**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)](http://kb.naanmudhalvan.in/Bharathiar_University_%28BU%29) | 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)](http://kb.naanmudhalvan.in/Bharathiar_University_%28BU%29) | 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-DigitalandMicroProcessor | - | - | 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 |
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|  | **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** |
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| **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 |
|  |
| **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.ofrectangularLaminaandTriangularlamina–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–VariationofS.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). |
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| **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–variationofspecificheatandatomicheatwithtemperature. |
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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’sconstantandcriticalconstants. |
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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. |
|  |
| **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 Opticsprovideabasicknowledgeonthebehavioroflightenergyandtheirpropagation 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–differenceinWavelengthbetweentwoneighboringspectrallines–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 |
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| **TotalLecturehours** | **60** |
| **TextBook(s)** |
| 1 | AText bookof Optics,Brijlal &Subramaniam,S.Chand Ltd. (2001) |
| 2 | ModernPhysics,RMurugesan,S.ChandPublishing, 18thEdition (2017) |
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| **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/> |
|  |
| 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.

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|  |
| **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. |
|  |
| **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,protestingdatausingstylesotemplates - reprinting worksheet creating charts - managing date - what if tables pate tables wraps, macros, linking worksheets. |
|  |
| **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. |
|  |
| **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 atomlearntheimpactofmagneticfieldsonspectra study the concept of photo electric cells |
|  |
| **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-massdefectandpackingfraction–polarizationofX–rays –scatteringofX-rays(Thomson’sformula). |
|  |
| **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. |
|  |
| **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. |
|  |
| **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. |
|  |
| **Unit:6** | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars– webinars |
|  |
| **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> |
|  |
| 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 |
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| **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) |
|  |
| **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 abilityapplytheequations forthesituation ofdifferentphysical problems.motivatethe students to applythemathematical principles ofin their day–to–day life. |
|  |
| **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 |
|  |
| **Unit:1** | **ClassicalMechanics –I** | **12--hours** |
| Constraints and Degrees of Freedom – Generalized coordinates – Generalized displacement –Velocity –Acceleration–Momentum–Force–PotentialEnergy–D’Alembert’sPrinciple–LagrangianequationfromD’Alembert’sprinciple–ApplicationofLagrange’sequationofmotiontoLinearHarmonic Oscillator, Simple Pendulum and Compound Pendulum. |
|  |
| **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. |
|  |
| **Unit:3** | **Special Functions** | **12 hours** |
| Definition–TheBetafunction–Gammafunction–EvaluationofBetafunction –OtherformsofBeta function–EvaluationofGammafunction–OtherformsofGammafunction–RelationbetweenBetaandGammafunctions – Problems. |
|  |
| **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–Curlof Conservativefield–SurfaceIntegral–VolumeIntegral (without problem)– Gauss’s Divergence theorem and it’s proof - Simple problems – Stoke’s theorem and its proof - Simple problems. |
|  |
| **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) |
|  |
| 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

# SEMESTERV

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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. |
|  |
| **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. |
|  |
| **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. |
|  |
| **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. |
|  |
| **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) |
|  |
| **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

# SEMESTERV

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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 |
|  |
| **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.) |
|  |
| **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 . |
|  |
| **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. |
|  |
| **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

# SEMESTERV

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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 |
|  |
| **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. |
|  |
| **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. |
|  |
| **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.fgeneratedinathermocoupletakingbothPeltiereffectandThomsoneffectinthemetals–Thermoelectricpower–ApplicationofthermodynamicstoThermocouple–Thermoelectric diagrams and their uses. |
|  |
| **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. |
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| **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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| **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++-Scoperesolutionoperators. |
|  |
| **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. |
|  |
| **Unit:3** | **Constructors** | **9 hours** |
| **Constructors:**Introduction–constructors–parameterizedconstructors–multipleconstructorsinaclass – constructors with default arguments – copy constructor-dynamic constructors. |
|  |
| **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 |
|  |
| **Unit:1** | **WavePropertiesof Matter** | **17 hours** |
| Introduction–deBrogliewavelength–Phasevelocity–ExpressionforPhasevelocity–Groupvelocity –Analyticaltreatment–Expressionforgroupvelocity–Relationbetweengroupvelocity(vg)andphasevelocity(vp)–VelocityofdeBrogliewave–(i)Phasevelocity(vp)–(ii)Groupvelocity(vg).Verification of de Broglie relation – Davisson and Germer’s experiments – G P Thomson’s experiment. |
|  |
| **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. |
|  |
| **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. |
|  |
| **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) |
|  |
| **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 |

**SEMESTERVI**

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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 |
|  |
| **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. |
|  |
| **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. |
|  |
| **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. |
|  |
| **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. |
|  |
| **Unit:6** | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars |
|  |
| **TotalLecturehours** | **90** |
| **TextBook(s)** |
| 1 | ModernPhysics,RMurugesan,S.ChandPublishing, 18thEdition(2017). |
| 2 | NuclearPhysics,DCTayal,PublisherHimalayaPublishingHouse (2009). |
|  |
| **ReferenceBooks** |
| 1 | ConceptofModernPhysics, ArthurBeiser, McGraw-Hill, (2007). |
| 2 | IntroductiontoModernPhysics,FK RichtmyerEtal,McGraw-Hill;6thedition (1969). |
|  |
| **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

# SEMESTERVI

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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 |
|  |
| **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-Inverseofamatrixby GaussJordonmethod – Eigenvalueof amatrix bypowermethod |
|  |
| **Unit:2** | **Interpolationandapproximation** | **18 hours** |
| Lagrangian Polynomials –Divideddifferences – Interpolatingwitha cubic spline – Newton’sforward and backward difference formulas |
|  |
| **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 |
|  |
| **Unit:4** | **Initialvalueproblemsforordinarydifferentialequations** | **18 hours** |
| Singlestepmethods: Taylorseries method – Euler and modified Eulermethods – Fourthorder Runge –Kuttamethodforsolvingfirstandsecondorderequations –Multistepmethods:Milne’sandAdam’s predictor and corrector methods |
|  |
| **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. |
|  |
| **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 |
|  |
| 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

# SEMESTERVI

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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
 |
|  |
| **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 |
|  |
| **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. |
|  |
| **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. |
|  |
| **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. |
|  |
| **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. |
|  |
| **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)
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| **ContemporaryIssues** | **4 hours** |
| Onlineworkshop,WebinarsonExperimentalElectronics |
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| **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. |
|  |
| **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 |
|  |
| **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.
 |
|  |
| **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 additionunderstandthe actionofflip flops.5.learnbasicprogrammingwithmicroprocessor 8085. |
|  |
| **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 |
|  |
| **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 |
| . |
| **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. |
|  |
| **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 anddistributedi.e.,fresh –pseudo staticram andautomatic refresh. |
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| **Unit:6** | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars –webinars |
|  |
| **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.
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| **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 |
|  |
| **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. |
|  |
| **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)–ClosedCycleOTECsystem–OpenCycleOTEC System. |
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| **Unit:6** | **ContemporaryIssues** | **2 hours** |
| Expertlectures,onlineseminars-webinars |
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| **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 |
|  |
| **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–itsretention, 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 |
|  |
| **Unit:3** | **ElectricPower** | **12 hours** |
| PrincipleofproductionofA.C.–AveragevalueofA.C.voltageorcurrent–R.M.S.valueofalternating voltageor current–power consumedinA.C.Circuits–kilowatthour–A.C.generator–ThreephaseA.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 |
|  |
| **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. |
|  |
| **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 |
|  |
| **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. |
|  |
| **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 |
|  |
| **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. |
|  |
| **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. |
|  |
| **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.
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|  |
| **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 |
|  |
| **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. |
|  |
| **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. |
|  |
| **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 fortheseparationofcolloids-Biologicalimportance ofcolloids–Gibb’sDonnanEquilibrium. |
|  |
| **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 |
|  |
| **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.
 |
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| **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 |
|  |
| **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. |  |
|  |
| **TotalLecturehours** | **30** |
| **TextBook(s)** |
| 1 | PracticalNon-DestructiveTesting,BaldevRaj,T.Jayakumar,M.Thavasimuthu,NarosaPublishing House, (2014). |  |
| 2 | Non-DestructiveTestingTechniques,RaviPrakash,NewAgeInternationalPublishers,(2010). |  |
|  |
| **ReferenceBooks** |
| 1 | HandbookofNon-destructiveevaluation, | Charles, J.Hellier, | McGrawHill Professional,(2001). |  |
| 2 | Introductionto Non-destructivetesting:atrainingguide, | PaulE Mix, | Wiley, | 2nd Edition |
| NewJersey,(2005).  |
|  |
| **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. |
|  |
| **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 |
|  |
| **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. |
|  |
| **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) |
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| 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.

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| --- |
| **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.