtLtd.
3. S.C.Gupta**, Optical Fiber Communication and is Applications**, PHI Learning Pvt.Ltd, New Delhi, First Edition,2004.
4. Dr. M. Arumugam, **Optical Communication**, Anuradhapublications
5. S.Salivahanan, N. Sureskumar and A. Vallavaraj, **Electronic Devices and Circuits**, Tata McGraw-Hill Publishing Company Ltd, New Delhi, Second Edition,2011.
1. 6. A.P.Godse, U.A.Bakshi**, Electronic Devices**, Technical Publication.

Web Resources:

1.https://archive.nptel.ac.in/courses/115/102/115102103/#watch
2. https://archive.nptel.ac.in/courses/115/102/115102103/#watch
3. https://archive.nptel.ac.in/courses/115/102/115102103/#watch

EXPECTED COURSE OUTCOME On successful completion of the course, the learners should be able to		**K Level**
CO1:	Understand the propagation of light waves in an optical fibre.	**K2**
CO2:	Understand the Fibre losses and Dispersion.	**K2**
CO3:	Understand the Light Emitting Diode, semiconductor laser diode and Photo transistor.	**K3**
CO4:	Improve the skill in the area of Types of optical couplers.	**K4**
CO5:	Apply the basics concepts of fibre optics in Fibre optic communication system.	**K4**

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	2	3	1
CO 2	3	1	3	3	1	3
CO 3	2	2	2	3	2	1
CO 4	3	3	2	3	1	2
CO 5	3	3	2	2	3	3

***3** – Advanced Application; **2** – Intermediate Development; **1** - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Importance of optical fibres - propagation of light waves in an optical fibre - basic structure of an optical fibre and propagation of light wave through it- acceptance angle and acceptance cone of a fibre-numerical aperture.	6	Chalk & Talk, and PPT
II	Losses in fibres- scattering losses-absorption losses-bending losses- Dispersion in an optical Fibre-Inter-modal dispersion-Material chromatic dispersion-Wave guide dispersion.	6	Chalk & Talk, and PPT
III	LED (Light Emitting Diode)- structures of LED- LED materials-LASER and its advantages- Semiconductor LASER diode - Characteristics of photo-detectors- Avalanche photo-diode-Photo transistor.	6	Chalk & Talk, and PPT
IV	Types of optical couplers-biconically tapered directional coupler-offset butt-joint directional coupler-beam splitting directional coupler	6	Chalk & Talk, and PPT
V	Measurement of Numerical aperture and its related terms-Optical Time-Domain Reflectometer (OTDR)-Measurement of fibre attenuation-Measurement of Refractive index	6	Chalk & Talk, and PPT

Course designed by: Mrs.A.Lakshmi & Dr.R.Sangeetha