

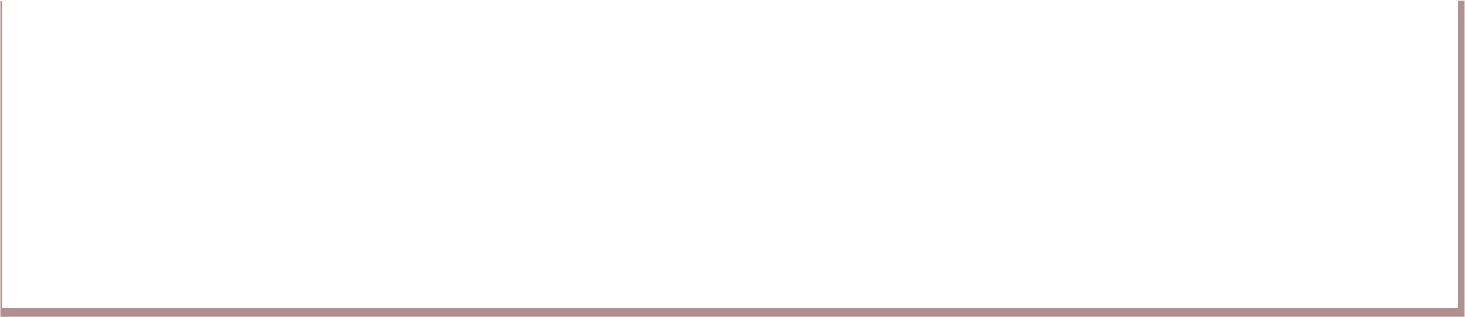
**B.Sc. Physics with CA**

Syllabus

AFFILIATED COLLEGES

**2025–2026onwards**

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**BHARATHIARUNIVERSITY**

**(AStateUniversity,Accreditedwith“A++”GradebyNAAC, Ranked 21st among Indian Universities by MHRD-NIRF)**

**Coimbatore-641046,TamilNadu, India**

**BHARATHIAR UNIVERSITY::COIMBATORE 641046**

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

(For the students admitted during the academic year 2025–26)

# Scheme of Examination

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Part** | **Course Code** | **TitleoftheCourse** | **Credits** | **Hours/week** | | **MaximumMarks** | | |
| **Theory** | **Prac- tical** | **CIA** | **CEE** | **Total** |
| **FIRSTSEMESTER** | | | | | | | | |
| I | 11T | Language:TamilI | 4 | 6 | - | 25 | 75 | 100 |
| II | 12E | EnglishI | 4 | 6 | - | 25 | 75 | 100 |
| III | 13A | CoreI-Mechanics,PropertiesofMatterand Sound | 4 | 6 | - | 25 | 75 | 100 |
| III | 23P | CorePracticalI | - | - | 3 | - | - | - |
| III | 1AA | AlliedMathematicsI | 4 | 7 | - | 25 | 75 | 100 |
| IV | 1FA | EnvironmentalStudies# | 2 | 2 | - | - | 50 | 50 |
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| **SECONDSEMESTER** | | | | | | | | |
| I | 21T | Language-Tamil II | 4 | 6 | - | 25 | 75 | 100 |
| II | 22E | EnglishII | 2 | 4 | - | 25 | 25 | 50 |
| II | 2NM$ | EffectiveEnglish:LanguageProficiencyfor Employability  <http://kb.naanmudhalvan.in/Bharathiar_University_(BU)> | 2 | 2 | - | 25 | 25 | 50 |
| III | 23A | CoreII-Heat andThermodynamics | 4 | 6 | - | 25 | 75 | 100 |
| III | 23P | CorePracticalI | 4 | - | 3 | 40 | 60 | 100 |
| III | 2AA | AlliedMathematicsII | 4 | 7 | - | 25 | 75 | 100 |
| IV | 2FB | ValueEducation:HumanRights# | 2 | 2 | - | - | 50 | 50 |
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| **THIRDSEMESTER** | | | | | | | | |
| I | 31T | Language-Tamil III | 4 | 6 | - | 25 | 75 | 100 |
| II | 32E | EnglishIII | 4 | 6 | - | 25 | 75 | 100 |
| III | 33A | CoreIII-Optics | 4 | 4 | - | 25 | 75 | 100 |
| III | 43P | CorePracticalII | - | - | 2 | - | - | - |
| III | 3AH | AlliedChemistryI | 3 | 4 | - | 20 | 55 | 75 |
| III | 4PH | AlliedChemistryPractical | - | - | 3 | - | - | - |
| IV | 3ZA | SkillBasedSubject -MSOffice | 3 | 3 | - | 20 | 55 | 75 |
| IV | 3FC | Non-majorelectiveI-Women’sRights# | 2 | 2 | - | - | 50 | 50 |
| IV | Health and Wellness | | 1 | - | - | - | - | 25 |
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| **FOURTH SEMESTER** | | | | | | | | |
| I | 41T | Language-Tamil IV | 4 | 6 | - | 25 | 75 | 100 |
| II | 42E | EnglishIV | 4 | 6 | - | 25 | 75 | 100 |
| III | 43A | CoreIV-AtomicPhysicsand Spectroscopy | 4 | 4 | - | 25 | 75 | 100 |
| III | 43P | CorePractical-PhysicsPracticalII | 3 | - | 2 | 20 | 55 | 75 |
| III | 4AH | AlliedChemistry II | 3 | 4 |  | 20 | 55 | 75 |
| III | 4PH | AlliedChemistryPractical | 2 | - | 3 | 20 | 30 | 50 |
| IV | 4ZB | Skill based subject - Principles of ProgrammingConceptsandCProgramming | 2 | 3 | - | 25 | 25 | 50 |
| IV | 4NM$ | Office Fundamentals: Digital Skills for Employability <http://kb.naanmudhalvan.in/Bharathiar_University_(BU)> | 2 |  |  | 25 | 25 | 50 |
| IV | 4FE | Non-majorelectiveII-GeneralAwareness# | 2 | 2 | - | - | 50 | 50 |
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| **FIFTHSEMESTER** | | | | | | | | |
| III | 53A | CoreV-MathematicalPhysics | 4 | 5 | - | 25 | 75 | 100 |
| III | 53B | CoreVI-AppliedElectronics | 4 | 4 | - | 25 | 75 | 100 |
| III | 53C | CoreVII-SolidState Physics | 4 | 5 | - | 25 | 75 | 100 |
| III | 53D | CoreVIII-ElectricityandMagnetism | 4 | 4 | - | 25 | 75 | 100 |
| III | 63P | CorePracticalIII-Electronics | - | - | 2 | - | - | - |
| III | 5EA | ElectiveI-PrinciplesofDigitalElectronics and Microprocessor | 3 | 3 | - | 20 | 55 | 75 |
| III | 63Q | ElectivePractical-DigitalandMicro  Processor | - | - | 2 | - | - | - |
| IV | 5ZC | SkillbasedSubject-ObjectOriented Programming in C++ | 3 | 3 | - | 20 | 55 | 75 |
| IV | 6ZP | SkillbasedPracticalV-ObjectOriented Programming in C++ and MS Office | - | - | 2 | - | - | - |
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| **SIXTHSEMESTER** | | | | | | | | |
| III | 63A | CoreIX-QuantumMechanicsandRelativity | 4 | 5 | - | 25 | 75 | 100 |
| III | 63B | CoreX-Nuclear Physics | 4 | 4 | - | 25 | 75 | 100 |
| III | 63C | CoreXI-Numerical Methods | 4 | 5 | - | 25 | 75 | 100 |
| III | 63D | CoreXII-FundamentalofNanomaterials | 4 | 4 | - | 25 | 75 | 100 |
| III | 63P | CorePracticalIII-ElectronicsLab | 4 | - | 3 | 25 | 75 | 100 |
| III | 6EA | ElectiveII-MATLAB | 3 | 3 | - | 20 | 55 | 75 |
| III | 63Q | ElectivePractical-DigitalandMicro Processor | 3 | - | 2 | 20 | 55 | 75 |
| IV | 6ZP | SkillbasedPractical-ProgramminginCand C++ and MS Office | 2 | - | 2 | 25 | 25 | 50 |

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| IV | 6NM$ | Project Based learning - Advanced Platform Technology-(Physics,Electronics,Mathematics,Statistics,Data Science) - Govt(auto) & Govt (Non-Auto)  Data Analytics with Advanced Tools - (Physics,Electronics, Mathematics, Statistics, Data Science) - Aided(Non-auto) & SF (Non-Auto)<http://kb.naanmudhalvan.in/Bharathiar_University_>  (BU) | 2 |  | 2 | 25 | 25 | 50 |
| V | 67A | ExtensionActivities@ | 1 | - | - | 25 | - | 25 |
|  |  | |  |  |  |  |  |  |
|  | **Grand Total** | | **140** |  |  |  |  | **3500** |

2NM$.4NM$,&6NM$-NaanMudalvanCourses.,

@NoUniversityExaminations.OnlyNoContinuousInternalassessment(CIA). # No Continuous Internal assessment (CIA). Only University Examinations.

# SEMESTERI

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| **Course code** | | **13A** | **MECHANICS,PROPERTIESOFMATTERAND SOUND** | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **COREPAPER I** | **6** | **0** | | **0** | **4** |
|  | | | | | | | | |
| **Pre-requisite** | | | Thestudentsareexpectedtoknowthefundamental properties of matter and sound | **Syllabus Version** | | | **2023-24** | |
| **Course Objectives:** | | | | | | | | |
| Themain objectives ofthis courseareto:   1. explorethebasiclawsgoverningthe behaviorofmatterineveryday life. 2. demonstratepracticalknowledgeandskillinunderstandingtheelasticpropertiesofsolids. 3. identifythebehavior ofsimpleharmonic waves 4. accesstheimportance ofUltrasonics | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | |
| 1 | understandand definethelaws involved in mechanics. | | | | | | K1 | |
| 2 | gaindeeperunderstandingofmechanics anditsfundamentalconcepts. | | | | | | K2 | |
| 3 | understandtheconceptofpropertiesofmatterandtorecognizetheirapplications in various real problems. | | | | | | K3 | |
| 4 | analyzetheuniversal behavior ofwavemotion. | | | | | | K4 | |
| 5 | learningthebasicconceptsofelasticity,surfacetension,Gravitation,viscosity,and sound and evaluating their values for various materials. | | | | | | K5 | |
| 6 | exploretheproduction andapplication ofultrasonic wave | | | | | | K6 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | |
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| **Unit:1** | | **ConservationLaws** | | | | **18 hours** | | |
| Impulse – Impact – Direct and oblique impact – Final velocity and loss of kinetic energy –Motion of a particle in a vertical circle – friction – Laws of friction – angle of friction – resultant reaction – cone of friction – Equilibrium of a body on a rough inclined plane to the horizontal and when the inclination is greater than the angle of friction. | | | | | | | | |
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| **Unit:2** | | **MotionofRigidBody** | | | | **18 hours** | | |
| Momentofinertia–Parallelandperpendicularaxestheorem–M.I.ofrectangularLaminaandTriangular  lamina–M.IofasolidsphereaboutanaxisthroughitsC.G.–Compoundpendulum–torqueand angular momentum – Relation – Kinetic rotation – conservation of angular momentum. | | | | | | | | |
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| **Unit:3** | | **Gravitation** | | **18 hours** | | | | |
| Kepler’sLawsofplanetarymotion–Lawsofgravitation–Boy’smethodforG–Gravitationalpotential – Gravitational field at a point dueto spherical shell – Variation of ‘g’ with latitude, altitude and depth. **Elasticity:**Elasticmodules–Poisson’sratio–relationbetweenthem–Expressionforbendingmoment –determinationofYoung’smodulusbyuniformandnon-uniformbending–Isectiongirders–Rigidity modulus – Static Torsion – Expression for couple per unit twist – Torsional oscillation. | | | | | | | | |
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| **Unit:4** | | **SurfaceTension** | **16 hours** |
| DefinitionanddimensionofsurfaceTension–ExcessofPressureoveracurvedsurface–Variationof  S.T. with temperature – Jaeger’s Experiment. **Viscosity:** Definition – Rotation viscometer- viscosity of gases, Meyer’s Modification of Poiseuille’s formula – Rankine’s method for viscosity of a gas. | | | |
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| **Unit:5** | | **Sound** | **18 hours** |
| Simple Harmonic vibration – Progressive waves – properties – Composition of two S.H.M. and beats – stationary waves – Properties Melde’s Experiment for the frequency of electrically maintained tuning fork – Transverse and longitudinal modes – Ultrasonics –Properties and application. | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
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| **TotalLecturehours** | | | **90** |
| **TextBook(s)** | | | |
| 1 | PropertiesofMatter andAcoustics,R.Murugesan,2nd Edition,S.Chand&Co.(2017). | | |
| 2 | PropertiesofMatter,Brijlaland N.Subrahmanyam,3rd Edition,S.Chand& Co.(2005). | | |
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| **ReferenceBooks** | | | |
| 1 | ElementsofPropertiesof Matter,D.S.Mathur,11th Edition,S.Chand &Co.,(2010). | | |
| 2 | Atextbook ofSound,Brijlal N.Subramaniam,Vikas Publishing, 2ndedition, (2010). | | |
| 3 | ATextbook ofSound, M.N.Srinivasan,HimalayaPublishinghouse, (1991). | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | https:/[/www.physicstutoronline.co.uk/alevelphysicsnotes/](http://www.physicstutoronline.co.uk/alevelphysicsnotes/) | | |
| 2 | https://latestcontents.com/bsc-physics-mechanics-notes/ | | |
| 3 | [www.khanacademy.org/science/physics/elasticity/surface](http://www.khanacademy.org/science/physics/elasticity/surface)tension | | |
| 4https://sites.google.com/brown.edu/lecture-demonstrations/home?authuser=0 | | | |
| CourseDesigned By: BoS-Physics CA | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | M | S | S | S | L | S | S |
| **CO2** | S | S | M | M | S | S | S | L | S | S |
| **CO3** | S | S | M | L | S | M | L | M | S | M |
| **CO4** | S | S | M | M | S | S | S | L | S | M |
| **CO5** | S | S | S | S | S | S | S | M | M | S |
| **CO6** | M | M | M | L | S | S | M | L | S | S |

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

# SEMESTERII

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| **Course code** | | **23A** | **HEATAND THERMODYNAMICS** | **L** | **T** | **P** | | **C** |
| **Core/Elective/SBS** | | | **COREPAPER II** | **6** | **0** | **0** | | **4** |
| **Pre-requisite** | | | Thestudentsareexpectedtoknowthefundamental concepts of heat and thermodynamics | **Syllabus Version** | | | **2023-24** | |
| **Course Objectives:** | | | | | | | | |
| Themain objectives ofthis courseareto:   * investigatetheroleof variouslaws ofheatandthermodynamics inour daily life * substantiatetheconceptsof heatandthermodynamics experimentally  * exploretheapplicationsofheatengines | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | |
| 1 | Torealisevarious principlesand lawsof heat | | | | | K2 | | |
| 2 | Toderiveexpressions andfind experimentalverificationsforthelaws studied | | | | | K3 | | |
| 3 | Toanalysetheapplicationsofheatandthermodynamicsinvariousareasand solve the real life problems. | | | | | K5 | | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | |
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| **Unit:1** | | **Calorimetry** | | | | **17 hours** | | |
| Definitions–Newton’slawofcooling–specificheatofaliquidcalendarandBarne’scontinuousflow method – two specific heats of a gas – specific heat of a gas by Joly’s differential steam calorimeter – Regnault’smethod–DulongandPetit’slaw–variationofspecificheatandatomicheatwith  temperature. | | | | | | | | |
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| **Unit:2** | | **TransmissionofHeat** | | | | **17 hours** | | |
| **Conduction:**Co-efficientofthermalconductivity–Cylindricalflowofheat–Thermalconductivityof rubber – Lee’s disc method for bad conductors. **Radiation:** Black body – Wein’s displacement law – Raleigh-Jean’s law – Stefan’s law – Experimental Determination of Stefan’s constant – Mathematical derivation of Stefan’s law. | | | | | | | | |
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| **Unit:3** | | **KineticTheoryofGases** | | | | | **18 hours** | |
| Maxwell’s law of distribution of molecular velocities – Experimental verification – equilibrium speed distribution of velocities. Mean free path – transport phenomena – diffusion – viscosity and thermal conductionofgases–Vanderwallsequation–relationbetweenVanderWall’sconstantandcritical  constants. | | | | | | | | |
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| **Unit:4** | | **Laws ofThermodynamics** | | | | | **18 hours** | |
| First law of thermodynamics – Isothermal and Adiabatic process – gas equation during an adiabatic process – Work done in adiabatic expansion of gas – Determination of γ by Clement and Desorme’s method–secondlawofthermodynamics–Carnot’sengine-Working–efficiency–Carnot’srefrigerator – Carnot’s Theorem. | | | | | | | | |
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| **Unit:5** | | **Conceptof Entropy** | **18 hours** |
| Entropy–Changeinentropy–Changeinentropyinareversiblecycle–Principleofincreaseofentropy – temperature entropy diagram – Entropy of a perfect gas – Thermo dynamic variables – Maxwell’s thermodynamicalrelations–Applications:JouleThomsoneffect–Temperatureofinversion-Claussius and Clapeyron’s equation. | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
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| **TotalLecturehours** | | | **90** |
| **TextBook(s)** | | | |
| 1 | ThermalPhysics,R.Murugesan,S.Chand &Co(2008). | | |
| 2 | Heat&Thermodynamics,Brijlal&N.Subramaniam,S.Chand&Co (2007) | | |
| 3 | Heat–M.NarayanamurthiandN.Nagaratnam,NationalPublishers. | | |
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| **ReferenceBooks** | | | |
| 1 | HeatandThermodynamics –ZemanskyandR.H. Dcltanann,TMH (2017) | | |
| 2 | Heatand Thermodynamics – D.S.Mathur, S.Chand & Co. (2002). | | |
| 3 | HeatandThermodynamics–Agarwal,Singhal,Sathyaprakash,KedarNathRamnathandCo.(2003). | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://www.askiitians.com/revision-notes/physics/heat-transfer/> | | |
| 2 | <https://www.askiitians.com/revision-notes/physics/kinetic-theory-of-gases/> | | |
| 3 | <https://www.askiitians.com/revision-notes/physics/heat-phenomena/> | | |
| 4 | <https://www.askiitians.com/revision-notes/physics/thermodynamics/> | | |
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| CourseDesigned By:**BoS -Physics CA** | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | S | M | S | S | M | M | M |
| **CO2** | S | S | S | S | M | M | M | S | M | S |
| **CO3** | M | S | S | S | S | S | S | S | S | S |

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

# SEMESTERI&II

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| **Coursecode** | | **23P** | **COREPRACTICAL I**  **(**Examinationattheend ofSecondSemester**)** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **CORE PRACTICAL** | **0** | | **0** | | **3** | **4** |
| **Pre-requisite** | | | Shouldhavethefundamentalknowledgeof experimental Physics | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:   * Todeveloptheexperimental skillsinMechanics andPropertiesof matter * Togainknowledgeabouttheexperimentsbased onElectricityand Magnetism * Tomotivatethestudents toapplytheexperimentaltechniquesinOpticsandSound. | | | | | | | | | |
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| **ExpectedCourse Outcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | analyzetheconceptsofViscosity,SurfaceTensionandYoung’sModulusof different substances | | | | | | | K4 | |
| 2 | exploretheknowledgeof SpectrometerandotherOptical instruments | | | | | | | K5 | |
| 3 | realizeprinciplesandapplicationsofPotentiometer,Sonometer,Magnetometerand PN junction diode. | | | | | | | K4 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | |
|  | | | | | | | | | |
| **LISTOFEXPERIMENTS**(Anytwelveexperiments) | | | | | **84 Hours** | | | | |
| 1. Accelerationduetogravity-Compound Pendulum 2. Surfacetensionofaliquid–DropWeight Method 3. ViscositybyCapillaryflowmethod 4. ComparisonofViscosities–CapillaryFlowMethod 5. Rigiditymodulus –StaticTorsion –ScaleandTelescope 6. Young’sModulus– Non-Uniformbending– Pinand Microscope 7. Young’sModulus–Uniformbending–Optic lever 8. Young’sModulus–Cantilever–Dynamic method 9. FrequencyofA.C.-Sonometer 10. FrequencyofVibrator-Melde’s Strings 11. Refractiveindex ofSolid Prism-Spectrometer 12. Determinationofwavelengthλ-Grating–Minimumdeviation -Spectrometer 13. Refractiveindexof Prism-(i-d) Curve -Spectrometer 14. Refractiveindexof liquid -Hollow prism – Spectrometer 15. ThicknessofWire-AirWedge 16. LowrangevoltmeterCalibration-Potentiometer 17. Lowrange AmmeterCalibration -Potentiometer 18. Velocityof Sound-ResonanceColumn apparatus 19. Momentofmagnet–TanC Position 20. CharacteristicsofaJunction Diode | | | | | | | | | |
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| **ContemporaryIssues** | | **6 Hours** |
| Onlineworkshop,WebinarsonExperimentalPhysics | | |
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| **TotalPracticalhours:90** | | |
| **ReferenceBooks** | | |
| 1 | AtextbookofPracticalPhysics,M.N.Srinivasan,S.Balasubramanian,R.Ranganathan,Sultan Chand & Sons(2017) | |
| 2 | PracticalPhysicsandElectronics,C.C.Ouseph,U.J.Rao,V.Vijayendran,S.Viswanathan Publishers (2007) | |
|  | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | |
| 1 | [https://nptel.ac.in/course.html/physics/experimentalphysicsI, IIand III](https://nptel.ac.in/course.html/physics/experimental%20physics%20I%2C%20II%20and%20III) | |
| 2 | <https://nptel.ac.in/courses/115/105/115105110/> | |
| 3 | <https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK> | |
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| CourseDesigned By:**BoS -Physics CA** | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | M | M | S | M | L | M | S |
| **CO2** | S | S | S | M | M | M | L | M | S | S |
| **CO3** | M | M | S | S | L | M | S | S | S | M |

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

# SEMESTERIII

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| **Course code** | | **33A** | **OPTICS** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **COREPAPER III** | **4** | | | **0** | | **0** | **4** |
| **Pre-requisite** | | | Thestudentsshouldacquireknowledgebasicpropertiesof light. They should be familiar with the behaviour of light in different medium. | **Syllabus Version** | | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | | |
| Themain objectives ofthis courseareto:  gainknowledgetowardsgeometricalandphysicaloptics provide a good platform in the field of Optics  provideabasicknowledgeonthebehavioroflightenergyandtheirpropagation inspire the concepts of LASER and their applications. | | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | | |
| 1 | rememberthebehaviorof lighton passingthrough lens,prism, thinfilm and grating | | | | | | | | K1 | |
| 2 | understandthephenomenaoflightlikeInterference,diffraction,polarizationand population inversion | | | | | | | | K2 | |
| 3 | analyzeandapplytheconceptsofdispersivepower,refractiveindex,resolvingpower, double refraction, specific rotation and optical pumping for different materials | | | | | | | | K4 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** – Create | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:1** | | **GeometricalOptics** | | | | **10 hours** | | | | |
| Aberrations-Sphericalaberrationsinlens-coma-Astigmatism-chromaticaberration-dispersionby a prism - Cauchy’s dispersion formula - dispersive power, achromatism in prism - deviation without dispersion -chromaticaberrationsinalens -circle ofleastconfusion -achromaticlens -conditionfor achromatism of two thin lenses separated by a finite distance. | | | | | | | | | | |
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| **Unit:2** | | **PhysicalOptics – Interference** | | | | **12 hours** | | | | |
| Fresnel’sBiprism–Interferenceinthinfilmsduetoreflectedlight–Fringesduetowedgeshapedthin film–Newton’srings–RefractiveindexoftheLiquid–Michelsoninterferometer–Determinationof awavelengthofmonochromaticlight–differenceinWavelengthbetweentwoneighboringspectral  lines–FabryPerotInterferometer. | | | | | | | | | | |
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| **Unit:3** | | **Diffraction** | | | **12 hours** | | | | | |
| Fresnel’sassumptions–rectilinearpropagationoflight–halfperiodzone–ZonePlates–Actionand Construction – comparison with a convex lens – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction at a Single light – Diffraction grating – Resolving power & Dispersive power of Grating. | | | | | | | | | | |
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| **Unit:4** | | **Polarization** | **12 hours** |
| Double Refraction – Huygen’s explanation --Optic axis in the plane of incidence, inclined and perpendicular to the crystal surface – Production and Detection of Plane, Circularly and Elliptically Polarizedlight–OpticalActivity–Fresnel’sexplanation–Specificrotation–HalfShadePolarimeter. | | | |
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| **Unit:5** | | **QuantumOptics** | **12 hours** |
| Lightquantaandtheirorigin–Resonanceradiation–Metastablestates–PopulationInverse–Optical pumping–SpontaneousandStimulatedemission–Einstein’scoefficient–Ruby,He-Ne,CO2laser–  Resonant cavities – elements of non-linear optics – second harmonic generation– threshold condition for laser – Stimulated Raman scattering. | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
|  | | | |
| **TotalLecturehours** | | | **60** |
| **TextBook(s)** | | | |
| 1 | AText bookof Optics,Brijlal &Subramaniam,S.Chand Ltd. (2001) | | |
| 2 | ModernPhysics,RMurugesan,S.ChandPublishing, 18thEdition (2017) | | |
|  | | | |
| **ReferenceBooks** | | | |
| 1 | OpticsandSpectroscopy, R Murugesan,S.ChandPublishing,5thEdition(2013) | | |
| 2 | Optoelectronics,AjoyKumarGhatak,K. Thyagarajan,CambridgeUniversityPress (1989). | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://www.youtube.com/watch?v=ML7HcZo6IaE> | | |
| 2 | <https://www.khanacademy.org/science/physics/light-waves/introduction-to-light-waves/v/polarization-of-light-linear-and-circular> | | |
| 3 | <https://nptel.ac.in/courses/104/104/104104085/> | | |
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| CourseDesigned By:**BoS -Physics CA** | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | M | M | S | M | M | M | S |
| **CO2** | S | M | S | M | S | M | M | M | S | S |
| **CO3** | M | M | M | S | S | S | S | S | S | S |

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

# SEMESTERIII

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| **Coursecode** | | **3ZA** | **MS OFFICE** | **L** | **T** | **P** | **C** |
| **Core/Elective/SBS** | | | **SKILLBASEDSUBJECT** | **3** | **0** | **0** | **3** |
| **Pre-requisite:** | | | Studentsshouldknowtheimportanceofcomputer for accuracy and speed | **Syllabus Version** | | **2023-24** | |
| **Course Objectives:** | | | | | | | |
| Themain objectives ofthis courseareto:   * understandthebasicprinciplesofcomputer, and computer-basedtechnology. * enablestudentstouse Internet,E-mail,webpage etc. * knowaboutMSword,MS excel,Powerpointand theiruses. | | | | | | | |
|  | | | | | | | |
| **ExpectedCourseOutcomes:** | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | |
| 1 | useinternetandEmailetc. | | | | | K1 | |
| 2 | understandtheconceptofcomputeranditsaccessories. | | | | | K2 | |
| 3 | Analyzeandapply MS word,MSexcelwhereverneeded | | | | | K3, K4 | |
| 4 | chooseasuitablesoftwareand apply it. | | | | | K3 | |
| 5 | evaluatetheproblems usingcomputer programs | | | | | K5 | |
| 6 | designandexecuterequiredprograms. | | | | | K6 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** – Create | | | | | | | |
|  | | | | | | | |
| **Unit:1** | | **Basics ofcomputer** | | **9 hours** | | | |
| **Introduction:**WhatisaComputer-SoftwareandHardwareHardwareComponents-HardwareAccessories Operating System Software -Software Application.  **ComputerNetwork:**LAN-Internet-E-Mail –Browsers-E-Mail–Clients | | | | | | | |
|  | | | | | | | |
| **Unit:2** | | **MSWord** | | **9 hours** | | | |
| **Setting Page Style** - Formatting -Border & Shading –Columns -Header & foot- Setting Footnotes - InsertingmanualPagebreak-Columnbreakandlinebreak.-Creatingsectionsandframes-InsertingClip arts, pictures, and other files-. Anchoring & Wrapping.  **Setting Document Styles -** Table of Contents -Index - Page Numbering, data &Time, Authoretc., Creating Master Documents -Web page. | | | | | | | |
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| **Unit:3** | | **MSExcel** | | **9 hours** | | | |
| Creatingworksheet -enteringandeditingtext,numbers,formulas -saving –Excelfunctions modifying worksheet range selection copying and moving data - defining names - inserting of deleting rows of columns - moving around worksheet naming worksheet, copying inserting of deleting worksheet - formatting,gauging,headingdisplayingvalue-changingofselectingfonts,protestingdatausingstyleso  templates - reprinting worksheet creating charts - managing date - what if tables pate tables wraps, macros, linking worksheets. | | | | | | | |
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| **Unit:4** | | **MSPowerpoint** | | **9 hours** | | | |
| **Creating a presentation:** Setting presentation style - Adding Text to the presentation **Formatting a presentation:**Addingstyle-Color,gradientfills-Arrangingobjects-AddingHeader&Footer-Slide Background - Slide layout | | | | | | | |

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| **Adding Graphics to the presentation:**Inserting pictures, movies, tables, etc., into thepresentation -Drawing Pictures using Draw.  **Addingeffectstothepresentation:**SettingAnimation&transitioneffect-Addingaudioand video. | | | |
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| **Unit:5** | | **Files** | **7 hours** |
| **Introduction**:Database concepts -Tables-Queries -Forms-Reports  **Opening&Savingdatabasefiles**:CreatingTableDesign - Indexing-Enteringdata–Importingdata  **CreatingQueries**:SQL statements -Settingrelationship -Using wizards  **CreatingForms**:GUI-FormCreating&printing reports | | | |
|  | | | |
| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
|  | | | |
| **TotalLecturehours** | | | **45** |
| **TextBook(s)** | | | |
| 1 | StepbyStepMicrosoft OfficeSystem (W/CD)byCurtisFrye,JoyceCox,SteveLambert | | |
| 2 | MicrosoftOfficeWordPlain&SimplebyJerryJoyce&MarianneMoon | | |
| 3 | TheUnofficialGuidetoMicrosoftOfficeExcel,JuliaKelly&CurtSimmons | | |
| 4 | MicrosoftOfficePower PointPlain&SimpleNancyMuir | | |
|  | | | |
| **ReferenceBooks** | | | |
| 1 | MicrosoftOfficeWordInsideOutMicrosoftPress Publication | | |
| 2 | MicrosoftOfficeExcelInsideOut MicrosoftPressPublication | | |
| 3 | BeyondBulletPoints:UsingMicrosoftPowerPointMicrosoftPress Publication | | |
| 4 | MicrosoftOfficeAccessInsideOutMicrosoft PressPublication | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | MS excel <https://www.linkedin.com/learning/excel-2021-essential-training-office-2021-ltsc?trk=share_android_course_learning&shareId=ZeoQBxVnRYipE3%2BpHYDcqw%3D%3D> | | |
| 2 | MS word <https://www.linkedin.com/learning/word-2021-essential-training-office-2021-ltsc?trk=share_android_course_learning&shareId=xZc0B%2BvRS26YccZtFwpcYA%3D%3D> | | |
| CourseDesigned By:**BoS -Physics CA** | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | M | S | M | M | L | S | S |
| **CO2** | S | S | S | M | M | M | M | L | S | S |
| **CO3** | S | S | S | M | S | M | M | M | S | S |
| **CO4** | S | S | S | S | S | S | M | M | S | S |
| **CO5** | S | M | S | M | M | S | S | M | M | M |
| **CO6** | M | S | S | M | M | S | S | S | M | M |

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

# SEMESTERIV

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| **Course code** | | **43A** | **ATOMICPHYSICS ANDSPECTROSCOPY** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **COREPAPER IV** | **4** | | **0** | | **0** | **4** |
| **Pre-requisite** | | | The students should have the awareness on structure of atoms, photoelectric effect and on X rays | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | |
| Themainobjectivesofthiscourseareto: provide a detailed study of atom  learntheimpactofmagneticfieldsonspectra study the concept of photo electric cells | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthecourse, studentwill beable to: | | | | | | | | | |
| 1 | analysevarious typesof spectrographs tostudy aboutthepositiverays | | | | | | | K4 | |
| 2 | explainmagnetoopticalpropertiesofmaterials | | | | | | | K5 | |
| 3 | findapplicationsofphotoelectricalcellsandXRays | | | | | | | K3 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** – Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **PositiveRays** | | | **11 hours** | | | | |
| Positiverays–Discovery–Properties–Positiverayanalysis–Thomson’sParabolamethod–actionof Electric and Magnetic fields – Determination of e/m – determination of mass – discovery of stable isotopes–Limitations–Dempster’smassspectrograph–Aston’smassspectrograph-massdefectand  packingfraction–polarizationofX–rays –scatteringofX-rays(Thomson’sformula). | | | | | | | | | |
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| **Unit:2** | | **Structureof theAtom** | | | **12 hours** | | | | |
| TheBohratommodel–CriticalPotentials–Methodofexcitationofatoms–Experimentaldetermination ofcriticalpotentialsbyDavisonandGoucher’smethod-Sommerfield’srelativisticmodel–Vectoratom model – Quantum numbers associated with Vectoratom model – coupling schemes (LS, JJ coupling) – Pauli’s exclusion principle – Periodic classification of elements. | | | | | | | | | |
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| **Unit:3** | | **MagnetoOpticalPropertiesofSpectrum** | | **12 hours** | | | | | |
| Magneticdipolemomentduetoorbitalmotionoftheelectron –Magneticdipolemomentduetospin – The Stern and Gerlach experiment – Optical spectra – Fine Structure of the sodium D line – Zeeman effect–Experiments–Lorentzclassicaltheory–ExpressionfortheZeemanshift–Larmor’stheorem– QuantummechanicalexplanationofthenormalZeemaneffect–AnomalousZeemaneffect–Paschen–  Backeffect–Starkeffect. | | | | | | | | | |
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| **Unit:4** | | **PhotoelectricEffect** | | **11 hours** | | | | | |
| Introduction – Richardson and Compton experiment – Relation between Photoelectric current and retardingpotentials–RelationbetweenvelocityofPhotoelectronsandthefrequencyoflight –Lawsof Photoelectric emission – Failure of electromagnetic theory – Einstein’s Photo electric equation – Experimentalverification–Millikan’sExperiments –Photoelectriccells–Photoemissivecell– Photo Voltaic cell – Photo conductive cell – Applications of Photo electric cells. | | | | | | | | | |
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| **Unit:5** | | | | **X-Ray Spectra** | | | | | | | | **12 hours** | | |
| X-ray – Coolidge tube – Properties – X-ray Spectra – Continuous and characteristics X-ray spectrum – Mosley’s law (Statement, Explanation and Importance) – Compton effect – Expression for change of wavelength-X-raydiffraction-Bragg’slaw-Bragg’sspectrometer-Powdercrystalmethod–**Quantum theory**: The distribution of energy in the spectrum of a black body – its results - Planck’s hypothesis – derivation of Planck’s law of radiation. | | | | | | | | | | | | | | |
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| **Unit:6** | | | | **ContemporaryIssues** | | | | | | | | **2 hours** | | |
| Expertlectures,onlineseminars– webinars | | | | | | | | | | | | | | |
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| **TotalLecturehours** | | | | | | | | | | | | **60** | | |
| **TextBook(s)** | | | | | | | | | | | | | | |
| 1 | | ModernPhysics,Murugesan R.and KiruthigaSivaprasath. S.Chand, 18th ed. (2016). | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **ReferenceBooks** | | | | | | | | | | | | | | |
| 1 | | ModernPhysics, Sehgal D.L. ChopraK.L.and Sehgal N.K. Sultan Chand& Sons, 9thed.,(2004) | | | | | | | | | | | | |
| 2 | | AtomicPhysics, Rajam JB, S. Chand andCompany Ltd, New Delhi,20thedition (2009). | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | | | | | | | | | | | | |
| 1 | | <https://www.askiitians.com/revision-notes/physics/atomic-physics/> | | | | | | | | | | | | |
| 2 | | <https://nptel.ac.in/courses/115/101/115101003/> | | | | | | | | | | | | |
| 3 | | <https://www2.physics.ox.ac.uk/sites/default/files/2011-10-19/atomic_physics_lectures_1_8_09_pdf_pdf_18283.pdf> | | | | | | | | | | | | |
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| CourseDesigned By:**BoS -Physics CA** | | | | | | | | | | | | | | |
|  | **MappingwithProgramme Outcomes** | | | | | | | | | | | | | |
|  | **COs** | | **PO1** | | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | | **PO9** | **PO10** |
|  | **CO1** | | S | | M | M | M | S | M | M | M | | M | S |
|  | **CO2** | | S | | M | S | S | M | M | S | M | | M | M |
|  | **CO3** | | M | | S | S | S | S | S | S | S | | S | S |

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

# SEMESTERIII&IV

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| **Course code** | | **43P** | **COREPRACTICAL II**  **(**ExaminationattheendofFourthSemester**)** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/SB S** | | | **CORE PRACTICAL** | **0** | | **0** | | **2** | **3** |
| **Pre-requisite** | | | Shouldhavethe fundamentalknowledgeof Physics | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:   * developtheexperimentalskillsinMechanicsandPropertiesofmatter * gainknowledgeabout theexperimentsbased onElectricityand Magnetism * motivatethe students toapply theexperimentaltechniques in Optics. | | | | | | | | | |
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| **ExpectedCourse**Outcomes**:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | applytheconceptsofSpecificheatcapacityandYoung’sModulusofdifferent substances | | | | | | | K3 | |
| 2 | acquirethe knowledgeof Physical opticsusing Spectrometer | | | | | | | K4 | |
| 3 | evaluateprinciplesandapplicationsofPotentiometer,MagnetometerandBG. | | | | | | | K5 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | |
|  | | | | | | | | | |
| **LISTOFEXPERIMENTS(**Anytwelveexperiments**)** | | | | | **56 hours** | | | | |
| 1. RigidityModulus –TorsionalPendulum– With&Withoutsymmetrical masses 2. Specificheatcapacity –Newton’sLawofcooling–SphericalCalorimeter 3. Determinationofwavelengthλ-Grating–NormalIncidence- Spectrometer 4. Refractiveindex of Prism-(i– i’)curve-Spectrometer 5. DeterminationofCauchy’sconstants -Spectrometer 6. DispersivePower ofPrism-Spectrometer 7. Refractiveindexof alens-Newton’srings 8. Comparisonofmagnetic moments–Deflectionmagnetometer–TanAposition 9. Magneticfieldintensity - Fieldalongtheaxisofa circularcoil 10. Young’sModulus–Cantilever–Depression–Pinand Microscope 11. Young’sModulus–Koenig’sMethod–Non-Uniformbending 12. Young’sModulus–Koenig’sMethod–Uniform bending 13. Specificresistanceof awire-Potentiometer 14. EMFof athermocouple -Potentiometer 15. CalibrationHighrangevoltmeter -Potentiometer 16. TemperatureCoefficient ofResistance-Thermistor-Carey Foster’s Bridge 17. CharacteristicsofZener diode 18. FigureofMerit–Chargesensitivity-Ballistic Galvanometer 19. ComparisonofMutualInductance-BG 20. DeterminationofHigh Resistancebyleakage-BG | | | | | | | | | |
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| **ContemporaryIssues** | | **4 hours** |
| Onlineworkshop,WebinarsonExperimentalPhysics | | |
|  | | |
| **TotalPractical Hours:** | | **60** |
| **ReferenceBooks** | | |
| 1 | AtextbookofPracticalPhysics,M.N.Srinivasan,S.Balasubramanian,R.Ranganathan,Sultan Chand & Sons(2017) | |
| 2 | PracticalPhysicsandElectronics,C.C.Ouseph,U.J.Rao,V.Vijayendran,S.Viswanathan Publishers(2007) | |
|  | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | |
| 1 | [https://nptel.ac.in/course.html/physics/experimentalphysicsI, IIand III](https://nptel.ac.in/course.html/physics/experimental%20physics%20I%2C%20II%20and%20III) | |
| 2 | <https://nptel.ac.in/courses/115/105/115105110/> | |
| 3 | <https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK> | |
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| CourseDesigned By:**BoS -Physics CA** | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | S | M | S | M | M | M | S |
| **CO2** | S | M | S | M | S | S | M | L | M | S |
| **CO3** | M | S | S | S | L | M | S | S | S | M |

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

# SEMESTERIV

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| **Course code** | | **4ZB** | **PRINCIPLES OF PROGRAMMING CONCEPTSANDCPROGRAMMING** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **SKILLBASEDSUBJECT** | **3** | | | **0** | | **0** | **2** |
| **Pre-requisite** | | | Studentsshouldknowthepreliminariesof programming concepts | **Syllabus Version** | | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | | |
| Themain objectives ofthis courseareto:   * developlogics whichwill aidin developingprograms and applications * solveproblemsusingfunctionalandlogicalthinking.  * useideasfromvariousparadigmswhen programminginalanguageofdifferentparadigm | | | | | | | | | | |
|  | | | | | | | | | | |
| **ExpectedCourseOutcomes:** | | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | | |
| 1 | designfeaturesofprogramminglanguages,andjustifytheirowndesigndecisions | | | | | | | | K2 | |
| 2 | criticallyevaluatewhatparadigm andlanguagearebest suitedforanew problem | | | | | | | | K5 | |
| 3 | useCprogramming tosolvePhysics problems. | | | | | | | | K6 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:1** | | **Constants,variablesanddata types** | | | | **9 hours** | | | | |
| Introduction–charactersets–constants–keywords–andidentifiers–variables–variables–datatypes – declaration of variables – assigning values to variables – defining symbolic constants. | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:2** | | **Operatorsandexpressions** | | | | **9 hours** | | | | |
| Arithmetic operators – relational operators – logical operators – assignment operators –incrementand decrementoperators–conditionaloperators–specialoperators–arithmeticexpression–evaluationof expression. – Precedence of arithmetic operators – some computer problems – type conversion in expression – operator precedence and associativity – mathematical functions. | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:3** | | **Decisionmaking,branchingand looping** | | | **9 hours** | | | | | |
| Readingandwritingcharacter–formattedinputandoutput–decisionmaking:IFstatement:SimpleIF   * IFELSE–NestingofIF..ELSE–ELSE.IFLadder–SwitchStatement–operator-gotostatement * while,do while– Forloop– Jumpsin loops– simpleprograms. | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:4** | | **Arraysandstrings** | | | **9 hours** | | | | | |
| Arrays: Introduction – One dimensional array – declaration of array – Initiating on two and multidimensional arrays – declaring and initializing string variables – reading strings fromterminal – writing strings on the screen – Arithmetic operations on characters – simple programs. | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:5** | | **Userdefined functions** | | | **7 hours** | | | | | |
| Needforuserdefinedfunctions–Amultifunctionprogram–RETURNvaluesandtheirtypes– functions calls – category of functions – no arguments and no return values – simple programs. | | | | | | | | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
|  | | | |
| **TotalLecturehours** | | | **45** |
| **TextBook(s)** | | | |
| 1 | ProgramminginANSIC, E.Balagurusamy,TMH(2008) | | |
| 2 | TheCProgrammingLanguage,BrianKernighan,DennisRitchie,PrenticeHall,(1978) | | |
|  | | | |
| **ReferenceBooks** | | | |
| 1 | ProgramminginCbyAshokN.Kamthane FirstIndianPrint,Pearson(2004). | | |
| 2 | ComputingFundamentalsandCProgramming,E.Balagurusamy,TMH(2011) | | |
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| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://www.programiz.com/c-programming> | | |
| 2 | <https://www.geeksforgeeks.org/c-language-set-1-introduction/> | | |
| 3 | <https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/> | | |
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| CourseDesigned By:**BoS -Physics CA** | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | M | S | M | S | M | S | S |
| **CO2** | M | S | M | M | M | M | S | S | M | S |
| **CO3** | S | S | S | S | M | S | M | M | S | S |

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

# SEMESTERV

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| **Coursecode** | | **53A** | **MATHEMATICAL PHYSICS** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **COREPAPER V** | **5** | | **0** | | **0** | **4** |
| **Pre-requisite** | | | ShouldhavethebasicknowledgeofMathematics and Mechanics | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:  enablethestudents to acquiretheproblem-solving ability  applytheequations forthesituation ofdifferentphysical problems.  motivatethe students to applythemathematical principles ofin their day–to–day life. | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | deriveLagrange’sandHamilton’sequations | | | | | | | K2 | |
| 2 | applyLagrange’sandHamilton’sequationstophysical problems | | | | | | | K3 | |
| 3 | analyzegammaand beta functions andtheirapplications | | | | | | | K3 | |
| 4 | solveproblemsonMatricesand applythemtorelevant problems | | | | | | | K4 | |
| 5 | applyStoke’sandGauss theoremstosuitablephysicalproblems | | | | | | | K5 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | |
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| **Unit:1** | | **ClassicalMechanics –I** | | | **12--hours** | | | | |
| Constraints and Degrees of Freedom – Generalized coordinates – Generalized displacement –Velocity –Acceleration–Momentum–Force–PotentialEnergy–D’Alembert’sPrinciple–Lagrangianequation  fromD’Alembert’sprinciple–ApplicationofLagrange’sequationofmotiontoLinearHarmonic Oscillator, Simple Pendulum and Compound Pendulum. | | | | | | | | | |
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| **Unit:2** | | **ClassicalMechanics –II** | | | **12 hours** | | | | |
| PhaseSpace–Hamiltonianfunction–HamiltonianPrinciple–Hamilton’scanonicalequationsof motion- Physical significance of H – Applications of Hamiltonian equations of motion to Simple Pendulum, Compound Pendulum and Linear Harmonic Oscillator. | | | | | | | | | |
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| **Unit:3** | | **Special Functions** | | | **12 hours** | | | | |
| Definition–TheBetafunction–Gammafunction–EvaluationofBetafunction –OtherformsofBeta function–EvaluationofGammafunction–OtherformsofGammafunction–RelationbetweenBeta  andGammafunctions – Problems. | | | | | | | | | |
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| **Unit:4** | | **Matrices** | | | **10 hours** | | | | |
| Introduction – special types of Matrices – Transpose of a Matrix – The Conjugate of a Matrix – ConjugateTransposeofaMatrix–SymmetricandAntisymmetric–HermitianandskewHermitian– Orthogonal and Unitary Matrices – Properties – Characteristic equation – Roots and characteristic vector – Diagonalization of matrices – Cayley–Hamilton theorem –Problems | | | | | | | | | |

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| **Unit:5** | | **VectorCalculus** | | **12 hours** |
| ∇ Operator – Divergence – Second derivative of Vector functions or fields – The Laplacian Operator – CurlofaVector–LineIntegral–LineIntegralofaVectorfieldaroundaninfinitesimalrectangle–Curl  of Conservativefield–SurfaceIntegral–VolumeIntegral (without problem)– Gauss’s Divergence theorem and it’s proof - Simple problems – Stoke’s theorem and its proof - Simple problems. | | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** | |
| Expertlectures,onlineseminars –webinars | | | | |
|  | | | | |
| **TotalLectureHours** | | | **60** | |
| **TextBook(s)** | | | | |
| 1 | MathematicalPhysics,B.D.Gupta-VikasPublishingHouse,4th Edition (2006) | | | |
| 2 | ClassicalMechanics,S.L.Gupta,V.Kumar&H.V.Sharma,PragatiPrakashan(2017) | | | |
|  | | | | |
| **ReferenceBooks** | | | | |
| 1 | MathematicalPhysics,SathyaPrakash,SultanChand,6thedition(2014) | | | |
| 2 | MathematicalPhysicsRajput,PragathiPrakasanPub.,(2017) | | | |
| 3 | MathematicalPhysics, H.K.Dass, S.Chand &Co., Eighthedition (2018) | | | |
| 4 | ClassicalMechanics,J.C.Upadhyaya,HimalayaPublishing House(2012) | | | |
|  | | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | | |
| 1 | [https://nptel.ac.in/course.html/Physics/Introductiontoclassicalmechanics](https://nptel.ac.in/course.html/Physics/Introduction%20to%20classical%20mechanics) | | | |
| 2 | [https://nptel.ac.in/course.html/Physics/Integralsandvectorcalculus](https://nptel.ac.in/course.html/Physics/Integrals%20and%20vector%20calculus) | | | |
| 3 | [https://nptel.ac.in/course.html/Physics/Matrixanalysisandwith applications](https://nptel.ac.in/course.html/Physics/Matrix%20analysis%20and%20with%20applications) | | | |
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| CourseDesigned By:**BoS -Physics CA** | | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | L | M | S | M | M | S | M | M |
| **CO2** | S | S | M | S | M | S | L | M | S | M |
| **CO3** | S | M | M | S | S | M | L | M | S | S |
| **CO4** | S | S | L | M | S | M | M | M | S | S |
| CO5 | S | S | M | L | M | S | S | M | M | S |

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

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| **Course code** | | **53B** | **ELECTRONICS** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **COREPAPER VI** | **4** | | **0** | | **0** | **4** |
| **Pre-requisite** | | | Shouldhavethebasicknowledgeof Semiconducting devices | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:  acquire knowledge and apply it to various electronic instruments. gainknowledgeaboutthedevelopmentoftheelectronicinstruments.  motivatethestudentsto applytheprinciplesof electronicsintheirday-to-day life. | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | differentiatebetweendifferenttypesofamplifiers andtheir applications | | | | | | | K2 | |
| 2 | designdifferenttypesof oscillators | | | | | | | K3 | |
| 3 | applyswitchingideastovarious devices | | | | | | | K3 | |
| 4 | analyzethepower electronicdevicesandtheiruses | | | | | | | K4 | |
| 5 | designoperationalamplifiercircuitsandtoanalyzetheirproperties | | | | | | | K5 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** – Create; | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **Amplifiers** | | | **12 hours** | | | | |
| Characteristics of an amplifier, Voltage amplifiers - Feedback amplifier- feedback and related terms- block diagram of a feedback amplifier-Transfer gain of an amplifier with feedback- Emitter follower circuit - an example of negative feedback. | | | | | | | | | |
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| **Unit:2** | | **Oscillators** | | | **11 hours** | | | | |
| Introduction - Types of oscillators - Fundamental principle of oscillators - Concept of feedback oscillators - Hartley oscillators –Analysis - Colpitts oscillators –Analysis - Phase shift oscillators- Analysis - Wien bridge oscillator – Analysis. | | | | | | | | | |
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| **Unit:3** | | **Solidstateswitching circuits** | | | **12 hours** | | | | |
| Introduction - important terms - Collector leakage current - Saturation collector current -Switching transistors-Switchingactiontransistor–OFFregion–ONregion–ActiveRegion.Multivibrator– Types of multivibrator –Transistor Astable multivibrator – circuit details -Operations - ON or OFF time – transistor mono stable multivibrator -Circuit details – operations  –transistorBistablemultivibrator-Circuitdetails –operations. | | | | | | | | | |
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| **Unit:4** | | **WaveShaping Circuits** | | | **12 hours** | | | | |
| Differentiating circuit - Output waveforms - Integrating circuit – Output waveforms-Importantapplicationsofdiodes–Clippingcircuit–positiveclipper–biasedclipper–combinations clipper – applications of clipper- Clamping Circuits-basic idea of a clamper-Positive clamber – Operations – negative clamper | | | | | | | | | |

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| **Unit:5** | | **PowerElectronics** | | **11 hours** |
| Introduction - power electronics - The Triac – Construction - Operations – Characteristics - Applications.TheDiac–Operations–ApplicationsofDiac–Lampdimmerheatcontrol.Unijunction transistor–Constructions–Operations-equivalentcircuitofUJT–CharacteristicsofUJT-advantages of UJT – UJT relaxations Oscillator - UJT over voltage detector. | | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** | |
| Expertlectures,onlineseminars –webinars | | | | |
|  | | | | |
| **TotalLecturehours** | | | **60** | |
| **TextBook(s)** | | | | |
| 1 | FoundationsofElectronics, DChattopadhyaya&P CRakshit,New Age Intl.Pub., IIEd. (2005) | | | |
| 2 | PrinciplesofElectronics,VKMehta,RohitMehta,S.Chand Co.,EleventhrevisedEd. (2015) | | | |
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| **ReferenceBooks** | | | | |
| 1 | Atextbook of AppliedElectronics, R SSedha, S. ChandCo., 1st Ed.(2010) | | | |
| 2 | IntegratedElectronics,JacobMillmanandChristosC.Halkias,TMH,2nd ed.(2015) | | | |
| 3 | ElectronicdevicesandCircuits,S.Salivahanan andN.Sureshkumar,TMH,4thed.(2016) | | | |
|  | | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | | |
| 1 | [https://nptel.ac.in/course.html/Electronics/Basicelectrnics](https://nptel.ac.in/course.html/Electronics/Basic%20electrnics) | | | |
| 2 | <https://www.askiitians.com/revision-notes/physics/solid-and-electronic-device/> | | | |
| 3 | [https://nptel.ac.in/course.html/electronics/operationalamplifier](https://nptel.ac.in/course.html/electronics/operational%20amplifier) | | | |
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| CourseDesigned By:**BoS -Physics CA** | | | | |

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| **MappingwithProgrammeOutcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | L | M | S | M | L | S | M | M |
| **CO3** | S | S | M | S | M | S | M | L | S | M |
| **CO3** | S | M | M | S | S | M | L | M | S | S |
| **CO4** | S | S | L | M | S | M | M | M | S | S |
| **CO5** | S | S | M | L | M | S | S | M | M | S |

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

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| **Course code** | | **53C** | **SOLIDSTATE PHYSICS** | **L** | | | **T** | **P** | **C** |
| **Core/Elective/SBS** | | | **COREPAPER VII** | **5** | | | **0** | **0** | **4** |
| **Pre-requisite** | | | Thestudentsshouldknowthefundamentalson kinds of bonds and classification of solids | **Syllabus Version** | | | | **2023-24** | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:   1. learnaboutthe crystalstructureandpropertiesofsolids. 2. knowaboutbond theoryandoptical propertiesof solids.  1. gainknowledgeonmagnetic, electricanddielectricmaterialsandtheirapplication. 2. understandthesuperconductingprocessforthefabricationofnewdevices. | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | choosetherightmaterialforagiven applicationbasedonFermilevel concept | | | | | | | K3 | |
| 2 | analyzethemagneticmaterials forutilizationinvaried fields. | | | | | | | K4 | |
| 3 | designnewcomponents ordevicesusing dielectricsandsuperconductors. | | | | | | | K6 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | |
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| **Unit:1** | | **Crystallography** | | | | **12 hours** | | | |
| Distinctionbetweencrystallineandamorphoussolids –Differentfeaturesofthecrystal –Crystallattice – Basis – Crystal structure – Unit cell – Number of lattice points per unit cell- Bravais lattices – Miller indices–ElementsofSymmetry–StructureofKClandNaClcrystal–AtomicPacking–Atomicradius  –-Latticeconstantanddensity-Crystalstructure(sc;hcp; fcc;bcc.) | | | | | | | | | |
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| **Unit:2** | | **BondTheoryofSolids** | | | | **10 hours** | | | |
| Classificationofsolids–BasicsofBondtheory–Opticalpropertiesofsolids–Specificheatcapacityof solids – Dulong and Pettit’s law – Einstein’s theory of specific heat of solids – Fermi levels . | | | | | | | | | |
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| **Unit:3** | | **MagneticPropertiesofMaterials** | | | **12 hours** | | | | |
| Introduction – Langevin’s theory of diamagnetism –Langevin’s theory of Paramagnetism – Ferromagentism – Weiss theory of Ferromagentism –Nuclear magnetic resonance – Ferroelectricity – Ferroelectric crystals – Quantum theory of paramagnetism – Cooling by adiabatic demagnetization of a paramagnetic salt. | | | | | | | | | |
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| **Unit:4** | | **FreeElectron Theory** | | | **12 hours** | | | | |
| Free electron theory – Drude Lorentz theory – Explanation of Ohm’s law – Electrical conductivity – Thermalconductivity–Wide-MannandFranzratio–Sommerfieldmodel–Schotckyeffect–Halleffect –HallvoltageandHallcoefficient–MobilityandHallangle–ImportanceofHalleffect–Experimental determination of Hall coefficient. | | | | | | | | | |
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| **Unit:5** | | **Dielectricsand Super Conductivity** | **12 hours** |
| Dielectrics-Dielectricconstantanddisplacementvector-ClausissMossottirelation-Atomicormolecular polarizability –Typesofpolarizability -Superconductivity –Phenomena–magneticproperties –Super conductor – Meissner effect – Experimental facts – Isotopes effect – Thermodynamic effect. | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
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| **TotalLecturehours** | | | **60** |
| **TextBook(s)** | | | |
| 1 | SolidStatePhysicsGuptaand Kumar, K.Nath&Co. (2018) | | |
| 2 | ModernPhysicsR Murugesan,SChandPublishing;Eighteenthedition(2016) | | |
|  | | | |
| **ReferenceBooks** | | | |
| 1 | IntroductiontoSolidStatePhysicsCharlesKittel,Wiley(2019) | | |
| 2 | SolidStatePhysicsA JDekker,Macmillan (2011) | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://youtu.be/RImqF8z91fU> | | |
| 2 | [https://nptel.ac.in/courses/115/105/115105099](https://nptel.ac.in/courses/115/105/115105099/)/ | | |
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| CourseDesigned By: BoS -Physics CA | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | S | S | M | M | S | M |
| **CO2** | M | M | S | S | M | S | S | M | M | S |
| **CO3** | M | S | S | S | S | S | S | S | S | S |

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

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| **Coursecode** | | **53D** | **ELECTRICITYAND MAGNETISM** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **COREPAPER VIII** | **4** | | | **0** | | **0** | **4** |
| **Pre-requisite** | | | Thestudentsaresupposedtohavethebasic knowledge of electricity and magnetism | **Syllabus Version** | | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | | |
| Themain objectives ofthis courseareto:   * makethestudentsfamiliarwiththelawsof electricityandmagnetismandtheir verifications * understandthepropertiesofelectric andmagneticmaterials * acquireexperimentalskillstoconstructtechnicallyusefuldevices. | | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | | |
| 1 | defineand derivethe lawsofelectricityand magnetism | | | | | | | | K2 | |
| 2 | updatetheknowledgeof propertiesand magnetism | | | | | | | | K3 | |
| 3 | expertisetheskillstomanufacturedevices | | | | | | | | K5 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | | |
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| **Unit:1** | | **GaussTheoremanditsApplications** | | | | **12 hours** | | | | |
| Normal electric induction Gauss theorem, application of gauss theorem - Electric intensity at a point immediately adjacent to a charged conductor - Energy stored in unit volume of an electric field.  **CapacitanceandCapacitors**  Spherical capacitor: cylindrical capacitor, Force of attraction between charged plates of a capacitor – capacityofaparallelplatecapacitor;effectofintroducingadielectricslabbetweentheplates–Guard ring condenser - polarizationin dielectric materials. | | | | | | | | | | |
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| **Unit:2** | | **MagneticPropertiesofMaterials** | | | | **12 hours** | | | | |
| Electron theory of magnetism; dia, para, ferromagnetism and their properties magnetic field B; magnetization M; magnetic field intensity H; magnetic susceptibility and magnetic permeability; magneticmaterialsandmagnetization;magnetichysterisis–areaofthehysterisisloop;determination of susceptibility: Guoy’s method – magnetic circuits –comparison of electrical circuit with magnetic circuit. | | | | | | | | | | |
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| **Unit:3** | | **ThermoElectricity** | | | **11 hours** | | | | | |
| Seebeckeffect–Lawsofthermoe.m.f–Peltiereffect;PeltierCo-efficient–determinationofPeltier co-efficient – thermo dynamical consideration of Peltier effect – Thomson effect – Thomson Co- efficient–e.m.fgeneratedinathermocoupletakingbothPeltiereffectandThomsoneffectinthe  metals–Thermoelectricpower–ApplicationofthermodynamicstoThermocouple–Thermoelectric diagrams and their uses. | | | | | | | | | | |
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| **Unit:4** | | **HelmholtzEquation ofVarying Current** | | | **11 hours** | | | | | |
| Growthanddecayofcurrentinaninductive–resistivecircuit–charginganddischargingofacapacitor througharesistance–growthofchargeinacircuitwithinductance,capacitanceandresistance(LCR)  -torqueonacurrentloopinamagneticfield–TheoryofBallisticGalvanometer–correctionfor damping – current and voltage sensitivities. | | | | | | | | | | |

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| **Unit:5** | | **DynamicsofCharged Particles** | **12 hours** |
| Motion of charged particle in uniform electric field – longitudinal – transverse – motion of charged particle in alternating electric field – motion of charged particle in uniform constant magnetic field – Motion of charged particle in crossed electric and magnetic field. **Electromagnetic Induction:** A conductingrodmovingthroughauniformmagneticfield–inductanceinseries–inductanceinparallel –self-inductanceofco-axialcylinders–self-inductanceoftoroidalcoilofrectangularcrosssection – self -inductance of toroidal coil of circular cross section. | | | |
|  | | | |
| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
|  | | | |
| **TotalLecturehours** | | | **60** |
| **TextBook(s)** | | | |
| 1 | ElectricityandMagnetism,Brijlaland Subramaniam, EducationalandUniv.Pub. (1984) | | |
| 2 | ElectricityandMagnetism,R.Murugesan, S.Chand&Co (2017) | | |
|  | | | |
| **ReferenceBooks** | | | |
| 1 | ElectricityandMagnetism, D.N.Vasudeva,S.Chand& Co,12th ed. (2007) | | |
| 2 | ElectricityandMagnetism,EdwardMillsPurcellandD.J.Morin,(2013)3rded.Cambridge University Press | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://www.askiitians.com/revision-notes/physics/current-electricity.html> | | |
| 2 | <https://www.askiitians.com/revision-notes/physics/electromagnetic-induction-and-alternating-current/> | | |
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| CourseDesigned By: BoS -Physics CA | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | M | M | S | S | M | M | S |
| **CO2** | S | M | M | M | S | M | M | S | S | M |
| **CO3** | S | S | S | S | S | S | S | S | S | S |

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

# SEMESTERV

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| **Course code** | | **5ZC** | **OBJECTORIENTEDPROGRAMMINGINC++** | | **L** | | **T** | **P** | **C** |
| **Core/Elective/SBS** | | | **SKILLBASEDSUBJECT** | | **3** | | **0** | **0** | **3** |
| **Pre-requisite** | | | The students are expected to possess fundamental knowledgeinobject-orientedprogrammingparadigm | | **Syllabus Version** | | | **2023-24** | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:   * understandhowC++improvesC withobject-oriented features. * learnhowtowriteinlinefunctionsforefficiencyand performance.  * learnthesyntaxandsemantics oftheC++programminglanguage. | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | understandtheconceptofdataabstractionandencapsulation | | | | | | | K1,K2 | |
| 2 | designC++classesforcodereuse. | | | | | | | K6 | |
| 3 | useexceptionhandling inC++ programs. | | | | | | | K3 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **Principles,Tokens,ExpressionsandControl Structures** | | | | **9 hours** | | | |
| StructureofC++program-Tokens–Keywords-Identifiers&constants–Basicdatatypes–Userdefined Data Types – Derived data types – symbolic constants – Type compatibility – Declaration of variables – DynamicalInitializationofvariables–Referencevariables–OperatorsinC++-Scoperesolution  operators. | | | | | | | | | |
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| **Unit:2** | | **FunctionsinC++** | | | | **9 hours** | | | |
| **Functions in C++:** The main function – Function prototyping – call by reference –Inline functions – Default arguments – Function overloading-Math library functions-Specifying a class-defining member functions- c++ program with class-making an outside function inline-nesting of member functions-static data members-static member functions-Friendly functions. | | | | | | | | | |
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| **Unit:3** | | **Constructors** | | **9 hours** | | | | | |
| **Constructors:**Introduction–constructors–parameterizedconstructors–multipleconstructorsinaclass – constructors with default arguments – copy constructor-dynamic constructors. | | | | | | | | | |
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| **Unit:4** | | **Destructors**&**Operatorover loading** | | **9 hours** | | | | | |
| Destructors-definingoperatoroverloading-overloadingunaryoperators-overloadingbinaryoperators – rules for over loading operators. | | | | | | | | | |
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| **Unit:5** | | **Inheritance** | | **7 hours** | | | | | |
| Inheritance-Definingderivedclasses-singleinheritance-Multilevelinheritance-Multipleinheritance-Hierarchical inheritance, Hybrid inheritance. | | | | | | | | | |

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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
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| **TotalLecturehours** | | | **45** |
| **TextBook(s)** | | | |
| 1 | “ObjectOrientedProgrammingwithC++”byE.Balagurusamy,Secondedition. (2013) | | |
| 2 | ProgrammingwithC++,JohnR.Hubbard,TMH Publications,(2002). | | |
|  | | | |
| **ReferenceBooks** | | | |
| 1 | ProgrammingwithC++,JohnR.Hubbard,IIEdition2002,TMHPublications | | |
| 2 | Programming:PrinciplesandPracticeUsingC++,BjarneStroustrup,Addison-Wesley,(2008) | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | https:/[/www.tutorialspoint.com](http://www.tutorialspoint.com/)› cplusplus | | |
| 2 | https:/[/www.programiz.com](http://www.programiz.com/)›cpp-programming | | |
| 3 | https:/[/www.toptal.com/c/the-ultimate-list-of-resources-to-learn-c-and-c-plus-plus](http://www.toptal.com/c/the-ultimate-list-of-resources-to-learn-c-and-c-plus-plus) | | |
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| CourseDesigned By: BoS-Physics CA | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | L | L | M | S | M | M | M | S | S |
| **CO2** | S | S | L | S | S | S | S | M | M | M |
| **CO3** | S | S | S | S | S | S | S | M | S | S |

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

# SEMESTER–VI

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| **Course code** | | **63A** | **QUANTUMMECHANICS ANDRELATIVITY** | **L** | **T** | **P** | **C** |
| **Core/Elective/SBS** | | | **COREPAPER IX** | **5** | **0** | **0** | **4** |
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| **Pre-requisite** | | | Thestudentsareexpectedtohavetheknowledgeof particle nature and wave nature of matter | **Syllabus Version** | | **2023-24** | |
| **Course Objectives:** | | | | | | | |
| Themain objectives ofthis courseareto:   * understandthe waveproperty ofmatter * acquireknowledgeofuncertainity principleand its applications * applytheconceptofrelativity tosolvevariousphysical problems | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | |
| 1 | acquiretheknowledgeof wavenatureof matterand itsexperimental verification | | | | | K2 | |
| 2 | understandHeisenberguncertainityprincipleand applyittoverifyproblemsinatomic and nuclear Physics | | | | | K3 | |
| 3 | Identify thereason behind various physical problems using relativity andto solvethem | | | | | K5 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | |
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| **Unit:1** | | **WavePropertiesof Matter** | | | | **17 hours** | |
| Introduction–deBrogliewavelength–Phasevelocity–ExpressionforPhasevelocity–Groupvelocity –Analyticaltreatment–Expressionforgroupvelocity–Relationbetweengroupvelocity(vg)andphase  velocity(vp)–VelocityofdeBrogliewave–(i)Phasevelocity(vp)–(ii)Groupvelocity(vg).Verification of de Broglie relation – Davisson and Germer’s experiments – G P Thomson’s experiment. | | | | | | | |
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| **Unit:2** | | **UncertaintyPrinciple** | | | | **17 hours** | |
| Introduction – Uncertainty Principle – Elementary proof between – Displacement and Momentum – Energy and Time – Physical Significance of Heisenberg’s Uncertainty Principle – Illustration – Diffraction of electrons through a slit – Gamma ray microscope thought experiment – Applications – Non-existenceoffreeelectronsinthenucleus –SizeandEnergyinthegroundstateofHydrogenatom. | | | | | | | |
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| **Unit:3** | | **Schrödinger’sWaveEquation** | | **18 hours** | | | |
| Introduction–Wavefunctionforafreeparticle–Schrödinger’sonedimensionalwaveequation–Time- dependent and Time independent – Limitations of wave function – Normalization of wave function – Operators – Eigen function – Eigen Value – Eigen equation – Operator for Momentum, KineticEnergy andTotalEnergy–PostulatesofQuantumMechanics–OrthogonalityofEnergyEigenfunction–Proof – Ehrenfest’s theorem – Statement and proof. | | | | | | | |
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| **Unit:4** | | **SphericalSymmetricalsystems** | **18 hours** |
| Three-dimensionalSchrödinger’swaveequation–Hydrogenatom–WaveequationfortheMotionofan electron – Separation of variables – Azimuthal wave equation and its solution – Radial wave equation and it’s solutions – Polar wave equation and its solution – Ground size of the Hydrogen atom. | | | |
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| **Unit:5** | | **Relativity** | **18 hours** |
| GalileanTransformationequation–EtherHypothesis–Michelson-Morleyexperiment–Explanationof theNegativeresults–specialtheoryofRelativity–Lorentztransformationequation–Lengthcontraction – Time dilation – Addition of Velocities – Variation of Mass with velocity – Mass energy equivalence. | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
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| **TotalLecturehours** | | | **90** |
| **TextBook(s)** | | | |
| 1 | Elementsof QuantumMechanics, KamalSingh, S.PSingh,S.Chand&Co (2005) | | |
| 2 | QuantumMechanics,S PSingh,M.KBagde,S.Chand &Co,secondedition(2004). | | |
| 3 | ModernPhysics,RMurugesan,S.Chand&Co (2016) | | |
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| **ReferenceBooks** | | | |
| 1 | QuantumMechanics,SathyaPrakash,C.K.Singh,Kedar NathRamNath&Co.(1997) | | |
| 2 | QuantumMechanics,Schiff,TataMcGraw-Hill,secondedition,(1968). | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://www.youtube.com/playlist?list=PLbMVogVj5nJTDMhThY9xu2Tvg0u1RPuxO> | | |
| 2 | <https://medium.com/predict/what-is-quantum-mechanics-what-is-theory-of-relativity-fdbe87eb9c79> | | |
| 3 | <https://www.askiitians.com/revision-notes/physics/special-theory-of-relativity/> | | |
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| CourseDesigned By:**BoS -Physics CA** | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | M | M | M | S | M | M | M |
| **CO2** | S | S | S | M | S | S | M | M | S | S |
| **CO3** | M | S | S | S | S | S | S | S | S | S |

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| **Course code** | | **63B** | **NUCLEAR PHYSICS** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **COREPAPER X** | **4** | | **0** | | **0** | **4** |
| **Pre-requisite** | | | The students should have knowledge about the basic constituents of atoms. They should be familiar with the structure of atoms and nucleus. | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:   * acquiretheknowledgetounderstand about nucleusand nucleus structure. * familiarizewithdifferent typesofradiationdetectorsandparticle accelerators * studytheradioactivityphenomenonofnucleus * motivatethestudentsto analyzethe energy releasedduringfissionandfusion process * acquirethebasic knowledgeofcosmicraysandelementary particles. | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | understandtheGeneralpropertiesofNucleus | | | | | | | K2 | |
| 2 | analyzetheconstructionandworkingofradiation detectors | | | | | | | K4 | |
| 3 | deviceinstrumentsutilizingthe behaviorofnuclear particles | | | | | | | K6 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** – Create | | | | | | | | | |
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| **Unit:1** | | **IntroductiontotheNucleus** | | | **16 hours** | | | | |
| General properties of Nucleus (Size, Mass, Density, Charge, Spin, Angular momentum, Magnetic dipolemoment)–Bindingenergy–BE/AandstabilityofNucleus–Packingfraction–Nuclearstability –Nuclearforces –Definition –Properties–Mesontheory –ModelofNuclearStructure –TheLiquid Drop model – Semi-Empirical mass formula – The Shell model – Evidence for Shell model –The collective model. | | | | | | | | | |
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| **Unit:2** | | **DetectorandParticleAccelerators** | | | **18 hours** | | | | |
| Interactionbetweentheenergeticparticlesandmatter–Heavychargedparticles–Electrons–Gamma ray-Ionization chamber – Solid State detector – GM counter – Wilson Cloud chamber – Nuclear emission – Linear accelerators – Cyclotron – Betaron. | | | | | | | | | |
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| **Unit:3** | | **Radioactivity** | | **18 hours** | | | | | |
| Natural Radioactivity – Alpha, Beta and Gamma rays – Properties – Determination of e/m of Alpha particle – Determination of Charge of Alpha particle – Determination of e/m of Beta particle – determinationofWavelengthofGammarays(DumondSpectrometer)–OriginofGammarays–Laws of Radioactivity – Soddy-Fajan’s displacement law – Law of Radioactive disintegration – Half life period–Meanlifeperiod(Definitions,Expression) –UnitsofRadioactivity –ArtificialRadioactivity – Preparation of radio elements – Application of radio isotopes. | | | | | | | | | |
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| **Unit:4** | | **NuclearFission andFusionReactions** | **18 hours** |
| Nuclear fission – Energy released in Fission – Bohr and Wheelers theory of Nuclear fission – Chain reaction–Multiplicationfactor –Criticalsize–NaturalUraniumandchainreactions –AtomBomb – Nuclear reactor – Nuclear fusion – Source of Stellar energy – Carbon Nitrogen cycle – Proton-Proton cycle – Hydrogen bomb – Controlled thermo nuclear reactions. | | | |
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| **Unit:5** | | **CosmicRaysandElementaryParticles** | **18 hours** |
| Cosmicrays–Originofcosmicrays–Latitudeeffect–Azimuthaleffect– Attitudeeffect–Seasonal, Diagonalchanges–PrimaryandSecondaryCosmicrays–cascadetheoryofshower–Pairproduction and Annihilation – Van Allen Belts – Elementary particles – Introduction – particles and antiparticles – Antimatter – The fundamental interactions – The Quark model. | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
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| **TotalLecturehours** | | | **90** |
| **TextBook(s)** | | | |
| 1 | ModernPhysics,RMurugesan,S.ChandPublishing, 18thEdition(2017). | | |
| 2 | NuclearPhysics,DCTayal,PublisherHimalayaPublishingHouse (2009). | | |
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| **ReferenceBooks** | | | |
| 1 | ConceptofModernPhysics, ArthurBeiser, McGraw-Hill, (2007). | | |
| 2 | IntroductiontoModernPhysics,FK RichtmyerEtal,McGraw-Hill;6thedition (1969). | | |
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| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://nptel.ac.in/courses/115/104/115104043/> | | |
| 2 | <https://nptel.ac.in/courses/115/103/115103101/> | | |
| 3 | <https://www.youtube.com/watch?v=xrk7Mt2fx6Y> | | |
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| CourseDesignedBy: **Dr.K. Selvaraju** | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | S | M | M | M | S | M | M |
| **CO2** | M | S | S | M | L | M | S | M | S | S |
| **CO3** | S | M | S | S | S | S | S | S | S | S |

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

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| **Course code** | | **63C** | **NUMERICALMETHODS** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **COREPAPER XI** | **5** | | | **0** | | **0** | **4** |
| **Pre-requisite** | | | ThestudentsshouldhaveknowledgeaboutthebasicMathematics.Theyshouldbecapableofsolvingproblems. | **Syllabus Version** | | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | | |
| Themain objectives ofthis courseareto:   * ensurethe studentsto analyzeand solvecomplicated problems. * Understandandapplyvariousrelatedtheories. * Gainknowledgeinsolvingdifferentialequations ofhigherorder | | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | | |
| 1 | understandtheeigenvalueproblems | | | | | | | | K2 | |
| 2 | analyzeandinterpolatetheresults | | | | | | | | K4 | |
| 3 | Solvetheproblemsusing differentialequations | | | | | | | | K6 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** – Create | | | | | | | | | | |
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| **Unit:1** | | **Solutionofequationsandeigenvalueproblems** | | | | **16 hours** | | | | |
| Linearinterpolationmethods(methodoffalseposition)–Newton’smethod–StatementofFixedpoint Theorem – Fixed point iteration: x=g(x) method – Solution of linear system by Gaussian elimination andGauss-Jordonmethods-Iterativemethods:GaussJacobiandGauss-Seidelmethods-Inverseofa  matrixby GaussJordonmethod – Eigenvalueof amatrix bypowermethod | | | | | | | | | | |
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| **Unit:2** | | **Interpolationandapproximation** | | | | **18 hours** | | | | |
| Lagrangian Polynomials –Divideddifferences – Interpolatingwitha cubic spline – Newton’sforward and backward difference formulas | | | | | | | | | | |
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| **Unit:3** | | **Numericaldifferentiationandintegration** | | | **18 hours** | | | | | |
| Derivativesfromdifferencetables–Divideddifferencesandfinitedifferences–Numericalintegration bytrapezoidaland Simpson’s1/3and3/8rules –Romberg’smethod–Two andThreepointGaussian quadrature formulas – Double integrals using trapezoidal and Simpson’srules | | | | | | | | | | |
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| **Unit:4** | | **Initialvalueproblemsforordinarydifferentialequations** | | | **18 hours** | | | | | |
| Singlestepmethods: Taylorseries method – Euler and modified Eulermethods – Fourthorder Runge –Kuttamethodforsolvingfirstandsecondorderequations –Multistepmethods:Milne’sandAdam’s predictor and corrector methods | | | | | | | | | | |
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| **Unit:5** | | **Boundaryvalueproblemsinordinaryandpartialdifferential equations** | | | **18 hours** | | | | | |
| Finitedifferencesolutionofsecondorderordinarydifferentialequation –Finitedifferencesolutionof one-dimensional heat equationbyexplicitandimplicitmethods –Onedimensionalwaveequationand two-dimensional Laplace and Poisson equations | | | | | | | | | | |

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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
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| **TotalLecturehours** | | | **90** |
| **Text Book(s)** | | | |
| 1 | Gerald,C.F,andWheatley,P.O,“AppliedNumericalAnalysis”,SixthEdition,Pearson Education Asia, New Delhi, 2002. | | |
| 2 | Balagurusamy,E.,“NumericalMethods”,TataMcGraw-HillPub.Co.Ltd,NewDelhi,1999. | | |
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| **ReferenceBooks** | | | |
| 1 | Kandasamy,P.,Thilagavathy,K.andGunavathy, K.,“NumericalMethods”,S.Chand,2003. | | |
| 2 | Burden,R.LandFaires, T.D.,“NumericalAnalysis”,7thEd.,ThomsonAsia,Singapore,2002 | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | https://onlinecourses.nptel.ac.in›noc19\_ma21›preview | | |
| 2 | https://nptel.ac.in›courses | | |
| 3 | https:/[/www.mooc-list.com](http://www.mooc-list.com/)›CourseSubject/Skill | | |
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| CourseDesigned By: BoS-Physics CA | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | M | M | M | M | S | M |
| **CO2** | S | M | S | M | S | S | M | S | M | S |
| **CO3** | M | S | M | M | S | L | S | S | S | L |

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

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| **Course code** | | **63D** | **FUNDAMENTALSOFNANOMATERIALS** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **COREPAPER XII** | **4** | | | **0** | | **0** | **4** |
| **Pre-requisite** | | | Thestudentsshouldhaveknowledgeaboutthesize and basic properties of nanoparticles | **Syllabus Version** | | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | | |
| Themain objectives ofthis courseareto:   * Impartknowledgeonnanostructuresandnanomaterials * Understandsizedependentphysical properties  * Gainknowledgeonquantumconfinement in zero, one,andtwodimensional nanosystems | | | | | | | | | | |
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| **ExpectedCourse Outcomes:** | | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | | |
| 1 | Knowthebasic concepts ofnanoparticlesandnanotechnology | | | | | | | | K1,K2 | |
| 2 | Analyzeandapplyvarioussynthesismethods | | | | | | | | K4 | |
| 3 | Applynanotechnologyandnanoparticles inthe required areas | | | | | | | | K6 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** – Create | | | | | | | | | | |
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| **Unit:1** | | **IntroductiontoNanoscience** | | | | **16 hours** | | | | |
| Definition of nano scale system - size & scale of atoms, molecules, clusters and particles - Classification of nanomaterials - dimensions - Surface to volume ratio, lotus leaf self-cleaning effect, Gecko feet effect, carbon allotropes: graphite, fullerene, carbon nanotubes, graphene structures. | | | | | | | | | | |
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| **Unit:2** | | **Sizedependent properties** | | | | **18 hours** | | | | |
| Electron confinements in quantum dots, wires, and sheets - density of states characteristics, metal nanoparticle-surfaceplasmonresonance,singledomainmagneticnanoparticle-superparamagnetism and ferrofluids, optical quantum dots- blue shift and red shift. | | | | | | | | | | |
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| **Unit:3** | | **Synthesisof nanomaterial** | | | **18 hours** | | | | | |
| Top-downandBottom-upsynthesisapproaches,strategiesinSol-Gelsynthesismethod,hydrothermal technique-Ballmillingmethod-particlesizeandshapeoptimization-chemicalvapourdepositionand physical vapour deposition methods. Molecular Beam Epitaxy, Lithographic techniques. | | | | | | | | | | |
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| **Unit:4** | | **Characterizationofnanomaterial** | | | **18 hours** | | | | | |
| Powder XRD diffraction - interpretation of XRD pattern and crystallite size determination - scanning and transmission electron microscopic analysis - elemental mapping - EDAX analysis, UV-visible spectroscopy and FTIR spectroscopy. | | | | | | | | | | |
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| **Unit:5** | | **Applicationofnanomaterials** | | | **18 hours** | | | | | |
| ImplicationsofDrugdelivery -PolymericNanoparticlesasDrug carriersandcontrolledrelease implantdevices-MagneticDataStorage-Magnetoopticsandmagneto-opticrecording-Nano Sensors - Physical, chemical and biosensors | | | | | | | | | | |
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| **Unit:6** | | | **ContemporaryIssues** | **2 hours** | |
| Expertlectures,onlineseminars –webinars | | | | | |
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| **TotalLecturehours** | | | | **90** | |
| **TextBook(s)** | | | | | |
| 1 | IntroductiontoNanotechnology,Charles P.Poole,Jr.,Frank J.Owens,JohnWiley (2003) | | | | |
| 2 | Nanotechnology:PrinciplesandPractices,SulabhaK.Kulkarni,Springer Nature(2015) | | | | |
|  | | | | | |
| **ReferenceBooks** | | | | | |
| 1 | TextbookofNanoscienceandNanotechnology,B.S.Murty,P.Shankar,BaldevRaj,James Murday, Springer (2013) | | | | |
| 2 | NanostructuresandNanomaterials:Synthesis,Properties,andApplications,GuozhongCao,Ying Wang, World Scientific, 2011 | | | | |
|  | | | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | | | |
| 1 |  | https:/[/www.pnnl.gov](http://www.pnnl.gov/) ›nano› links | | |  |
| 2 | https:/[/www.loc.gov](http://www.loc.gov/)›scitech›nanotechnology | | | | |
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| CourseDesigned By:**BoS -Physics CA** | | | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | M | S | M | M | S | S | S |
| **CO2** | M | S | M | S | M | S | M | M | S | M |
| **CO3** | S | S | M | L | S | S | S | L | M | M |

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

# SEMESTERV&VI

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| **Coursecode** | | **63P** | **COREPRACTICAL III ELECTRONICS**  **(**Examinationattheendof SixthSemester**)** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **COREPRACTICAL III** | **0** | | **0** | | **3** | **4** |
| **Pre-requisite** | | | ShouldhavethefundamentalknowledgeofBasic Electronics | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:  transformtheprinciplesofBasicElectronicsintoExperimentaltechniques gain knowledge about different electronic gadgets.  motivatethestudentsto applytheprinciplesofelectronicsintheirday-to–day life. | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | designdifferenttypesofPowersupplies,AmplifiersandOscillators | | | | | | | K4 | |
| 2 | toanalyzethecharacteristicsofvariousElectronicdeviceslikeBJT,UJT,LDR,and Solar cell | | | | | | | K4 | |
| 3 | acquiretheknowledgeof thecharacteristicsofanoperationalamplifier | | | | | | | K5 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | |
|  | | | | | | | | | |
| **LISTOFEXPERIMENTS**(Anytwelveexperiments) | | | | | **56 hours** | | | | |
| 1. LogicGatesusingdiodesandtransistor. 2. BridgerectifierwithZenervoltageregulator 3. RegulatedPowerSupply - IC 4. DualPowerSupply 5. Voltage Doubler 6. CharacteristicsofTransistor -CE mode 7. DifferentiatingandIntegratingCircuits. 8. Clippingand ClampingCircuits 9. R.C.Coupled Amplifier –Singlestage-Transistor 10. EmitterFollower 11. SeriesandParallelresonancecircuits 12. HartleyOscillator–SolidState 13. Colpitt’sOscillator–SolidState 14. SquarewavegeneratorusingIC555 Timer 15. AstableMultivibrator 16. Studyof SolarCell 17. Study of LDR 18. CharacteristicsofUJT 19. InvertingandNoninvertingamplifiers-Op-amp(IC741) 20. AdderandSubtractorcircuits-Op-amp(IC741) | | | | | | | | | |
|  | | | | | | | | | |
| **ContemporaryIssues** | | | | **4 hours** | | | | | |
| Onlineworkshop,WebinarsonExperimentalElectronics | | | | | | | | | |
|  | | | | | | | | | |
| **TotalPractical Hours:** | | | | **60** | | | | | |

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| **ReferenceBooks** | |
| 1 | PracticalPhysicsandElectronics,C.C.Ouseph,U.J.Rao,V.Vijayendran,S.Viswanathan(2007) |
| 2 | AtextbookofpracticalPhysics,M.N.Srinivasan,S.Balasubramanian,R.Ranganathan,Sultan Chand & Sons (2017) |
|  | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | |
| 1 | <https://www.slideshare.net/mobile/sunilrathore77398/basicanalogelectronics> |
| 2 | <https://www.slideshare.net/mobile/PatruniChidanandaSas/basics-of-electronics-53962342> |
| CourseDesigned By:**BoS -Physics CA** | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | S | S | M | L | M | S | M |
| **CO2** | S | S | M | S | S | L | M | S | S | S |
| **CO3** | M | M | S | S | L | M | S | S | S | M |

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

# SEMESTERV&VI

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| **Coursecode** | | **63Q** | **DIGITALAND MICROPROCESSOR**  (Examinationattheendofsixth semester) | **L** | | **T** | **P** | **C** |
| **Core/Elective/SBS** | | | **ELECTIVE PRACTICAL** | **0** | | **0** | **2** | **2** |
| **Pre-requisite** | | | Shouldhavethefundamentalknowledgeof Digital Electronics and Microprocessors | **Syllabus Version** | | | **2023-24** | |
| **Course Objectives:** | | | | | | | | |
| Themain objectives ofthis courseareto:  understandtheprinciplesandapplicationsofDigitalElectronics gain knowledge about the development of the Microprocessors.  motivatethestudents toapply theprinciples ofDigital Electronicsin their day–to–day life. | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | |
| 1 | analyzethedifferent typesof digitalcircuits andtheirapplications | | | | | | K4 | |
| 2 | realizetheapplicationsofregistersincomputers | | | | | | K5 | |
| 3 | updatetheknowledgeofMicroprocessor programming | | | | | | K6 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | |
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| **LIST OF EXPERIMENTS**  (Anytwelveexperimentsbychoosing**atleastfive**fromeachdivision) | | | | | **56 hours** | | | |
| **DIGITAL ELECTRONICS**   1. VerificationoftruthtablesoflogicgatesusingIC’s: OR, AND, NOT, XOR, NOR and NAND. 2. NANDasuniversal buildingblock-AND,OR, NOTand Ex-OR 3. NORasuniversalbuildingblock-AND,OR,NOT and Ex-NOR 4. VerificationofDeMorgan’s theorem. 5. BooleanAlgebra–problem solving 6. StudyofRS Flip-Flop. 7. HalfadderandHalfSubtractor 8. Full adder 9. Full Subtractor. 10. 4Bit– BinaryAdder/Subtractorusing7483   **MICROPROCESSORS**   1. 8085ALP for8bit Addition and Subtraction 2. 8085ALPfor8bitadditionwith carryand subtractionwith borrow 3. 8085ALP for8 Bit Multiplication 4. 8085ALP for8 Bit Division 5. 8085ALPforOne’sComplement,Masking offmostsignificant4bitsandsetting bits. 6. 8085ALPforTwo’scomplimentAdditionand Subtraction 7. 8085ALPforfindingthebiggestnumberelementinthearrayandSumoftheelementsinthe array. 8. 8085ALPforarrangingAscendingand Descendingorder ofthegiven setof numbers 9. 8085ALPforconversion ofHexadecimalintoDecimal number. 10. 8085ALPforconversionofHexadecimalintoBinary number. | | | | | | | | |

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| **ContemporaryIssues** | | **4 hours** |
| Onlineworkshop,WebinarsonExperimentalDigitalElectronicsandMicroprocessors | | |
| **TotalPracticalHours:60** | | |
| **ReferenceBooks** | | |
| 1 | PracticalPhysicsandElectronics,C.C.Ouseph,U.J.Rao,V.Vijayendran,S.Viswanathan Publishers(2007) | |
| 2 | AtextbookofpracticalPhysics,M.N.Srinivasan,S.Balasubramanian,R.Ranganathan,Sultan Chand&Sons(2017) | |
|  | | |
| **RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websites etc.]** | | |
| 1 | <http://www.sircrrengg.ac.in/images/Others/CSE/MP-LAB-MANUAL.pdf> | |
| 2 | <https://www.youtube.com/playlist?list=PL_pGb42kre_QXwuaizYb21tSYpoHyXsCQ> | |
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| CourseDesigned By:**BoS -Physics CA** | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | M | L | S | M | S | M |
| **CO2** | S | M | M | S | S | L | S | M | S | S |
| **CO3** | S | M | S | M | L | M | M | S | S | M |

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

# SEMESTERV&VI

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| **Coursecode** | | **6ZP** | **MSOFFICE, C AND C++ PROGRAMMING**  (Examinationattheendofsixth semester) | **L** | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **SKILLBASEDSUBJECT PRACTICAL** | **0** | | **0** | | **2** | **2** |
| **Pre-requisite** | | | ShouldhavethefundamentalknowledgeofC, C++ Programming and MS Office | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:   * UnderstandProgrammingconceptsofCandC++ * ApplyProgramming concepts ofC andC++tovarious programmes * Motivatethestudentsto learnMS Office | | | | | | | | | |
|  | | | | | | | | | |
| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | Writeandexecuteprogrammes inC and C++ | | | | | | | K3 | |
| 2 | Analyzetheprogrammingconceptsfor Physicsproblems | | | | | | | K4 | |
| 3 | Evaluatethesolutions fordifferentMathematical problems | | | | | | | K5 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | |
|  | | | | | | | | | |
| **LIST OF EXPERIMENTS**  (Anytwelveexperimentsbychoosing**atleastthree**fromeachdivision) | | | | | **84 hours** | | | | |
| **MSOffice**  **MSWord**   1. Type Chairman’s speech/ Auditor’s report / Minutes/ Agenda and perform the followingoperations: Bold, Underline, Font Size, style, Background color, Text color, Line spacing, SpellCheck, Alignment, Header & Footer, Inserting pages and page numbers, Find and Replace 2. Prepare a Class Time Table and perform the following operations: Inserting the table, DataEntry, AlignmentofRowsandColumns,InsertingandDeletingtheRowsandColumnsandChange of Table Format   **MSExcel**   1. Prepare a statement of Bank customer’s account showing simple and compound interest calculations for 10 different customers using mathematical and logical functions. 2. Prepareamarklistofyourclass(minimumof5subjects)andperformthefollowingoperations:Data Entry, Total, Average, Result and Ranking by using arithmetic and logical functions and sorting.   **MSPowerpoint**   1. Design presentation slides for a product of your choice. The slides must include name, brandname, typeofproduct,characteristics,specialfeatures,price,specialofferetc.Addvoice ifpossible to explain the features of the product. The presentation should work in manual mod 2. Design presentation slides for the Seminar/Lecture Presentation using animation effects andperform the following operations: Creation of different slides, changing background color, fontcolor using word art | | | | | | | | | |

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| **B.Programmingin C**   1. FindthenumberofDayselapsedbetweentwo dates. 2. ConvertIntegerintherange1to100in words. 3. Write a program that uses functions to compare two strings input byuser. The Programshould state whether the first string is less than, equal or greater than the second Strings. 4. WriteaProgramtocomparetwofilesprintingtheCharacterpositionwheretheyequalandwherethey are differ. 5. WriteaProgram forMatrix addition 6. WriteaProgramforMatrix Multiplication. 7. WriteaProgram forAddition ofTwo times  1. WriteaProgramforfindtheInverseofgiven Matrix 2. WriteaProgram fordisplaytheMultiplicationtable.   **ProgramminginC++**   1. ToreadanytwonumberthroughthekeyboardandtoperformsimpleArithmeticOperation(UseDo while loop) 2. To displaythe nameof the dayin a week, dependingupon the number entered throughthe keyboard using Switch – case statement. 3. Toreadtheelements ofthegiventwomatrixofm Xn andtoperform theMatrix addition 4. WriteaProgram forMatrixMultiplicationtable. 5. WriteaProgramtofindthe InverseofGivenmX n Matrix 6. WriteaProgramto findtheModulusoftheGiven Number 7. WriteaProgram tocomparetwofilesprintingthecharacterposition wheretheyareequalandwhere they are differed. | | |
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| **ContemporaryIssues** | | **6 hours** |
| Onlineworkshop,Webinarson CandC++ programming | | |
| **TotalPractical Hours:** | | **90** |
| **ReferenceBooks** | | |
| 1 | ProgramminginANSICbyE. Balagurusamy,TataMcGrawHill,sixth Edition(2012) | |
| 2 | ObjectOrientedProgrammingwithC++byE.Balagurusamy,TataMcGrawHill,SixthEdition (2013) | |
|  | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | |
| 1 | [https://nptel.ac.in/course.html/computerscienceandengineering//C,C++programming](https://nptel.ac.in/course.html/computerscience%20and%20engineering/C%2C%20C%2B%2B%20programming) | |
| 2 | <https://www.geeksforgeeks.org/introduction-to-c-programming-language/> | |
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| CourseDesigned By:**BoS -Physics CA** | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | S | L | M | S | M | S | M |
| **CO2** | M | S | S | M | S | L | S | M | S | S |
| **CO3** | S | M | S | M | L | M | M | S | S | M |

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

# LISTOFELECTIVEPAPERS SEMESTER V

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| **Coursecode** | | **5EA** | **DIGITALANDMICRO PROCESSOR** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **ELECTIVEPAPER– IA** | **3** | | **0** | | **0** | **3** |
| **Pre-requisite** | | | The students are expected to procure foundational knowledge on digital and micro processor | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:  give description for the students in order to make use of digital devices and microprocessors learntheconceptsoflogiccircuitsandtoconstructthelogiccircuitforanyBooleanequation acquire basic knowledge of binary addition  understandthe actionofflip flops.  5.learnbasicprogrammingwithmicroprocessor 8085. | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | drawandconstructthelogiccircuitforanyBooleanequation. | | | | | | | K2 | |
| 2 | applytheKarnaughMaptosimplifyBooleanequationanddrawasimplified circuit | | | | | | | K3 | |
| 3 | understandthefunctionofdataprocessingandarithmeticcircuits | | | | | | | K4 | |
| 4 | understandtheMnemonics andOpcodesintheMicroprocessor | | | | | | | K4 | |
| 5 | developprogrammingskills usingthebasic concepts. | | | | | | | K5 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **ArithmeticCircuitsandFlip-Flops** | | | **10 hours** | | | | |
| **Arithmetic Circuits:** Binary addition - Binary Subtraction – Unsigned Binary numbers - sign magnitude numbers –2’s complement representation – 2’s complement Arithmetic – Arithmetic building blocks – The Adder – Subtractor  **Flip-Flops:** RS flip flop – Clocked RS flip flop – D flip flop – Edge triggered D flip flop – JK flip Flop – Master Slave flip flop – Schmitt trigger | | | | | | | | | |
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| **Unit:2** | | **ShiftRegisterandCounters** | | | **12 hours** | | | | |
| Types – Serial In Serial Out – Serial In Parallel Out – Parallel In Serial Out – Parallel In Parallel Out – Ring counter – Asynchronous counter – Decoding gates – Synchronous counter – Mod 3counter – Mod 5 counter – shift counter | | | | | | | | | |
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| **Unit:3** | | **SemiconductorMemories** | | **12 hours** | | | | | |
| Basic–Memoryaddressing–ROM’sPROM’sandEPROM’s–RAM’s–DRAM’s–DynamicRam’s.  **D/Aand A/D Conversion**  Variable–ResistorNetwork–Binaryladder–D/Aconverter–A/Dconverter–Simultaneous conversion – Counter method – continuous A/D conversion | | | | | | | | | |
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| **Unit:4** | | **MicroprocessorandDataRepresentation** | **12 hours** |
| Basic concept – what is Microprocessor, 4, 8, 16, 32 – Organization of Microprocessor – Microprocessor Programming – Instruction – Machine and Mnemonic codes – Machineand Assembly Language Programming – High level Language programming – Timingdiagram conventions. Organizationof8085–DataandAddressbusesaddressing–TheI/O devices – Registerin8085–Instructiontypes–ClassificationofInstruction–Addressingmodes–Programming the 8085 –The Programming process – machinelanguage programming – Assembler Programming. | | | |
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| **Unit:5** | | **Semi-ConductorMemories** | **12 hours** |
| Introduction – Registers – Primary memory – Mass storage, cache – off line backup – memory chips – static and dynamic RAMs, ROMs and their versions characteristics of memories: Memory chip capacity and organization – memory size – combining the chips together with example electrical signals. Static RAM: Organization of 6264 – Read and write cycle of 6264 –dynamic RAMS: Organizationof 51100x– Read andwritecycleof 51100 xRAS only freshhidden fresh– Burst and  distributedi.e.,fresh –pseudo staticram andautomatic refresh. | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars | | | |
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| **TotalLecturehours** | | | **60** |
| **TextBook(s)** | | | |
| 1 | DigitalPrinciplesandApplications–AlbertPaulMalvino&DonaldPLeach(FourthEdition, TMH). | | |
| 2 | IntroductiontoMicroprocessorsbyAdityaP Mathur(3rdEditionTMH). | | |
| **ReferenceBooks** | | | |
| 1 | IntegratedElectronics–Millmann&Halkeias | | |
| 2 | MicroprocessorsbyGoenkar-MicroprocessorsbyK Ramachandran | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://www.tutorialspoint.com/microprocessor/microprocessor_overview.htm>l | | |
| 2 | <https://www.geeksforgeeks.org/introduction-of-microprocessor/> | | |
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| CourseDesigned By:**BoS -Physics CA** | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | M | S | L | S | M | L | S |
| **CO2** | M | S | S | S | S | S | M | S | S | L |
| **CO3** | S | M | S | M | L | M | S | S | M | S |
| **CO4** | L | L | M | L | M | S | S | L | S | M |
| **CO5** | M | S | M | S | S | M | L | S | S | S |

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

# SEMESTERV

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| **Coursecode** | | **5EA** | **ENERGY PHYSICS** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **ELECTIVEPAPER-IB** | **4** | | | **0** | | **0** | **4** |
| **Pre-requisite** | | | Thestudentsshouldknowthefundamental principle of motor and classification of energy | **Syllabus Version** | | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | | |
| Themain objectives ofthis courseareto:   * learnabout theproduction of electricity. * knowaboutfibreopticalcommunicationsystem.  * gainknowledgeonatomic,molecularenergy andthermal energy. * understandthenon-conventionalenergyresourcesandutilization. | | | | | | | | | | |
|  | | | | | | | | | | |
| **ExpectedCourse Outcomes:** | | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | | |
| 1 | understandtheheatingeffectof currentandapplicationofit. | | | | | | | | K2 | |
| 2 | selectthecorrectmaterialformakingwaveguide basedonbasicoptical laws. | | | | | | | | K3 | |
| 3 | understandMaxwell’slawofequipartitionof energy. | | | | | | | | K2 | |
| 4 | analyzethedistributionofenergy inthethermal spectrum. | | | | | | | | K4 | |
| 5 | Calculateeffectiveutilizationofsolarradiation,powerinthewindandtidal energy | | | | | | | | K5 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | | |
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| **Unit:1** | | **ElectricalEnergy** | | | | **12 hours** | | | | |
| Principle of production of A.C. – A.C generators – D.C generators –D.C Motors. Heat developed in currentcarryingconductor–Applicationofheatingeffect–Electricheaterorstove–Electricradiation and Electric Iron – Electricwelding and electric furnace – Carbonarc– ElectricLamp – Efficiency of a Lamp – Measurement of Electric Power. | | | | | | | | | | |
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| **Unit:2** | | **OpticalEnergy** | | | | **12 hours** | | | | |
| Characteristics of Light – Light sources – LED, LASER – optical fiber– Light propagation through opticalfibers:Basicopticallawsusedinopticalfibers–Opticalparametersofopticalfiber:Acceptance angle and Numerical aperture – Types of optical fibers: Based on material, Number of modes and refractiveindexprofile–Fiberopticalcommunicationsystem–BlockDiagram–Source–Transmitter – Optical fiber – Receiver. | | | | | | | | | | |
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| **Unit:3** | | **AtomicAndMolecularEnergy** | | | **12 hours** | | | | | |
| Degreesoffreedom–NumberofDegreesofFreedomofMono,DiandTriAtomicsystem–Maxwell’s LawofequipartitionofEnergy–MolarSpecificheatcapacityatconstantvolumeandconstantpressure –TotalInternalEnergyandRatioofHeatcapacitiesinmonoatomicgas,Diatomicgas,NonLinearand LineartypeofTriatomicgasmolecularsystem.GasandVapourDistinction–Measurementofsaturated and unsaturated vapour Pressure: Regnault’s statistical method – Their characteristics – Graphical Illustration of Gas laws. | | | | | | | | | | |
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| **Unit:4** | | **ThermalEnergy** | | **12 hours** |
| Definition of Total thermal Energy density - Spectral Energy density – Spectral Emissive power – Emissivity–Emissivepower–Absorptivepower–Reflectivepower–Kirchoff’sLawofradiationand itsproof–verificationofKirchoff’sResults:Ritche'sExperiment.DistributionofEnergyinthethermal spectrum – Lummer and Pringsheim Experiment and its Results – Wien's Displacement Law and RadiationLaw–RayleighJean'sLawPlanck'sRadiationLaw–DeductionofWien'sLawandRayleigh – Jean's Law from Planck's law. Solar constant – Temperature of sun – Disappearing filament optical Pyrometer - **Pyrheliometers**: Angstrom Pyroheliometer – Water flow Pyrohelio meter. | | | | |
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| **Unit:5** | | **Nonconventional Energy** | | **10 hours** |
| **Solar Energy**: Solar radiation – Solar radiation outside the earth's atmosphere Solar radiation at the earth'ssurface–SolarThermalEnergy–SolarThermaldevicesandsystems:Solarwaterheater–Sub componentsofsolarwaterheater –SolarCookeranditsmeritsand demerits.**WindEnergy**:Powerin thewind–Typesofwindenergysystems–HorizontalaxiswindTurbine–VerticalaxiswindTurbine. **OceanEnergy**:TidalEnergy–OceanThermalEnergyConversion(OTEC)–ClosedCycleOTEC  system–OpenCycleOTEC System. | | | | |
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| **Unit:6** | | **ContemporaryIssues** | | **2 hours** |
| Expertlectures,onlineseminars-webinars | | | | |
|  | | | | |
| **TotalLecturehours** | | | | **60** |
| **TextBook(s)** | | | | |
| 1 | RenewableEnergyEnvironmentandDevelopment-MaheshwarDayal. KonarkPubl.,(1989) | | | |
| 2 | EngineeringPhysics - I- G.Senthil Kumar, | | VRBPublishers, (2011) | |
|  | | | | |
| **ReferenceBooks** | | | | |
| 1 | SolarEnergyUtilization-G.D.RaiKhhannaPublishers,(1995) | | | |
| 2 | EngineeringPhysics -II- M.Arumugham,AnuradhaPublishers(2010) | | | |
|  | | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | | |
| 1 | <https://www.askiitians.com/revision-notes/physics/heat-phenomena/> | | | |
| 2 | <https://www.askiitians.com/revision-notes/physics/thermodynamics/> | | | |
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| CourseDesigned By:**BoS -Physics CA** | | | | |

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| **MappingwithProgrammeOutcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | S | M | M | S | M | M | S | M |
| **CO2** | M | S | S | S | M | S | S | M | S | M |
| **CO3** | S | M | M | S | S | M | M | S | M | S |
| **CO4** | S | S | M | M | M | M | M | S | S | M |
| **CO5** | S | S | S | S | S | S | S | S | S | S |

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

# SEMESTERV

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| **Coursecode** | | **5EA** | **AGRICULTURAL PHYSICS** | **L** | | | **T** | **P** | **C** |
| **Core/Elective/SBS** | | | **ElectivePaperIC** | **3** | | | **0** | **0** | **3** |
| **Pre-requisite** | | | Studentsshouldpossessthefundamentalknowledge on agronomy which is described using physical sciences. | **Syllabus Version** | | | | **2023-24** | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:   * haveknowledgeof physicalphenomenain agricultural environment.  * evokelogicalthinkingin thefieldof farming. * improvepractical knowledgeof the student. | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | understandthe role ofphysics in daily life. | | | | | | | K2 | |
| 2 | introducetechnologicalapplicationsintoagriculture. | | | | | | | K3 | |
| 3 | explorethe physicalproperties ofsoil and water. | | | | | | | K4 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | |
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| **Unit:1** | | **Soil Physics** | | | | **12 hours** | | | |
| Mechanical compositionof soil – physical properties of soil, porespace, bulk density, particle density – classification – significance of clays – plasticity, shrinkage, flocculation and deflocculation – Soil structure–soilcolour–Thermalpropertiesofsoilandsoiltemperatures–typesofsoilwater–its  retention, movement – viscosity, swelling – soil moisture losses – Elementary ideas of soil water conservation. | | | | | | | | | |
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| **Unit:2** | | **WaterPhysics** | | | | **10 hours** | | | |
| Waterqualities –Rainfall –Groundwater–surfacewaterpollution –instrumentationandsampling – water quality monitoring | | | | | | | | | |
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| **Unit:3** | | **ElectricPower** | | | **12 hours** | | | | |
| PrincipleofproductionofA.C.–AveragevalueofA.C.voltageorcurrent–R.M.S.valueofalternating voltageor current–power consumedinA.C.Circuits–kilowatthour–A.C.generator–Threephase  A.C.–Distributionof three phase A.C.Three phase power system–Thechoke- The transformer– Transmission of electric power over long distances. | | | | | | | | | |
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| **Unit:4** | | **HygrometryandPumps** | | | **12 hours** | | | | |
| Absolute Humidity – Relative Humidity – Dew point, Daniell’s Hygrometer, Regnault’s hygrometer. Advantages of Regnault’s hygrometer – wet and Dry and Bulb hygrometer. Water pumps – common pump –forcepump – Fireengine,inflator(or)compression pump – pressureaftern strokes – Exhaust pump (or) common air pump. | | | | | | | | | |
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| **Unit:5** | | **SolarCollectorandApplications** | **12 hours** |
| Solar Air heaters- Application of solar air heaters. Solar Drying with various driers – Heating and Drying of Agricultural products – Theory of solar drying – moisture content and its measurement – solarponds–Applicationofsolarponds–Solarpumping–Solarpumpsystemcomponents–Turbine driven pump – Application of solar energy to agricultural crops. | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars-webinars | | | |
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| **TotalLecturehours** | | | **60** |
| **TextBook(s)** | | | |
| 1 | TheNatureandPropertiesof Soil,H.O.Buckman,Brady,Macmillan, (1967). | | |
| 2 | SoilPhysics,H.Kohnke,McGraw-Hill,(1968). | | |
| 3 | SystematicHydrology,JohnC.Rodda,RichardA.Downing,FrankM.Law,Newnes-Butterworths, (1976). | | |
|  | | | |
| **ReferenceBooks** | | | |
| 1 | ElectricityandMagnetism,R.Murugesan,S.Chand,(2017). | | |
| 2 | Hydrostatics,A.S.Ramsey,CambridgeUniversityPress, (2017). | | |
| 3 | SolarenergyUtilization, G.D.Rai,KhannaPublisers,(1987). | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/soil-physics> | | |
| 2 | <https://www.sciencedirect.com/science/article/pii/S1631071304002780> | | |
| 3 | <https://www.sciencedirect.com/topics/engineering/solar-energy-application> | | |
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| CourseDesigned By:**BoS -Physics CA** | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | M | M | M | S | M | S | M |
| **CO2** | M | S | S | S | S | S | M | S | M | M |
| **CO3** | M | S | S | M | S | M | S | S | S | S |

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

# SEMESTERVI

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| **Coursecode** | | **6EA** | **MATLAB** | **L** | **T** | **P** | | **C** |
| **Core/Elective/SBS** | | | **ELECTIVE II A** | **3** | **0** | **0** | | **3** |
| **Pre-requisite** | | | Thestudentsshouldhavebasicunderstandingin arithmetic and arrays | **Syllabus Version** | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | |
| Themain objectives ofthis courseareto:  impartknowledgeonbasicarithmeticandarrays evokelogicalthinkinginthefieldofMATLAB. improve practical knowledge of the student. | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | |
| 1 | Solvearithmeticandarrays relatedproblemsusingMAT LAB | | | | | | K5 | |
| 2 | Analyzevarious types ofoperators | | | | | | K4 | |
| 3 | Createand workwithfiles | | | | | | K6 | |
| **K1** -Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** – Create | | | | | | | | |
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| **Unit:1** | | **MATLABwindows** | | **12hours** | | | | |
| Working in the Command Window – Arithmetic operations with scalars – order of Precedence – Display formats – Elementary Math built-in functions – Assignment operator – Rules about variable names.  Creating a one dimensional array -Creating a two dimensional array – zeros, ones and eye commands – Transpose operator - Array addressing - adding elements to a matrix – deleting elements – Built – in – functions in handling arrays. | | | | | | | | |
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| **Unit:2** | | **Mathematicaloperationswitharrays** | | **12hours** | | | | |
| Array addition and subtraction – Array Multiplication – array division – element – by – element operations –Relationaloperations–Logicaloperations,Trigonometricandexponentialfunctions–characterstrings  -Commandline functions,Inlinefunctions–Anonymous functions-Programs | | | | | | | | |
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| **Unit:3** | | **Scriptfiles** | | **12hours** | | | | |
| Creating and saving a script file – Running a script file – input to a script file – output commands – disp command – fprintf command, Creating a Function File – function definition line – input and output arguments – Localand Global variables – saving a function file, for loops – while loops – if – elseif – else statements – Switch – case – otherwise – breakstatement – Programs. | | | | | | | | |
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| **Unit:4** | | **ConditionalstatementsandLoops** | | **12hours** | | | | |
| **Conditionalstatements:**if…endstructure–if..else…endstructure–if..elseif..else  …endstructure–switch– casestatement –  **Loops**:for…endloops–while..endloops- Nested loops and nested conditionalstatements–break and continue commands | | | | | | | | |

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| **Unit:5** | | **Twodimensional plots** | | **10hours** |
| Plotcommandlinespecifies–PropertynameandPropertyvalue–fplotcommand-Plottingmultiplegraphs in the same plot – Formatting a plot: x label, y label, title, legends, text – subscript and superscript - axis command – grid command – formatting a plot using the plot editor | | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** | |
| Expertlectures,onlineseminars-webinars | | | | |
| **TotalLecturehours** | | | | **60** |
| **Book(s)for Study** | | | | |
| 1 | MATLABAnintroduction withApplications:AmosGilatWileyIndiaPvtLtd,New Delhi | | | |
| 2 | MATLAB7:RudraPratap,1stedition,2006,OxfordUniversityPress,2002edition | | | |
|  | | | | |
| **Book(s)for Reference** | | | | |
| 1 | MATLABanditsApplicationsinEngineering:RajKumarBansal,AshokKumarGoelandManoj Kumar Sharma, Published by Dorling Kindersley (India) Pvt Ltd.. | | | |
| 2 | AguidetoMATLAB:BrianR.Hunt,RonaldL.LipsmanandJonathanM.Rosenberg,Cambridge University Press, 1st edition, reprinted 2003. | | | |
|  | | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | | |
| 1 | https:/[/www.mathworks.com](http://www.mathworks.com/)›products›matlab-online | | | |
| 2 | https://matlab.mathworks.com | | | |
| **CourseDesigned By: BoS -Physics CA** | | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | S | M | S | L | S | S | S |
| **CO2** | S | S | S | M | M | S | S | M | S | M |
| **CO3** | M | L | M | S | S | M | M | S | M | S |

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



# SEMESTERVI

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| **Coursecode** | | **6EA** | **OPTICALFIBERSANDFIBEROPTIC COMMUNICATION SYSTEMS** | **L** | | | **T** | **P** | **C** |
| **Core/Elective/SBS** | | | **ELECTIVE IIB** | **3** | | | **0** | **0** | **3** |
| **Pre-requisite** | | | Thestudentsmustknowthebasicopticallaws and properties of optical fiber. | **Syllabus Version** | | | | **2023-24** | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:   * learnabout thepropagation oflight wavesin anoptical fiber. * knowaboutfiber fabricationandcables. * gainknowledgeonfiberlossesand dispersion. * understandthestructuresoflightsources foropticalfiberopticcommunication. | | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | understandthefiber classification. | | | | | | | K2 | |
| 2 | testthecablesduringinstallationofcablebasedoncableselectioncriteria. | | | | | | | K3 | |
| 3 | analyzetheattenuation anddispersionin anoptical fiber. | | | | | | | K4 | |
| 4 | calculatetheefficiency,modulationbandwidthandspectralemissionoflight sources. | | | | | | | K5 | |
| 5 | usethe knowledgeto makevaried linkand networking. | | | | | | | K6 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **Fiber Classification** | | | | **12 hours** | | | |
| Propagationoflight wavesinanopticalfiber –AcceptanceangleandAcceptanceconeofafiber – NumericalAperture(NA)–NAofagradedIndexfiber–Modeofpropagation.Fiber–classification – stepped index fiber – stepped index mono mode fiber – Graded index multimode fiber – Comparison of step and graded index fibers. | | | | | | | | | |
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| **Unit:2** | | **FiberFabrication andCables** | | | | **12 hours** | | | |
| Classification of Techniques – External chemical vapour deposition – Characteristics – Internal chemical vapour deposition (1st method only) – Characteristics – Phasil system Fiber cable construction – losses incurred during installation of cable – Testing of cables – cable selection criteria. | | | | | | | | | |
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| **Unit:3** | | **FiberLossesand Dispersion in Optics** | | | **12 hours** | | | | |
| Attenuation in optic fiber – Rayleigh Scattering losses – Absorption losses – Bending losses – Radiation induced losses – Inherent defect losses – Core and Cladding losses. Dispersion in an OpticalFiber–Inter-modaldispersion–MaterialChromaticDispersion–DispersionPowerpenalty – Total Dispersion delay. | | | | | | | | | |
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| **Unit:4** | | **LightSourcesForOptical Fibers** | | | **10 hours** | | | | |
| LED – The process involved in LEDs – Structures of LED – Fiber – LED Coupling – Modulation bandwidth and Spectral Emission of LEDs. | | | | | | | | | |

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| **Unit:5** | | **Applications** | **12 hours** |
| Introduction – Video Link Satellite Link – Computer Link – Nuclear Reaction Link – Community Antenna Television – Switched Star CATV – Networking | | | |
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| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars-webinars | | | |
|  | | | |
| **TotalLecturehours** | | | **60** |
| **TextBook(s)** | | | |
| 1 | OpticalFibersandFiberOpticCommunicationSystems,SubirKumarSarkar,S.ChandLimited, (2007) | | |
| 2 | FiberOpticsCommunication, D.C.Agarwal,S.Chand(2010) | | |
| 3 | OpticalfiberCommunication,Keiser, McGrawHill(2010) | | |
|  | | | |
| **ReferenceBooks** | | | |
| 1 | OpticalFibersandFiberOpticCommunicationSystems,R.K.PuriandV.K.Babbar,S.Chand & CO | | |
| 2 | IntroductiontoFiberOptics,AjoyGhatak,K.Thyagarajan,Cambridge(2009) | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://nptel.ac.in/courses/115/107/115107095/> | | |
| 2 | [https://www.youtube.com/playlist?list=PLq-Gm0yRYwTgr7v3HhdrI\_Kcc38369fw](https://www.youtube.com/playlist?list=PLq-Gm0yRYwTgr7v3HhdrI_Kcc38369fw-)- | | |
| CourseDesigned By:**BoS -Physics CA** | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | S | M | S | M | M | S | S |
| **CO2** | M | S | M | M | S | S | S | M | M | M |
| **CO3** | S | M | S | S | M | M | M | M | S | M |
| **CO4** | S | S | M | M | S | S | S | S | S | S |
| **CO5** | S | S | S | M | M | S | S | S | S | S |

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

# SEMESTERVI

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| **Coursecode** | | **6EA** | **BIO PHYSICS** | **L** | | **T** | | **P** | **C** |
| **Core/Elective/SBS** | | | **ELECTIVEPAPER –IIC** | **3** | | **0** | | **0** | **3** |
| **Pre-requisite** | | | The students are expected to have basic knowledge in the area of biophysics. | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | | |
| Themain objectives ofthis courseareto:   * dealwithhow physicsappliesto theprocessesofbiology. * discoverhowtomodifymicro-organismsforproducingbio fuel.  * replacebio-electricityintheplaceofcoalandpetroleumproductsforproducingelectricity. | | | | | | | | | |
|  | | | | | | | | | |
| **ExpectedCourseOutcomes:** | | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | | |
| 1 | understandinteractionsbetweenvarioussystemsofcells. | | | | | | | K2 | |
| 2 | providelife-savingtreatmentmethodslikeradiationtherapy. | | | | | | | K4 | |
| 3 | findpowerfulvaccines againstinfectiousdiseases. | | | | | | | K6 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | | |
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| **Unit:1** | | **StructureofBiomolecules** | | | **12 hours** | | | | |
| Introduction-Atomicstructure-Hydrogenatom-Bondsbetweenatomsandmolecules-secondaryor weakbonds-Bondenergy-Disulphatebonds–Peptidebond-StructureofProteins-Molecularweight determination - Kinetic methods - Static methods - Structure of nucleic acids - DNA - RNA. | | | | | | | | | |
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| **Unit:2** | | **KineticsofMoleculesI** | | | **10 hours** | | | | |
| **Diffusion:** Factors affecting diffusion·- Simple diffusion – Fick’s law of diffusion - Diffusion of electrolytes - Biological significance of diffusion. **Osmosis:** Osmosis - Osmotic pressure - Laws of osmosis-osmometry-osmoticpressureofelectrolytes.**Filtration:**Filtration-Passageoffluidthough bloodvessels-FormationofUrine-DialysisPrincipleofdialysisinartificialkidney-kindsofdialysis. | | | | | | | | | |
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| **Unit:3** | | **KineticsofMoleculesII** | | **12 hours** | | | | | |
| **Adsorption:** Adsorption - Factors affecting adsorption - Adsorption of ions by Solids and Liquids - adsorption of Gases by solids - Biological significance of adsorption. **Hydrotropy**: Hydrotropy - Biological importanceofhydrotropy. **Precipitation:** Precipitation -Biological significance. **Colloids:** Types ofcolloids-characteristicsofcolloids-stabilityofcolloids-Gel-Emulsions-Techniques for  theseparationofcolloids-Biologicalimportance ofcolloids–Gibb’sDonnanEquilibrium. | | | | | | | | | |
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| **Unit:4** | | **OpticalTechniquesinBiologicalStudies** | | **12 hours** | | | | | |
| Characteristics of light- compound· microscope - Ultraviolet microscope - Electron microscope Transmission electron microscope - Scanning Electron microscope - Monochromator - Light sensitive detectors- Spectrophotometer - Atomic absorption flame photometer - Electromagnetic radiation Spectroscopy - Ultraviolet, visible, infrared and fluorescent spectroscopy - Atomic absorption and emissionspectroscopy-massspectroscopy-Ramanspectroscopy–X-raydiffractioncrystallography. | | | | | | | | | |
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| **Unit:5** | | **BioelectricityandRadiationBiology** | **12 hours** |
| Membrane potential - Resting membrane potential - Action potential and nerve impulse conductionRateofnerveimpulseconduction-RecordingofnerveimpulsesbyC.R.O-Restingmembranepotential  -.J Injury potential- Monophasic and diphasic action potentials - Radioactivity - Natural radioactivity Artificial or induced radioactivity - Radioactive disintegration - units of Radioactivity. | | | |
|  | | | |
| **Unit:6** | | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars-webinars | | | |
|  | | | |
| **TotalLecturehours** | | | **60** |
| **Text Book(s)** | | | |
| 1 | Biophysics:PrinciplesandTechniques,M.A.Subramanian,MJP Publishers,(2015). | | |
| 2 | Principlesofbiophysics,DrS.Palanichamy,Dr.M.Shanmugavelu,PalaniParamountPublications, (1996). | | |
|  | | | |
| **ReferenceBooks** | | | |
| 1 | Biophysics,S.ThiraviaRaj,SarasPublication,(2009). | | |
| 2 | BasicBiophysicsforBiologist, M.Daniel,Agro-Bios, (1998). | | |
|  | | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | |
| 1 | <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/biophysics> | | |
| 2 | <https://onlinecourses.nptel.ac.in/noc20_ph02/preview> | | |
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| CourseDesigned By:**BoS -Physics CA** | | | |

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| **MappingwithProgramme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | M | S | M | M | M | S | M |
| **CO2** | M | S | S | M | S | S | S | M | S | S |
| **CO3** | M | S | S | S | S | S | M | S | S | S |

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

**VALUEADDED COURSE I**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Valueadded course** | | **OPTOELECTRONICS** | **L** | **T** | | **P** | **C** |
| **30** | **0** | | **0** | **4** |
| **Pre-requisite** | | Students are expected to possess some basic knowledge in the field of Semiconductor technology. | **Syllabus Version** | | **2023-24** | | |
| **Course Objectives:** | | | | | | | |
| Themain objectives ofthis courseareto:   * understandtheopticalprocessinasemiconductor. * understandthebasicoptoelectronicsdevices-LED,OLED,photodetectorandphotovoltaicdevices.  * befamiliarwithrecenttrendsinoptoelectronics. | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | |
| 1 | describebasic laws and phenomenathatdefinebehaviour ofoptoelectronicdevices. | | | | | K1 | |
| 2 | describethedevelopmentandapplicationofoptoelectronic systems | | | | | K2 | |
| 3 | interprettheacquireddataandmeasuredresults. | | | | | K4 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | |
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| **Module:1** | | | **2 hours** | | | | |
| Electron-holepairformationandrecombination,absorptioninsemiconductordirectandindirectband gap semiconductors. | | | | | | | |
| **Module:2** | | | **2 hours** | | | | |
| Effectofelectricfieldonabsorption,Franz-Keldysheffectinsemiconductors. | | | | | | | |
| **Module:3** | | | **2 hours** | | | | |
| Light Emitting Diodes — Materials for light emitting diodes, Principle of action of LED, expression forlightpowerintermsofphotonenergy,homo structuredLEDandHeterojunctionLED,drawbacks of homo structured LED. | | | | | | | |
| **Module:4** | | | **2 hours** | | | | |
| TypesofLEDstructures—planar,dometype, surfaceemitter,edgeemitter,superluminescentstructure. | | | | | | | |
| **Module:5** | | | **2 hours** | | | | |
| PerformancecharacteristicsofLED—Opticaloutputpower-currentcharacteristics,forwardcurrent voltage characteristics. | | | | | | | |
| **Module:6** | | | **2 hours** | | | | |
| Performance characteristics of LED—Optical output power-current characteristics, forward current voltagecharacteristics,Modulationbandwidth,powerbandwidthproduct,Lifetime,Risetime/falltime, reliability, | | | | | | | |
| **Module:7** | | | **2 hours** | | | | |
| Internalquantumefficiency,advantages/disadvantagesofusingLED.Numericalproblems | | | | | | | |
| **Module:8** | | | **2 hours** | | | | |
| Organic light emitting diodes (OLED), The principle of OLED, characterisation, structure, efficiency, multilayer OLED. | | | | | | | |

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| **Module:9** | | **2 hours** |
| Importantparametersofphotodetectors,Detectorresponsivity,spectralresponserange,responsetime, quantum efficiency, capacitance, noise characteristics. | | |
| **Module:10** | | **2 hours** |
| Absorptionofradiation—absorptioncoefficient,mentionofexpressionforphotocurrent,long wavelength cut off, direct and indirect absorption T. | | |
| **Module:11** | | **2 hours** |
| Typesofphotodiodes—Junctionphotodiodes,pindiode,avalanchephotodiodes,CCDphotodetectors; Comparison of different detectors, Photomultiplier tubes. | | |
| **Module:12** | | **2 hours** |
| Phototransistors—characteristics. Photo conductive detectors—expression for photoconductive gain. Numerical problems. | | |
| **Module:13** | | **2 hours** |
| Solarcell—IVcharacteristics,efficiency, materials | | |
| **Module:14** | | **2 hours** |
| Organicphotovoltaicdiodes(OPVD)—fundamentalprocess,excitonabsorption,excitondissociation | | |
| **Module:15** | | **2 hours** |
| Chargetransport,chargecollection,characterisation.numerical problems | | |
| **TotalLecturehours** | | **30** |
| **TextBook(s)** | | |
| 1 | FibreOpticsCommunications,HaroldKolimbiris,PrenticeHall,(2004). | |
| 2 | OpticalFibreCommunications,KeiserG,McGrawHill,(2000). | |
|  | | |
| **ReferenceBooks** | | |
| 1 | FibreOpticCommunication,AgarwalDC,WheelerPublications,(1996). | |
| 2 | OpticalCommunication,KatiyarS,SKKatariaandSons, (2010). | |
| 3 | Optoelectronics andPhotonics:PrinciplesandPractices,KasapSO,Pearson,(2013). | |
|  | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | |
| 1 | <https://nptel.ac.in/courses/115/102/115102026/> | |
| 2 | [https://moodle.usth.edu.vn/course/view.php?id=362#section-1](https://moodle.usth.edu.vn/course/view.php?id=362&section-1) | |
| 3 | <https://www.classcentral.com/course/swayam-semiconductor-optoelectronics-10043> | |
| Coursedesigned by: **BoS-Physics CA** | | |

**VALUEADDED COURSE II**

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| **Valueadded course** | | | **NON– DESTRUCTIVE TESTING** | **L** | **T** | **P** | **C** | |
| **30** | **0** | **0** | **4** | |
| **Pre-requisite** | | | Students should be aware of some fundamental principles of non – destructive testing and thermography. | **Syllabus Version** | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | |
| Themain objectives ofthis courseareto:   * learn the fundamentals of NDT and its applications which will be used for solving problems inindustries to produce flawless components. * acquiretheknowledgeaboutdifferenttypesofNon-Destructivetestingmethodsandtoapplythose principles to identify defects in various products produced in industries. * studyand understand various Non-Destructive evaluations, testing methods, theories and theirindustrial applications. | | | | | | | | |
|  | | | | | | | | |
| **ExpectedCourseOutcomes:** | | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | | |
| 1 | | understandthemagnetictestingmethodsandinterpretationofresultsand applications. | | | | K2 | | |
| 2 | | understandtheapplicationofThermography,eddycurrenttestingmethod,ultrasonic and acoustic emission testing. | | | | K3 | | |
| 3 | | understand the instrumentation of various Radiography and testing techniques such as Fluoroscopy, Xerography, Computed Radiography and Computed Tomography. | | | | K5 | | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6**– Create | | | | | | | | |
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| **Module:1** | | | | **2 hours** | | | | |
| Introductionofmaterialstesting-Classificationofmaterialstests–Overviewofnon-destructivetesting methods. | | | | | | | | |
| **Module:2** | | | | **2hours** | | | | |
| VariousNDTmethods-selection ofNDTmethods-VisualInspection. | | | | | | | | |
| **Module:3** | | | | **2hours** | | | | |
|  | Introduction-principle-typesofvisualtesting-Experimentsusedinvisualinspection-Applications. | | | | | | |  |
| **Module:4** | | | | **2 hours** | | | | |
| LiquidPenetrantTesting–Principles-TestingProcess-penetrantmaterials–Developers. | | | | | | | | |
| **Module:5** | | | | **2 hours** | | | | |
| Penetranttestingmethods-Interpretationofresults- Applications. | | | | | | | | |
| **Module:6** | | | | **2 hours** | | | | |
| MagneticParticleTesting-Magnetictestingmethods-Interpretationandevaluationoftestindications.  -ApplicationofMagneticparticleInspection. | | | | | | | | |
| **Module:7** | | | | **2 hours** | | | | |
| Thermographyprinciples-Contactandnon-contactinspectionmethods-Techniquesforapplyingliquid crystals-Advantages and limitation. | | | | | | | | |

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| **Module:8** | | | | | | | **2 hours** | | | |
| Infraredradiationandinfrareddetectors-Generationofeddycurrents,Propertiesofeddycurrents | | | | | | | | | | |
| **Module:9** | | | | | | | **2 hours** | | | |
| Eddycurrentsensingelements,Probes,Instrumentation,Typesofarrangement,Applications, advantages, Limitations, Interpretation/Evaluation. | | | | | | | | | | |
| **Module:10** | | | | | | | **2 hours** | | | |
| Ultrasonicandacousticemissiontesting-Basicsofultrasonicwaves-Principle-Equipmentfor ultrasonic testing- Testing methods. | | | | | | | | | | |
| **Module:11** | | | | | | | **2 hours** | | | |
|  | Ultrasonictransducers- Modeofdisplays-Application. | | | | | | | | |  |
| **Module*:*12** | | | | | | | **2 hours** | | | |
|  | Introduction- Basic principle- Instrumentation ofacoustic emission testing- Modes- Fourchannel data acquisition- Applications. | | | | | | | | |  |
| **Module:13** | | | | | | | **2 hours** | | | |
| Radiographytesting-Principle-EquipmentofRadiographyTesting-filmandfilmlesstechniques-types and use of filters and screens. | | | | | | | | | | |
| **Module:14** | | | | | | | **2 hours** | | | |
| Characteristicsoffilms-graininess,density,speed,contrast-characteristiccurves-Radiographictechniques. | | | | | | | | | | |
| **Module:15** | | | | | | | **2 hours** | | | |
|  | Fluoroscopy-Xerography-ComputedRadiography-ComputedTomography. | | | | | | | | |  |
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| **TotalLecturehours** | | | | | | | **30** | | | |
| **TextBook(s)** | | | | | | | | | | |
| 1 | | PracticalNon-DestructiveTesting,BaldevRaj,T.Jayakumar,M.Thavasimuthu,NarosaPublishing House, (2014). | | | | | | | |  |
| 2 | | Non-DestructiveTestingTechniques,RaviPrakash,NewAgeInternationalPublishers,(2010). | | | | | | | |  |
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| **ReferenceBooks** | | | | | | | | | | |
| 1 | | HandbookofNon-destructiveevaluation, | Charles, J.Hellier, | | McGrawHill Professional,(2001). | | | |  | |
| 2 | | Introductionto Non-destructivetesting:atrainingguide, | | PaulE Mix, | | Wiley, | | 2nd Edition | | |
| NewJersey,(2005). | | | | | | | | |
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| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | | | | | | | | | |
| 1 | | https://nptel.ac.in/courses/113/106/113106070/ | | | | | | | | |
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| Coursedesigned by: **BoS-Physics CA** | | | | | | | | | | |

**VALUEADDED COURSE III**

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| **Valueadded course** | | **Biomedical instrumentation** | **L** | **T** | | **P** | **C** |
| **30** | **0** | | **0** | **4** |
| **Pre-requisite** | | Students are expected to have some basic knowledge in the field of physiology, operations and instruments used in medical field. | **Syllabus Version** | | **2023-24** | | |
| **Course Objectives:** | | | | | | | |
| Themain objectives ofthis courseareto:  understandtheworkingprinciplesofBiomedicalInstruments. find applications of various biomedical instruments.  imparttheknowledgeof electronicsonvariousbiomedicalinstruments. | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | |
| Onthesuccessful completionofthe course,studentwill beable to: | | | | | | | |
| 1 | studythesafetyinstrumentationagainstradiation,physiologicaleffectsduetocurrent passage and electrical accidents in the hospitals. | | | | | K1 | |
| 2 | analysethetheoryofBio-Telemetry,itsproblemsand uses. | | | | | K4 | |
| 3 | evaluatetheadvancesinbiomedicalinstrumentationsuchaslasersinmedicine, endoscope, CT scan, ultrasonic imaging, MRI and biofeedback instrumentation | | | | | K5 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | |
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| **Module:1** | | | **2 hours** | | | | |
| **PhysiologicalAssistDevices**:-Introduction–pacemakers–pacemakerbatteries. | | | | | | | |
| **Module:2** | | | **2 hours** | | | | |
| Artificialheartvalves– nerveandmuscle stimulators. | | | | | | | |
| **Module:3** | | | **2 hours** | | | | |
| Heartlungmachine–kidney machine. | | | | | | | |
| **Module:4** | | | **2 hours** | | | | |
| **Operationtheatre equipment:**Introduction–surgicaldiathermy –ventilators–anesthesiamachine. | | | | | | | |
| **Module:5** | | | **2 hours** | | | | |
| Cardiacoutputmeasurements–pulmonaryfunctionanalysers –gasanalysers. | | | | | | | |
| **Module:6** | | | **2 hours** | | | | |
| Bloodgas analysers– oxymeters –elements ofintensive care monitoring. | | | | | | | |
| **Module:7** | | | **2 hours** | | | | |
| **Bio-Telemetry:**Elementsofbio-telemetrysystem. | | | | | | | |
| **Module:8** | | | **2 hours** | | | | |
| Designofabio-telemetry system–radiotelemetry system. | | | | | | | |
| **Module:9** | | | **2 hours** | | | | |
| Problemsinimplanttelemetry–usesofbio-telemetry. | | | | | | | |

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| **Module:10** | | **2 hours** |
| **Safetyinstrumentation**Introduction–radiationsafety instrumentation. | | |
| **Module:11** | | **2 hours** |
| Physiologicaleffectsdue to50Hzcurrentpassage–electricalaccidents inhospitals. | | |
| **Module:12** | | **2 hours** |
| Devicestoprotectagainstelectricalhazards–hospitalarchitecture. | | |
| **Module:13** | | **2 hours** |
| **Advancesinbio-medicalinstrumentation:**Introduction–computersinmedicine–lasersinmedicine. | | |
| **Module:14** | | **2 hours** |
| Endoscopes–cryogenicsurgery– CTscan –ultrasonicimaging. | | |
| **Module:15** | | **2 hours** |
| MRI–biofeedback instrumentation– biomaterials. | | |
| **TotalLecturehours** | | **30** |
| **TextBook(s)** | | |
| 1 | Biomedicalinstrumentation,M.Arumugam,AnuradhaPublicatios,(2009). | |
| 2 | Introductiontobiomedicalelectronics,JosephDubovy,TataMcGrawHillCompany(1978). | |
|  | | |
| **ReferenceBooks** | | |
| 1 | Biomedical Instrumentation and Measurements, Leslie Cromwell, Fred J. Weibell And Erich A. Pfeiffer, Measurements Prentice Hall of India (1997). | |
| 2 | Handbookofbiomedicalinstruments,Khandpur. R.S,TataMcGraw HillCompany(2003). | |
|  | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | |
| 1 | https://nptel.ac.in/courses/108/105/108105101/ | |
| 2 | https://onlinecourses.nptel.ac.in/noc20\_ee41/preview | |
| 3 | https:/[/www.classcentral.com/course/bioengineering-20126](http://www.classcentral.com/course/bioengineering-20126) | |
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| Coursedesigned by: **BoS-Physics CA** | | |

**VALUEADDED COURSE IV**

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| **Valueadded course** | | **ModernDisplayDevicesandStorage Materials** | **L** | | **T** | | **P** | **C** |
| **30** | | **0** | | **0** | **4** |
| **Pre-requisite** | | Students are expected to know some basic concepts of display devices, its usage and about some storage materials. | **Syllabus Version** | | | **2023-24** | | |
| **Course Objectives:** | | | | | | | | |
| Themain objectives ofthis courseareto:  acquireknowledgeaboutdifferenttypesofelectronicdevicesandaboutsome storagematerials. understand the selection process which will be used in industries.  createvariouselectronic andoptoelectronicdevicesusingsuitablematerials. | | | | | | | | |
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| **ExpectedCourseOutcomes:** | | | | | | | | |
| Onthesuccessful completionofthecourse, studentwill beable to: | | | | | | | | |
| 1 | evaluate display performances which are necessary to appropriately select a LCD in clinical situations. | | | | | | K1 | |
| 2 | presentinformationinvisualortactileform. | | | | | | K2 | |
| 3 | applytheseconceptsforelectronicvisualdisplays. | | | | | | K4 | |
| **K1**-Remember;**K2** -Understand;**K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create | | | | | | | | |
|  | | | | | | | | |
| **Module:1** | | | | **2 hours** | | | | |
| **Selectionofmaterialsfordifferentdevices:**SelectionCriteria-OperatingParameters-Manufacturing Process-Functional Requirements-Cost consideration. | | | | | | | | |
| **Module:2** | | | | **2 hours** | | | | |
| EngineeringRequirements-TypesofMaterials-Examplesofselectioncriteria. | | | | | | | | |
| **Module:3** | | | | **2 hours** | | | | |
| **ModernEngineeringmaterials:**MetallicGlasses-Structure-Preparation-Properties-Applications. | | | | | | | | |
| **Module:4** | | | | **2 hours** | | | | |
| Shapememoryalloys-Introduction-StructuralChanges-GeneralCharacteristics-Characterization Techniques-Commercial SMAs-Applications. | | | | | | | | |
| **Module:5** | | | | **2 hours** | | | | |
| ICPackagingMaterials.Introduction-ICpacking-Packagetype-Package materials. | | | | | | | | |
| **Module:6** | | | | **2 hours** | | | | |
| **DisplayDevices:** Introduction-Electroluminescenceprocess-LED materials. | | | | | | | | |
| **Module:7** | | | | **2 hours** | | | | |
| FabricationofLED- Applications -Activeandpassivedisplay devices. | | | | | | | | |
| **Module:8** | | | | **2 hours** | | | | |
| Liquidcrystals-Types-Generalfeaturesofliquidcrystals-liquidcrystaldisplaysystems-TN-LED (twisted nematic liquid crystal display) - merits and Demerits**.** | | | | | | | | |

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| **Module:9** | | **2 hours** |
| **MagneticDataStorageDevices:**Basicsofmagneticmaterialsandtheirparameters-Memory concepts | | |
| **Module:10** | | **2 hours** |
| Magneticsurfacestorage devices-magneticDisc Memories | | |
| **Module:11** | | **2 hours** |
| Flexiblediscstoragesystems-Floppydisks-MagneticTapesand drives-MagneticBubble materials | | |
| **Module:12** | | **2 hours** |
| Rareearthgarnets-MagneticBubblememories- ChargeCoupledevices –Applications**.** | | |
| **Module:13** | | **2 hours** |
| **Optical Data Storage Devices:** Principle-Disc data storage- Structure and operating principle of CD- ROM. | | |
| **Module:14** | | **2 hours** |
| Magneto-opticalstorage system(recordingandreading)-Datastorageandretrievalmethods. | | |
| **Module:15** | | **2 hours** |
| Holographydatastorage-principle-storingandretrievingdigitaldata-ApplicationsofHolography. | | |
| **TotalLecturehours** | | **30** |
| **TextBook(s)** | | |
| 1 | Semiconductor Physics and Optoelectronics, V.Rajendran, J.Hemalatha, M.Stalin Mano Gibson, Vikas Publishing House PVT Ltd, (2003). | |
| 2 | ATextbookof MaterialScience,K.G.Aswani,S.Chand &Companyltd, (2001). | |
|  | | |
| **ReferenceBooks** | | |
| 1 | Materialscience,O.P.Khanna,DhanpatRaiPublications,(2004). | |
| 2 | SemiconductorPhysicsandOptoelectronics,M.Arumugam,Anuradha Agencies,(2003). | |
|  | | |
| **RelatedOnlineContents[MOOC,SWAYAM, NPTEL,Websitesetc.]** | | |
| 1 | https:/[/www.slideshare.net/mobile/thesaifeye/material-handling-storage-system](http://www.slideshare.net/mobile/thesaifeye/material-handling-storage-system) | |
| 2 | https:/[/www.slideshare.net/mobile/jerinmartin/display-devices-44886026](http://www.slideshare.net/mobile/jerinmartin/display-devices-44886026) | |
|  | | |
| Coursedesigned by: **BoS-Physics CA** | | |

Thedistributionofmarks forCIAand CEE theory (core/elective)subjectsisasgivenunder:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Paper** | **Maximum Marks** | **Marksfor** | | **Componentsfor CIA** | | |
| **CIA** | **CEE** | **Tests** | **Assignment** | **Seminar /Others\*** |
| Theory(Core/ Elective) | 50 | 20 | 30 | 10 | 05 | 05 |
| Theory(Core/ Elective) | 75 | 20 | 55 | 10 | 05 | 05 |
| Theory(Core/ Elective) | 100 | 25 | 75 | 15 | 05 | 05 |

\*Componentsfor‘others’mayincludethe following:

ClassParticipation,CaseStudiesPresentation,FieldWork,FieldSurvey,GroupDiscussion,TermPaper, Workshop / Conference Participation, Presentation of Papers in Conferences, Quiz, Report / Content Writing, etc.

* Thedistribution ofmarks forCIA andCEE for practical(core/elective) subjectsisas given under:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Paper** | **Maximum Marks** | **Marksfor** | | **ComponentsforCIA** | | |
| **CIA** | **CEE** | **Tests** | **ObservationNote** | **RecordNote** |
| Practical(Core/Elective) | 50 | 20 | 30 | 10 | 05 | 05 |
| Practical(Core/Elective) | 75 | 30 | 45 | 20 | 05 | 05 |
| Practical(Core/Elective) | 100 | 40 | 60 | 20 | 10 | 10 |

* Threetests(Test1,Test2andTest3)forcontinuousinternalassessmentforeachcore/elective/ supportive papers offered in a semester shall be conducted in the following manner:
* Test 1andTest2maybe theunit-basedtests
* Test 3maybethemodel test.
* 25%weightage toeachofTest1and2,and 50%weightagetoTest3
* It ismandatoryforeverystudenttoattendatleastonetestineverysubject.
* Theaverageoftwoorthreeassignmentsforcontinuousinternalassessmentforeachcore/electivepapers offered in a semester shall be taken as the marks for the assignment component.
* At least one seminar / one component in ‘others’ category shall be considered to arrive at the marks for seminar / others component.

# QUESTIONPAPER PATTERN

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

|  |  |  |  |
| --- | --- | --- | --- |
| **Maximum55Marks–wherever applicable** | | | |
| SectionA | Multiplechoicequestions withfour options | 10\*1=10 | 10questions – 2fromeach unit |
| SectionB | Shortanswerquestionsofeither/ortype | 5\*3=15 | 5questions – 1fromeach unit |
| SectionC | Essay-typequestionsofeither/ortype | 5\*6=30 | 5questions – 1fromeach unit |

|  |  |  |  |
| --- | --- | --- | --- |
| **Maximum75Marks–wherever applicable** | | | |
| SectionA | Multiplechoicequestions withfouroptions | 10\*1=10 | 10questions – 2fromeach unit |
| SectionB | Shortanswerquestionsofeither/ortype | 5\*5=25 | 5questions – 1fromeach unit |
| SectionC | Essay-typequestionsofeither/ortype | 5\*8=40 | 5questions – 1fromeach unit |

The General Awareness paper to have multiple-choice questions (with four options) to be evaluated by using OMR. For other courses in Part IV namely, Environmental Studies, Value Education – Human Rights,YogaforHumanExcellenceandWomen’sRightsthequestionpaperpatternshouldbe5outof

10.Eachquestioncarries 10marks.