

**SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)**  
**RAHMATH NAGAR - 627 011**  
**DEPARTMENT OF PHYSICS, B.Sc. Physics – Syllabus**  
**(Applicable for students admitted in June 2021 and onwards)**

**TOTAL NUMBER OF COURSES OFFERED ( 2021 – 2024)**

<b>% OF SYLLABUS REVISION CARRIED OUT IN THE SYLLABUS 2021- 2024</b>						
<b>Programme Code</b>	<b>Programme Name</b>	<b>Name of the Department</b>	<b>Year of Introduction</b>	<b>If revision has been carried out in the syllabus Mention Yes / No</b>	<b>Percentage of Syllabus content added or replaced</b>	<b>Link of the relevant document</b>
B.Sc	Mechanics and Properties of matter	Physics	2021-22	Yes	81	
B.Sc	Optics and Acoustics	Physics	2021-22	Yes	50	
B.Sc	Physics Practicals –I	Physics	2021-22	Yes	10	
B.Sc	Thermal physics and Statistical Mechanics	Physics	2021-22	Yes	25	
B.Sc	Spectroscopy and Laser Physics	Physics	2021-22	Yes	30	
B.Sc	Physics Practicals –II	Physics	2021-22	Yes	10	

B.Sc	Electricity and Electromagnetism	Physics	2022-23	Yes	60	
B.Sc	Physics Practicals –III	Physics	2022-23	Yes	30	
B.Sc	Laser Physics	Physics	2022-23	Yes	50	
B.Sc	Computational Physics	Physics	2022-23	Yes	100( New Paper)	
B.Sc	Physics Practicals –IV	Physics	2022-23	Yes	35	
B.Sc	Energy Physics	Physics	2022-23	Yes	45	
B.Sc	Renewable energy/ Energy Harvesting	Physics	2022-23	Yes	100 ( New Paper)	
B.Sc	Physics workshop skills	Physics	2022-23	Yes	100( New Paper)	
B.Sc	Applied Physics	Physics	2022-23	Yes	20	
B.Sc	Atomic and Nuclear Physics	Physics	2023-24	Yes	60	
B.Sc	Analog Electronics	Physics	2023-24	Yes	15	
B.Sc	Mathematical methods	Physics	2023-24	Yes	100(New Paper)	
B.Sc	Physics Practicals-V	Physics	2023-24	Yes	20	
B.Sc	Physics	Physics	2023-24	Yes	10	

	Practicals -VI					
B.Sc	Nano materials and Applications	Physics	2023-24	Yes	40	
B.Sc	Geo Physics	Physics	2023-24	Yes	100 ( New Paper)	
B.Sc	Recent trends in Physics	Physics	2023-24	Yes	100 (New Paper)	
B.Sc	Biomedical Instrumentation	Physics	2023-24	Yes	70	
B.Sc	Numerical Methods	Physics	2023-24	No	-	
B.Sc	Particle and Astrophysics	Physics	2023-24	Yes	100 (New Paper)	
B.Sc	Quantum Mechanics and Relativity	Physics	2023-24	Yes	40	
B.Sc	Digital Electronics	Physics	2023-24	Yes	15	
B.Sc	Solid State Physics	Physics	2023-24	Yes	25	
B.Sc	Physics Practicals -VII	Physics	2023-24	Yes	20	
B.Sc	Physics Practicals - VIII	Physics	2023-24	Yes	10	
B.Sc	Communication systems	Physics	2023-24	Yes	75	
B.Sc	Opto Electronics	Physics	2023-24	Yes	100 (New Paper)	
B.Sc	Microprocessor and	Physics	2023-24	No	-	

	Programming					
B.Sc	Project	Physics	2023-24	No	-	
B.Sc	Radiation safety	Physics	2023-24	Yes	10	
B.Sc	Basic Instrumentation skills	Physics	2023-24	Yes	100 ( New Paper)	
B.Sc	Weather Forecasting	Physics	2023-24	Yes	100 (New Paper)	
B.Sc	Allied Physics-I	Physics	2022-23	Yes	47	
B.Sc	Allied Physics practicals-I	Physics	2022-23	No	-	
B.Sc	Allied Physics-II	Physics	2022-23	Yes	65	
B.Sc	Allied Physics practicals-II	Physics	2022-23	No	-	

% of Revision (up to second semester ) =  $206/600$

= 34.33 %

# **Sadakathullah Appa College**

(Autonomous)

(Reaccredited by NAAC at an 'A' Grade. An ISO 9001:2015 Certified Institution)

Rahmath Nagar, Tirunelveli- 11.

Tamil Nadu.

## **DEPARTMENT OF PHYSICS**



**Draft CBCS SYLLABUS**

**For**

**B.Sc PHYSICS**

**(Applicable for students admitted in June 2021 and onwards)**

**(Submitted before the Physics BOS Meeting  
to be held on 15<sup>th</sup> March,2021)**

**COURSE STRUCTURE**

**CBCS SYLLABUS FOR B.Sc. Physics**

**First Year - I SEMESTER**

<b>Course Title</b>	<b>DSC 1: MECHANICS AND PROPERTIES OF MATTER</b>
<b>Total Hrs.</b>	60
<b>Hrs./Week</b>	4
<b>Sub.Code</b>	21UCPH11
<b>Course Type</b>	Theory
<b>Credits</b>	4
<b>Marks</b>	100

**General Objective:**

To study the basic principles and applications of Mechanics and Properties of Matter.

**Course Objectives: The learners will be able to:**

<b>CO</b>	<b>Course Objectives</b>
CO-1	Define the basic concepts of linear and angular momentum.
CO-2	Derive expressions for Moment of Inertia of bodies with different shapes.
CO-3	Explain the concepts and theories related to modulus of elasticity.
CO-4	Analyze the excess pressure of different surfaces using the concepts of molecular forces and surface tension.
CO-5	Illustrate the motion of viscous fluids using Poiseuille's formula.

## Unit I Laws of Motion

Laws of conservation of energy, linear momentum and angular momentum - work energy theorem - work done by gravitational force - potential energy - conservative and non conservative forces - Collision - Elastic and inelastic collision - (Fundamental laws of impact) - Newton's law of impact - coefficient of restitution - Impact of a smooth sphere on a fixed plane - Direct impact between two smooth spheres .

## Unit II Dynamics of Rigid body

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

## Unit III Elasticity

817  
Elasticity -- Hooke's law - Elastic moduli - Poisson's ratio - Beams - bending of beams - Expression for bending moment - Cantilever- Theory of uniform and non - uniform bending - Determination of young's modulus - Torsion of a body - Expression for couple per unit twist - Rigidity modulus of a wire (Torsional Pendulum)

## Unit IV Surface Tension

Surface tension - definition - Molecular forces - Explanation of surface tension on kinetic theory - Surface energy - work done in increasing the area of a surface - Excess pressure inside a curved liquid surface - Excess pressure inside a spherical and cylindrical drops and bubbles-drop weight method- angle of contact- Quincke's method-variation of surface tension with temperature-Jaegar's Method.

## Unit V Viscosity

Viscosity - Coefficient of viscosity - Streamlined and turbulent motion - critical velocity - Rate of flow of liquid in a capillary tube - Poiseuille's formula -viscosity of highly viscous liquid-terminal velocity-Stoke's method-Ostwald Viscometer-viscosity of gas-Mayer's formula-Applications of viscosity- Pitots tube -Mercury venturimeter.

### Textbooks:

1. Properties of matter - R. Murugesan - S. Chand & Co., 2004.
3. Properties of matter - Brijlal and Subramanian S. Chand & Co., 2006.

4. Mechanics – Part I and II by Narayanamoorthy, National Publishing Company.
5. Mechanics by D.S.Mathur, S.Chand& Co., 2ndEdition (2001).
6. Mechanics by P. Duraipandian, LaxmiDuraipandian,

**Reference Books:**

1. Fundamentals of General Properties of Matter by H.R.Gulati, S. Chand & Co., NewDelhi (1982).
2. Fundamental of Physics, D. Halliday , Resnick and J Walker, 6th Edition, Wiley, New York 2001.

**Course Outcomes**

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the impacts of elastic and inelastic collisions between objects.	PSO 2, 4	Understanding
CO-2	Apply the concepts of Moment of Inertia to determine $g$ and $k$ values.	PSO 3,4	Applying
CO-3	Determine Young's and Rigidity modulus of various materials.	PSO 1,2	Applying
CO-4	Calculate the surface tension of liquids using various methods.	PSO 2,4	Analyzing
CO-5	Estimate the viscosity of liquids using Stoke's and Poiseuille's method.	PSO 3,4	Analyzing



### Relationship Matrix

Semester	Course Code	Title of the Course	Hours	Credit						
I		<b>MECHANICS AND PROPERTIES OF MATTER</b>	4	4						
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	✓	✓	✓				✓		✓	
CO-2	✓	✓	✓	✓				✓	✓	
CO-3	✓	✓	✓	✓	✓	✓	✓			
CO-4	✓	✓	✓				✓		✓	
CO-5	✓	✓	✓	✓				✓	✓	
Number of matches (✓) = 29										
Relationship = Medium										

Prepared by

Checked by

Name :Dr.S.Nazarath Begum

Head of the Department

Signature :

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(For the candidates admitted from June 2021 onwards)

SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)- TIRUNELVELI-11

DEPARTMENT OF PHYSICS

FIRST YEAR – SEMESTER-I

<b>Course Title</b>	<b>OPTICS AND ACOUSTICS</b>
<b>Total Hrs.</b>	<b>60</b>
<b>Hrs./Week</b>	<b>04</b>
<b>Sub.Code</b>	<b>21UCPH12</b>
<b>Course Type</b>	<b>Theory</b>
<b>Credits</b>	<b>04</b>
<b>Marks</b>	<b>100</b>

**General Objective:**

To understand the concepts of Physical Optics through interference, diffraction and polarization with their applications besides learning the basics of Acoustics.

**Course Objectives: The learners will be able to:**

<b>CO</b>	<b>Course Objectives</b>
CO-1	Understand the basic concepts of interference and its related experiments.
CO-2	Discuss Fresnel and Fraunhofer Diffractions, and the principle of plane transmission grating.
CO-3	Discover how light is polarised using doubly refracting crystals and the functions of different devices.
CO-4	Explain the laws of transverse vibrations of a string.
CO-5	Focus on the methods of production and properties of ultrasonic waves, besides understanding the applications of acoustics.

### UNIT I: INTERFERENCE

Analytical treatment of interference - Expression for intensity - Condition for maxima and minima in terms of phase and path difference - Coherent sources, Interference in thin films - transmitted and reflected - Colour of thin films - Air wedge - Determination of diameter of thin wire - Test for optical flatness - Determination of wavelength of light using Newton's rings - Michelson's Interferometer - Theory - Applications - Determination of wavelength.

### UNIT II: DIFFRACTION

Fresnel diffraction - diffraction at a narrow wire - Fraunhofer diffraction - Single slit - Double slit - (Simple theory) - Plane diffraction grating - Plane transmission grating element - Overlapping spectra - Maximum number of orders - Determination of wavelengths using grating - Normal incidence - Dispersive power of a grating - Rayleigh's criterion for resolution - Resolving power of prism and grating - Difference between resolving power and dispersive power.

### UNIT III: POLARISATION

Double refraction - Nicol prism - Polarizer and analyser - Huygens explanation of double refraction in uni-axial crystals - Polaroids and their uses - Quarter wave plate and Half wave plate - Plane, elliptically and circularly polarized light - Production and detection - Optical Activity - Fresnel's explanation of optical activity - Specific rotatory power - Determination using Laurent's half shade polarimeter.

### UNIT IV: SOUND

501.  
401.  
Simple Harmonic Motion - Composition of two S.H.M in a straight line-at right angles- Lissajous's figures- Free, Damped, Forced vibrations - Resonance - Fourier theorem- application- Laws of transverse vibration of strings - Sonometer- Determination of AC frequency using sonometer - Determination of frequency using Melde's apparatus- Decibels.

### UNIT V: ULTRASONICS AND ACOUSTICS

Ultrasonics - Production - Piezoelectric crystal method - Magnetostriction method - Properties and Applications Acoustics of building - Reverberation- Sabine's Reverberation formula (No derivation) - Factors affecting acoustics of building- Sound distribution in an auditorium- Requisites for good acoustics.

**BOOKS FOR STUDY:**

1. Optics, Ajay Ghatak, Tata McGraw-Hill publishing Co. Ltd., New Delhi (1998).
2. A Text book of Optics, Subrahmanyam N., Brij Lal and M. N. Avadhanulu, S. Chand & Co., New Delhi (2006).
3. Optics and Spectroscopy, R. Murugesan and Kiruthiga Sivaprasath, S. Chand & Co., New Delhi (2006).
4. A Text Book of Sound- Brij Lal and Subrahmanyam, Vikas Publishing Pvt. Ltd, New Delhi (2<sup>nd</sup> edition, 2008).

**BOOKS FOR REFERENCE:**

1. Optics, Khanna D. R. & Gulati H. R., S. Chand & Co., New Delhi (1979).
2. Fundamental of optics, Jenkins & White, McGraw Hill 4th edition (1981).

**Course Outcomes****The Learners will be able to**

<b>CO</b>	<b>Course Outcomes</b>	<b>PSOs Addressed</b>	<b>Cognitive Level</b>
CO-1	Discuss the applications of interference through Airwedge, Newton's rings and Michelson's interferometer experiments.	2, 4	Understanding
CO-2	Determine the wavelength of spectral lines using grating with the concept of diffraction.	2,4 & 5	Applying
CO-3	Examine the nature of different types of polarised light using Nicol prism, QWP and HWP.	3,4	Applying
CO-4	Estimate the frequency by applying the laws of transverse vibrations of a string in the Sonometer and Melde's string apparatus.	1,2,3 & 5	Analyzing
CO-5	Analyze the sound distribution in an auditorium.	1, 2 & 4	Analyzing

(For the candidates admitted from June 2021 onwards)

SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)- TIRUNELVELI-11

DEPARTMENT OF PHYSICS

FIRST YEAR - SEMESTER-I

<b>Course Title</b>	PHYSICS PRACTICALS-I
<b>Total Hrs.</b>	30
<b>Hrs./Week</b>	2
<b>Sub.Code</b>	21UCPH1P1
<b>Course Type</b>	Practical
<b>Credits</b>	1
<b>Marks</b>	50

**General Objective:**

**To examine the principles of properties of matter, Optics, Polarization and heat through experiments.**

**Course Objectives: The learner will be able to:**

<b>CO</b>	<b>Course Objectives</b>
CO-1	Comprehend the basic ideas of measuring instruments.
CO-2	Apply the principles of elasticity to evaluate the Young's modulus of the given material.
CO-3	Determine the specific heat capacity of a liquid by the method of cooling.
CO-4	Examine the basic principles of optics through air wedge and spectrometer experiments.
CO-5	Deduce the optical activity values of various liquids.

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To determine the Young's Modulus of the material of the bar by Uniform bending method (Pin and Microscope).
3. To determine the Young's Modulus of the material of the bar by Non-Uniform bending method (Scale and telescope).
4. To determine acceleration due to gravity (g) by Compound Pendulum.
5. To determine the Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
6. To determine the AC frequency - Sonometer
7. To determine the Refractive index and Dispersive power of the material of a given prism using sodium light- spectrometer.
8. To determine the thickness of a wire – Airwedge.
9. To determine the specific heat capacity of a liquid-Newton's law of cooling
- 10.) 10. Optical activity- Polarimeter.

**Books for Reference:**

1. Practical Physics, C.C. Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan (Printers & Publishers) Pvt. Ltd., (1<sup>st</sup> ed., 2007).
2. Practical Physics, P. R. Sasi Kumar, PHI.
3. Advanced Practical Physics ,S. P. Singh, Pragathi Prakasam.
4. Practical Physics – St. Joseph College, Trichy.
5. A Text book of Practical Physics, Indu Prakash and Ram Krishna, Kitab Mahal (1999).

**Course Outcomes**

**The Learners will be able to:**

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Observe readings with measuring instruments such as Vernier Microscope, Telescope, Spectrometer and Polarimeter.	PSO 3,4,5	Understanding
CO-2	Determine the Young's modulus of the given material by Uniform and Non-uniform bending methods.	PSO 2,3,4,5	Applying
CO-3	Apply the Newton's law of cooling to calculate the specific heat capacity of a	PSO 1,3,4,5	Applying

(For the candidates admitted from June 2021 onwards)

SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)- TIRUNELVELI-11

DEPARTMENT OF PHYSICS

FIRST YEAR - SEMESTER-II

Course Title	THERMAL PHYSICS AND STATISTICAL MECHANICS
Total Hrs.	Hrs/Sem: 4X15= 60
Hrs./Week	04
Sub.Code	21UCPH21
Course Type	Theory
Credits	04
Marks	100

**General Objective:**

To understand the modes of transmission of heat, laws of thermodynamics and their applications besides understanding the main features of statistical Mechanics.

**Course Objectives: The learner will be able to:**

CO	Course Objectives
CO-1	Define basic aspects of Kinetic theory of gases and transport phenomena
CO-2	Discuss laws of Thermodynamics and understand concepts of Entropy
CO-3	Compare the modes of transmission of heat and learn the laws of radiations
CO-4	Correlate the basic concepts related to common thermodynamic applications

CO-5

Summarize various distribution laws of statistical Mechanics

**UNIT I Kinetic theory of gases**

Mean free path – Expression for mean free path – Brownian motion – Degrees of freedom and the ratio of specific heat capacities of mono, di and tri atomic gases – Transport phenomena: viscosity, thermal conduction and diffusion – Real gases – Andrews' experiment on carbon dioxide – Critical constants of a gas,

**UNIT II Laws of Thermodynamics**

Zeroth Law of thermodynamics and temperature- First law and internal energy, conversion of heat into work, Various Thermodynamical Processes- Applications of First Law:(heat capacities of gas, adiabatic equation of state)- **Enthalpy** - Second law –Origin of second law - Kelvin, Planck and Clausius statements - Heat engines – Carnot cycle - Carnot's theorem - Entropy changes in reversible & irreversible processes, Entropy - **temperature diagrams** - Third law of thermodynamics – **Unattainability of Absolute zero.**

**UNIT III Transmission of heat**

Types – Thermal conductivity – Lee's experiment – Convection-Applications of convection-Properties of thermal radiation – black body – absorptive and emissive power radiation in a uniform enclosure – laws of radiation – Kirchoff's law – Pressure of radiation – Stefan – Boltzmann law – Distribution of energy in black body spectrum – Planck's law( No derivation) – deduction of Wein's displacement law & Rayleigh – Jean's law from Planck's law.

**UNIT IV Common thermodynamic applications**

Practical applications of conduction of heat –Davy's safety lamp – applications of convection – Thermopile – Steam power plants – examples of cooling by evaporation- domestic refrigerator – ammonia ice plant – Air conditioning systems (summer and winter type)

**UNIT V Basics of Statistical mechanics**

**Probability – phase space – quantum states – micro states and macro states – fundamental postulates of statistical mechanics – thermodynamic probability – Maxwell – Boltzmann statistics – Bose – Einstein statistics – Fermi – Dirac statistics –**

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comparison of the three statistics- Kinds of ensembles- micro canonical, canonical, Grand canonical ensembles and uses.

### Books for Study:

- 1.Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981,McGraw-Hill.
- 2.Heat Thermodynamics & Statistical Physics, Brij Lal and Subramaniam, 1<sup>st</sup> Edn., 2008, S.Chand
- 3.Heat, Narayana Moorthy and KrishnaRao, Triveni Publishers, Madras (1969).

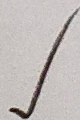
### Books for Reference

- 1.Statistical Mechanics, R.K. Pathria, Butterworth Heinemann: 2<sup>nd</sup>Ed., 1996, Oxford UniversityPress.
- 2.Statistical Physics, Berkeley Physics Course, F. Reif, 2008, TataMcGraw-Hill
- 3.Thermodynamics, Kinetic Theory and Statistical Thermodynamics, Francis W. Sears and Gerhard L. Salinger, 1986,Narosa.
- 4.An Introduction to Statistical Mechanics & Thermodynamics, R.H.Swendsen, 2012, Oxford Univ.Press

### Course Outcomes

The Learner will be able to

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Describe mean free path , ratio of specific heat caps. of real gases.	2, 5	Understanding
CO-2	Correlate the Laws of Thermodynamics in various thermodynamic processes and applications (Heat engine & Carnot engine).	2 , 4	Applying
CO-3	Illustrate the Lee's Disc experiment	2 &3	Applying



	through the knowledge of conduction.		
CO-4	Analyze the thermodynamic principles involved in the common applications such as Thermopile, Refrigerator , ammonia ice plant & steam plants.	1 & 5	Analyzing
CO-5	Deduce the different distribution laws such as M-B , B-E & F-D.	1, 2 & 4	Analyzing

### Relationship Matrix

Semester	Course Code	Title of the Course					Hours	Credit				
II	---	<b>THERMAL PHYSICS AND STATISTICAL MECHANICS</b>					4	4				
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)						
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5		
CO-1	✓		✓		✓		✓			✓		
CO-2	✓	✓	✓				✓		✓			
CO-3	✓	✓	✓	✓			✓	✓				
CO-4		✓	✓	✓	✓	✓				✓		
CO-5	✓	✓	✓	✓	✓	✓	✓		✓			
Number of matches (✓) =..30.. Relationship = <b>Medium</b>												

Prepared by

Checked by

Name :Dr. M. Mohamed Roshan

Head of the Department

(For the candidates admitted from June 2021 onwards)

SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)- TIRUNELVELI-11

DEPARTMENT OF PHYSICS

FIRST YEAR - SEMESTER-II

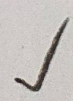
<b>Course Title</b>	<b>SPECTROSCOPY AND LASER PHYSICS</b>
<b>Total Hrs.</b>	
<b>Hrs./Week</b>	<b>4X15= 60</b>
<b>Sub.Code</b>	
<b>Course Type</b>	<b>Theory</b>
<b>Credits</b>	<b>4</b>
<b>Marks</b>	<b>100</b>

**General Objective:**

*Understand modern spectroscopic techniques including time-resolved laser methods and to acquire in-depth knowledge of laser and its applications*

**Course Objectives: The learner will be able to:**

<b>CO</b>	<b>Course Objectives</b>
CO-1	Examine spectroscopy in microwave and their applications in microwave spectrometer and microwave oven.
CO-2	Discuss IR spectroscopy, its instrumentation and applications
CO-3	Predict the signals to be observed in the rotational, vibrational spectrum of various materials using IR and Raman spectroscopy.
CO-4	Analyze the basic concepts of Laser and to apply the knowledge in designing optical techniques of Laser Sources.
CO-5	Evaluate the applications of lasers and appraise the working of laser detectors.



### Unit 1: Microwave Spectroscopy

Introduction to microwave related frequencies -Rotation of molecules - Classification of molecules - Rotation spectra of diatomic molecules - Intensities of Spectral lines - Effect of Isotopic Substitution-Polyatomic Molecules - Symmetric Top molecules - Asymmetric Top molecules--microwave spectrometer- microwave oven

### Unit 2:I.R. Spectroscopy and its Instrumentation

I.R. Spectroscopy - Instrumentation and Techniques in Infrared spectroscopy - Sources - monochromators - Sample cells - Detectors - Single beam Infra red spectrometer - Double beam Infra red spectrometer- Fourier Transform Infrared Spectroscopy- Applications

### Unit 3: Raman spectroscopy

Raman effect: Discovery - Classical theory of Raman Effect - Quantum theory of Raman effect -Pure rotational Raman Spectra- Linear molecules - Raman Spectrum of symmetric top molecules - Vibrational Raman spectra -Rotational Fine Structure - Structure determination from IR and Raman spectroscopy.

### Unit 4: Fundamentals of LASER & Production of LASER

Spontaneous emission - Stimulated emission - Meta stable state - Population inversion - Pumping - Types of Pumping- Optical pumping- electrical discharge method-direct conversion-inelastic atom-atom collision-chemical method- Laser Characteristics- Einstein's coefficients - Ruby Laser - CO<sub>2</sub> Laser - - Dye laser -Semiconductor Laser

### Unit 5: Industrial Applications of LASER

Laser cutting - Welding - Drilling - Hologram - Recording and reconstruction of hologram - Lasers in Surgery - LIDAR- Raman LIDAR - Lasers in Air Pollution monitoring- -Lasers induced fusion reactor

#### Book for Study:

1. K. Thyagarajan and A.K. Ghatak, *LASER Theory and Application*, Mc Millan, India Ltd, second Edition, 2010.
2. *Spectroscopy (Atomic and Molecular)*, Gurdeep R. Chatwal, Himalaya Publishing House, 2009.
3. *Molecular structure and spectroscopy* - G. Aruldhas, PHI Learning Pvt. Ltd, India, Second Edition 2007, Reprint 2008.
4. *Laser and its applications*- Ubald Raj & Jose Robin, Indira publications, 2003

#### Book for Reference:

1. William T. Silfvast, *Laser fundamentals*, University Press, Published in South Asia by Foundation books, New Delhi, 1998
2. WALKER
3. N. Avadhanulu, *An introduction to LASERS*, S. Chand & Company, 2001.
4. *Fundamentals of Molecular Spectroscopy* - Colin N Banwell Elaine- M MccashFifth Edition
5. *Hand book of Analytical Instruments* -R.S. Khandpur, Tata MC Grow Hill Ltd
6. *Lasers in Medicine* - H K Kobener (Wiley)

### Online Materials

1. Lasers in surgery-<https://www.slideshare.net/adityakalya/lasers-in-surgery>

2. Laser induced fusion reactor-  
[http://www.gammaexplorer.com/lanlreports/lanl2\\_a/lib-www/la-pubs/00191043.pdf](http://www.gammaexplorer.com/lanlreports/lanl2_a/lib-www/la-pubs/00191043.pdf)

### Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recognize spectroscopy in microwave and their applications in microwave spectrometer and microwave oven.	1,4,5	Remembering
CO-2	Explain IR spectroscopy, its instrumentation and applications	4,5	Understanding
CO-3	Analyze the rotational, vibrational spectrum of various materials using IR and Raman spectroscopy.	1, 4,5	Applying
CO-4	Appraise the basic concepts of Laser and to apply the knowledge in designing optical techniques of Laser Sources.	2,4,5	Analyzing
CO-5	Summarize the applications of lasers and analyze the working of laser detectors.	4,5	Evaluating

### Relationship Matrix

Semester	Course Code	Title of the Course	Hours	Credit						
III	---	SPECTROSCOPY AND LASER PHYSICS	4	4						
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	✓	✓	✓	✓	✓	✓			✓	✓
CO-2	✓	✓	✓		✓				✓	✓
CO-3	✓	✓	✓	✓	✓	✓			✓	✓

(For the candidates admitted from June 2021 onwards)

SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)- TIRUNELVELI-11

DEPARTMENT OF PHYSICS

FIRST YEAR – SEMESTER-II

<b>Course Title</b>	PHYSICS PRACTICALS-II
<b>Total Hrs.</b>	30
<b>Hrs./Week</b>	2
<b>Sub.Code</b>	
<b>Course Type</b>	Practical
<b>Credits</b>	1
<b>Marks</b>	50

**General Objective:**

To understand the basics of properties of matter, Optics and Thermal physics by doing related experiments

**Course Objectives: The learner will be able to:**

<b>CO</b>	<b>Course Objectives</b>
CO-1	Evaluate the Young's modulus and Rigidity modulus of the given material
CO-2	Apply the basic principles of optics in Newton's rings and spectrometer experiments
CO-3	Evaluate the coefficient of thermal conductivity by Lee's disc apparatus
CO-4	Test the perpendicular axes theorem by Bifilar pendulum.
CO-5	Determine the coefficient of viscosity and surface tension of the given liquid

1. To determine the Young's Modulus of the material of the bar by Cantilever

2. To determine the Rigidity Modulus of a Wire by Torsional pendulum.
3. To verify the perpendicular axes theorem by Bifilar pendulum.
4. To determine the coefficient of viscosity by Stokes method.
5. To determine the surface tension of a liquid
6. To determine the frequency of a tuning fork – Melde’s string
7. To determine wavelength of sodium light using Newton’s Rings.
8. To determine the wavelength of spectral lines of mercury spectrum-Grating normal incidence method-spectrometer.
9. To determine the coefficient of thermal conductivity of a bad conductor- Lee’s Disc method
10. To determine the particle size of lycopodium powder using LASER .

**Books for Reference:**

1. Practical Physics, C.C. Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan (Printers & Publishers) Pvt. Ltd., (1<sup>st</sup> ed., 2007).
2. Practical Physics, P. R. Sasi Kumar, PHI.
3. Advanced Practical Physics , S. P. Singh, Pragathi Prakasam.
4. Practical Physics – St. Joseph College, Trichy.
5. A Text book of Practical Physics, Indu Prakash and Ram Krishna, Kitab Mahal (1999).

**Course Outcomes**

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Determine the Young’s modulus and Rigidity modulus of the given material	PSO 2,3,4,5	Applying
CO-2	Calculate the refractive index of glass material and wavelength of the spectral lines.	PSO 2,3,4,5	Analyzing
CO-3	Calculate the coefficient of thermal conductivity given bad conductor	PSO 2,3,4,5	Analyzing
CO-4	Verify the perpendicular axes theorem by Bifilar pendulum.	PSO 2,3,4,5	Applying
CO-5	Calculate the coefficient of viscosity and surface tension of the given liquid	PSO 2,3,4,5	Evaluating



### Relationship Matrix

Semester	Course Code	Title of the Course	Hours	Credit						
II	---	Physics practicals -II	2	1						
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	✓	✓	✓	✓	✓		✓	✓	✓	✓
CO-2	✓	✓	✓	✓	✓		✓	✓	✓	✓
CO-3	✓	✓	✓	✓	✓		✓	✓	✓	✓
CO-4	✓	✓	✓	✓	✓		✓	✓	✓	✓
CO-5	✓	✓	✓	✓	✓		✓	✓	✓	✓
	Number of matches (✓) = 45									
	Relationship = High									

Prepared by

Checked by

Name :Dr.S.Nazarath Begum

Head of the Department

Signature :

