THIRUVALLUVAR UNIVERSITY, VELLORE – 632 115
(B.Sc Physics) – 2022-2023 onwards

Semester: VI **Paper type: Allied**
Paper code: **Name of the Paper: Allied Physics-1** **Credit: 3**
Total Hours per Week: 4 Lecture Hours: 60 Tutorial Hours: Nil Practical Hours: 45

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CourseObjectives

1. Tounderstandthebasics ofgravitationandtostudythepropertiesofmatter.
2. Tolearnthelawofthermoelectric circuitsandthermoelectricdiagrams.
3. Toteachthegrowthanddecayofatransientcurrentandmagnetometer.
4. Toexplainproductionofultrasonicsandreverberationtime.
5. Toknowthebasics oflaserandfibreopticsprinciplesandapplications.

UNIT-1 **Teachinghours :14**

PROPERTIESOFMATTER
Gravitation: Acceleration due to gravity -Determination of 'g' by Simple pendulum -Drawbacks of simple pendulum –Determination of time period of compound pendulum - 'g'by compound pendulum -Centre of Oscillation and Centre of Suspension areinterchangeable-Determinationof 'g'by Bar/compoundpendulum.
Elasticity:Bendingofbeams-Expressionforbendingmoment-CantileverDepressionattheloaded end of a cantilever Expression forYoung's modulus -non–uniform bending-Pin andmicroscopemethod.
Torsion : Torsion couple – Potential energy in a twisted wire – Torsional pendulum – Timeperiod-DeterminationofrigiditymodulusbyTorsionaloscillation(withoutmasses).
Viscosity: Viscosity of a liquid -Viscous force - Co-efficient of viscosity of a liquid – Poiseuille'sformula-ExperimentalmethodusingBurette-Effectof temperatureandpressureonviscosity-applications.
Surface Tension: Surface tension of a liquid-Surface Tension and interfacial surface tensionbythemethod of drops-applications.

UNIT-2 **Teachinghours:10**

THERMOELECTRICITY
Seeback, Peltier and Thomson effects - laws of thermoelectric circuits -Peltier coefficient - Thomsoncoefficient-
applicationofthermodynamicstoathermocoupleandexpressionsforPeltierandThomsoncoefficients-thermoelectricpowerandthermoelectricdiagrams.

UNIT-3 **Teachinghours:12**

TRANSIENTCURRENTANDMAGNETISM
Growth and decay of current in a circuit containing resistance and inductance- Growth

anddecayofchargeincircuitcontainingresistanceandcapacitor-
growthanddecayofchargeinaLCRcircuit–conditionforthedischargetobeoscillatory–
frequencyofoscillation.

Magnetism -Magnetic moment and pole strength of a magnet – Deflection magnetometer –
TanCPosition-Vibrationmagnetometer $-$Theory–PeriodofOscillation–DeterminationofM
andB$_H$usingthedeflectionmagnetometerandthevibrationmagnetometer.

UNIT-4   **Teachinghours:11**

ACOUSTICS
Sound:Transversevibrationofstrings-Velocityandfrequencyofvibrationsofastretchedstring-laws-
Sonometer-A.C.Frequency-Steelwire-Brasswire.

Introduction to Ultrasonics – Piezo electric effect–production by Piezo electric method –
properties–applications-Acousticsofbuildings –reverberationtime–derivationofSabine'sformula–
determinationofabsorptioncoefficient-Acousticaspectsofhalls andauditoria.

UNIT-5 LasersandFibreOptics   **Teachinghours:13**

LASERSANDFIBREOPTICS
Laser: Introduction - Principles of laser -Einstein's explanation for stimulatedemission –
Differencesbetweenstimulatedandspontaneousemission-Populationinversion–Propertiesoflaser -
Types oflasers-He-NeLaser -SemiconductorLaser-Applications oflaser

Fibreoptics:Basicprincipleofanopticalfibre-Totalinternalreflection-Basicstructureofanoptical fibre
-Numerical aperture –Coherent bundle – Attenuation and dispersion -classification
ofopticalfibres-stepindex andgradedindex fibers– singlemodeandmultimodefibers-
Fibreopticcommunication systemblockdiagram.-applications
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TextBooks

Unit1and Unit4
1. R. Murugesan and KiruthigaSivaprasath, Properties of Matter and Acoustics,
   S.Chand&Co. NewDelhi, Kindleedition.

Unit2and Unit3
1. Murugesan,Electricity&Magnetism,S.Chand&Co.New Delhi,2019.

Unit5
1. NSubrahmanyam,BrijLalandM.NAvadhanulu,ATextBookofOptics,S.Chand&Co.New
   Delhi, RevisedEdition asperUGCmodelsyllabus.

ReferenceBooks

1. BrijLalandNSubrahmanyam,ElectricityandMagnetism,SChand&CompanyPvtLtd,NewDe
   lhi, 2000.
2. D.C.Tayal,ElectricityandMagnetism,HimalayaPublishingHouse,Bombay,2014.
3. BrijLalandN.Subrahmanyam,ATextBookofSound,VikasPublications,NewDelhi.
4. C.L.Arora,PhysicsforDegreeStudentsB.ScFirstYear,S.ChandPublishing,2013.
5. K.Thyagarajan and Ajay Ghatak, Introduction to Fibre optics-, CambridgeUniversity.

6. AjayGhatakandK.Thyagarajan,FiberopticsandLasers-Thetworevolutions,Macmillan,2006.
7. K.ThyagarajanandAjay Ghatak,Lasers;Fundamentalsandapplications,Springer.
8. ModernPhysics –R,Murugeshan,KiruthigaSivaprasath,S.Chand&Co,NewDelhi,2016.
9. இயற்பியல் துணைப் பாடம் I &II-A.சுந்தரவேலுசாமி, பிரியாபப்ளிகேஷன்ஸ், கரூர் (தமிழ் வழியில் பயிலும் மாணவர்களுக்கு)

E-Materials

1. https://courses.lumenlearning.com/physics/chapter/16-4-the-simple-pendulum/
2. https://www.youtube.com/watch?v=aw0_seEt4v0
3. https://en.wikipedia.org/wiki/Thermoelectric_effect
4. https://www.youtube.com/watch?v=S0I37M2sx_0
5. https://physicscatalyst.com/elecmagnetism/growth-and-delay-charge-R-C-circuit.php
6. https://www.youtube.com/watch?v=PLQQPXot6vE
7. https://www.youtube.com/watch?v=d0_Eff4MXwM
8. https://www.techglads.com/cse/sem1/production-of-ultrasonics-by-piezoelectricmethods/
9. https://thefactfactor.com/facts/pure_science/physics/optical-fibre/5159/
10. https://www.youtube.com/watch?v=auk1OS0SVWc(Tamilvideo)

CourseOutcomes

1. Afterstudiedunit-1,thestudentwillbe abletofind theaccelerationduetogravityataplaceusingsimplependulumandcompoundpendulum.Alsocanknow theproperties ofmatterlikeelasticity,viscosityandsurfacetension.
2. Afterstudiedunit-2, thestudentwillbeabletolearn thermoemf usingSeebeckandPeltiereffects and henceunderstand thermoelectriccircuits.
3. After studied unit-3, the student will be able to explain growth and decay of atransient current in a circuit containing resistance-inductance, resistance-capacitanceand LCR in series. Also will be able to determine the horizontal components ofearth's magnetic induction at a place using deflection magnetometer in Tan Cposition.
4. Afterstudiedunit-4,thestudentwillbeabletoderivetheexpressionforthevelocityof a sound in a stretched string and hence they can determine the frequency of A.Cmains.
5. Afterstudiedunit-5,thestudentwillbeabletounderstandingtheprincipleoflaserand can demonstrate the working of He-Ne laser and applications of laser. Also, thestudent will be able to learn the fibre optics, structure and application incommunication.

Matchingtable(PutYes/Noin theappropriatebox)

Unit	(i)Remembering	(ii)Understanding	(iii)Applying	(iv)Analyzing	(v)Evaluating	(vi)Creating
1	Yes	Yes	Yes	Yes	Yes	Yes
2	Yes	Yes	Yes	Yes	Yes	No
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	No	Yes	No	No

MappingwithProgrammeOutcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	S	S
CO2	S	S	S	M	M	M	S	M	S	S
CO3	S	S	S	S	S	M	S	M	S	S
CO4	S	S	S	S	S	M	S	M	S	S
CO5	S	S	S	M	S	M	S	M	S	S

CO–CourseOutcomePO–ProgrammeOutcomeS – StrongM- Medium   L-Low(Low hastobeavoided)

Semester: VI   **Paper type: Allied**
Paper code: **Name of the Paper: Allied Physics-2**   **Credit: 3**
Total Hours per Week: 4   Lecture Hours: 60   Tutorial Hours: Nil   Practical Hours: 45

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CourseObjectives

1. Tostudytheconceptofspecialtheoryofrelativity.
2. Toexposethestructureof atomwithdifferentmodels.
3. Toknow thedefinitionofbindingenergyandtostudyaboutnuclearmodels
4. Tolearnthedifferentnumbersystemindigitalelectronicsandlogicgates
5. Togiveanintroductionaboutnanomaterial.

UNIT-1   **Teachinghours:13**

SPECIALTHEORYOFRELATIVITY
Framesofreference-inertialframesandnon-inertialframes-Galileantransformations   -Michelson-Morley experiment-interpretation of results - postulates of special theory ofrelativity Lorentz transformation equations -length contraction - time dilation -transformationofvelocities - variationofmasswithvelocity-Mass-energyequation.

UNIT-2   **Teachinghours: 13**

ATOMICPHYSICS
Bohr atom model – Critical Potentials - Experimental determination of critical potentials -Franck and Hertz's experiment -Sommerfield's Relativistic atom model The vector atommodel – spatial quantization–spinning of an electron –quantum numbers associated with thevector atom model – coupling schemes –LS and jj coupling – the Pauli's exclusion principle –Sternand Gerlach experiment

UNIT-3   **Teachinghours:11**

NUCLEARPHYSICS
Binding energy-Binding energy per nucleon-Packing fraction-Nuclear models – liquid dropmodel–semiempiricalmassformula –merits anddemerits-shellmodel-evidencesforshellmodel – nuclear radiation detectors –ionization chamber – G.M Counter-Wilson cloudchamber-Particleaccelerators-Cyclotron-Betatron.

Unit-4   **Teachinghours:11**

DIGITALELECTRONICS
Number systems -Decimal, Binary, Octal and Hexadecimal system – Conversion from onenumber system to another- Binary Arithmetic -Addition –Subtraction- 1's and 2's complement-Binarycodes-BCDcode–Excess3code,Graycode.NAND,NORandEXOR–functionsand

truthtables.NAND&NORasuniversalgates-HalfadderandFulladder-
HalfsubtractorandFullsubtractor using NANDgateonly.

UNIT-5   **Teachinghours:12**

NANOMATERIAL
Need and origin of nano -- Nano and energetic – Top-down and bottom-up approaches–
Introductory ideas of 1D, 2D and 3D nanostructured materials – Quantumdots -- Quantum wire –
Quantum well-Carbon materials – Allotropes of carbon – Structure of carbon nanotubes – Types
of CNTs -Electronic properties of CNTs-synthesis of metal oxide nanomaterial by sol-gel
method- Morphology-Scanning Electron Microscope (SEM)- Principleand Instrumentation-
Applications of nanomaterial in electronics & communication, healthcare, sensors, clothes,
paints.

Text BooksUnit1toUnit3
1. ModernPhysics–R,Murugeshan,KiruthigaSivaprasath,S.Chand&Co,New
   Delhi,2016

Unit4
1. V.Vijayendran,IntroductiontoIntegratedElectronics(Digital&Analog),S.Viswanathan,Prin
   ters &Publishers PrivateLtd, Chennai,2007

Unit5
1. V.Raghavan,*MaterialScienceandEngineering*,PrenticeHallIndia.,2004.2.

ReferenceBooks

1. AlliedPhysics–R.MurugesanS.Chand&Co.New Delhi,2005.
2. ATextbookofDigitalelectronics–R.S.Sedha,S.Chand&Co,2013
3. Malvino and Leech, Digital Principles and Application, 4th Edition, Tata McGrawHill,New Delhi,
   2000.
4. Dr.M.N.Avadhanulu, *Materialscience*,S.Chand&Company,NewDelhi,2014.
5. M.Arumugam,*Materialscience*,Anuradhapublishers,1990.
6. V.Rajendran,*MaterialScience*,TataMcGrawHillLtd,NewDelhi,2001.
7. D.C.Tayal,NuclearPhysics,HimalayaPublishingHouse,2009.
8. இயற்பியல் துணைப் பாடம் I &II-A.சுந்தரவேலுசாமி, பிரியாபப்ளிகேஷன்ஸ், கரூர் (தமிழ்
   வழியில் பயிலும் மாணவர்களுக்கு)

E-Materials

1. https://en.wikipedia.org/wiki/Galilean_transformation
2. https://www.youtube.com/watch?v=NH3_lIkSB9s
3. https://www.youtube.com/watch?v=EEWuUst2GK4
4. https://en.wikipedia.org/wiki/Vector_model_of_the_atom
5. https://www.tutorialspoint.com/what-is-a-geiger-muller-counter
6. https://www.youtube.com/watch?v=jxY6RC52Cf0
7. https://www.tutorialspoint.com/digital_circuits/digital_circuits_number_systems.htm
8. https://www.youtube.com/watch?v=4ae9sJBBkvw

9. https://en.wikipedia.org/wiki/Nanomaterials
10. https://www.youtube.com/watch?v=mPxoJz6treE(Tamilvideo)

CourseOutcomes

1. Afterstudiedunit-1,thestudentwillbeabletostudytheframes ofreference,Galileantransformationequationsand specialtheory of relativity.
2. Afterstudiedunit-2,thestudentwillbeabletodescribethedifferentatomicmodelsandStern andGerlach Experiment.
3. Afterstudiedunit-3,thestudentwillbeabletoexplainbindingenergy,liquiddropmodel,G.Mcounterand particleaccelerators.
4. After studied unit-4, the student will be able to know the conversion of numbersystems from one to other and also will be able to design universal gates using NANDandNOR gates.
5. Afterstudiedunit-5,thestudentwillbeabletounderstandingthebasics ofnanomaterial,synthesisanditsapplications.

Matchingtable(PutYes/Noin theappropriatebox)

Unit	(i)Remembering	(ii)Understanding	(iii)Applying	(iv)Analyzing	(v)Evaluating	(vi)Creating
1	Yes	Yes	No	Yes	No	No
2	Yes	Yes	No	Yes	No	No
3	Yes	Yes	No	Yes	No	No
4	Yes	Yes	Yes	Yes	No	Yes
5	Yes	Yes	Yes	Yes	No	Yes

MappingwithProgrammeOutcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	M	M	S	M	S	M
CO2	S	S	S	M	M	M	S	M	S	S
CO3	S	S	S	M	M	M	S	M	S	S
CO4	S	S	S	S	S	M	S	M	S	S
CO5	S	S	S	M	M	M	S	M	S	S

CO–CourseOutcomePO–ProgrammeOutcomeS-Strong   M-Medium   L-Low(Lowhas tobeavoided)

Semester: VI   **Paper type: Allied Practical**
Paper code: **Name of the Paper: Allied Physics Practical**   **Credit: 2**
Total Hours per Week: 4   Lecture Hours: 60   Tutorial Hours: Nil   Practical Hours: 45
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ListofExperiments(Any12Experimentsonly)

1. Determinationofˇg'usingCompoundpendulum.
2. Young'smodulus-Non-Uniformbending-Pin&microscope
3. RigidityModulus –Torsionaloscillationmethod(withoutmasses).
4. RigidityModulus–Static TorsionmethodusingScale andTelescope.
5. Surfacetensionandinterfacialsurface tensionbyDropWeightmethod.
6. Sonometer–FrequencyofaTuningfork.
7. Sonometer–DeterminationofA.C.frequency-usingsteelandbrass wire
8. AirWedge–Determinationofthicknessofathinwire
9. Newton'sRings–Radius ofCurvatureofaconvexlens.
10. Spectrometer–Refractiveindexofaliquid –Hollowprism.
11. Spectrometergrating–MinimumDeviation-WavelengthofMercurylines.
12. Potentiometer–Calibrationoflowrangevoltmeter.
13. Deflection magnetometer and Vibration magnetometer-Tan C Position-Determination ofMand B$_H$.
14. Figureofmerit-Tablegalvanometer.
15. ConstructionofAND,ORgates usingdiodesandNOTgateusingatransistor.
16. NAND/NORasuniversalgate.
17. HalfadderandFulladderusingNANDgate.
18. HalfsubtractorandFullsubtractorusingNANDgate.
19. Lasers:Studyoflaserbeamparameters.
20. MeasurementofNumericalaperture(NA)ofatelecommunicationgradedindexopticfiber.

TextBooks
1. C.C.Ouseph,U.J.Rao,V.Vijayendran,Practical PhysicsandElectronics,S.Viswanathan,Printers &Publishers PrivateLtd,Chennai,2018.
2. M.N.Srinivasan,S.Balasubramanian,R.Ranganathan,ATextBookofPracticalPhysics,Sultan Chand &Sons,NewDelhi, 2015.

ReferenceBooks
1. Dr.S.Somasundaram,PracticalPhysics,Apsarapublications,Tiruchirapalli,2012.
2. R.Sasikumar,PracticalPhysics,PHILearningPvt.Ltd,NewDelhi,2011.