(CBCS BASED)

ORDINANCE, REGULATION & SYLLABUS
For
B.Sc. [PHYSICS]

Offered by

NEHRU GRAM BHARATI

(DEEMED TO BE UNIVERSITY),

KOTWA-JAMUNIPUR-DUBAWAL

PRAYAGRAJ-221505

UTTAR PRADESH

Session:
From 2019 – 2020

Syllabi of
B.Sc. Semester I,II,III,IV,V,VI
(A Six Semester Degree Course)
DEPARTMENTOFPHYSICS
(w.e.f.Session-2019-20)

No.	Code	Paper	Title	IA	ESE	Total Marks	Credits
Semester I							
1.	BOP 101	Paper I	Mechanics	10	40	50	2
2.	BOP 102	Paper II	Thermal Physics	10	40	50	2
3.	BOP 103	Paper III	Electrical Circuits	10	40	50	2
4.	BOP 104	Practical		10	40	50	2
			Total Credits			200	8
Semester II							
5.	BOP 201	Paper I	Elasticity and Fluid Mechanics	10	40	50	2
6.	BOP 202	Paper II	Conduction and Radiation of Heat	10	40	50	2
7.	BOP203	Paper III	Basic Semiconductor Electronics	10	40	50	2
8.	BOP 204	Practical		10	40	50	2
						200	8
Semester III							
9.	BOP 301	Paper I	Optics-1	10	40	50	2
10.	BOP 302	Paper II	Waves and Oscillation	10	40	50	2
11.	BOP 303	Paper III	Atomic Physics	10	40	50	2
12.	BOP 304	Practical		10	40	50	2
						200	8
Semester IV							
13.	BOP 401	Paper I	Optics-2	10	40	50	2
14.	BOP 402	Paper II	Electromagnetism	10	40	50	2
15.	BOP 403	Paper III	Nuclear Physics	10	40	50	2
16.	BOP 404	Practical		10	40	50	2
						200	8
Semester V							
17.	BOP 501	Paper I	Quantum Mechanics-1	10	40	50	2
18.	BOP 502	Paper II	Statistical Mechanics	10	40	50	2
19.	BOP 503	Paper III	Basic Digital Electronics	10	40	50	2
20.	BOP 504	Paper IV	Electromagnetic Theory	10	40	50	2
21.	BOP 505	Practical		20	80	100	4
						300	12
Semester VI							
22.	BOP 601	Paper I	Quantum Mechanics-2	10	40	50	2
23.	BOP 602	Paper II	Solid State Physics	10	40	50	2
24.	BOP 603	Paper III	Photonic Devices	10	40	50	2
25.	BOP 604	Paper IV	Laser, Holography and Optical Instruments	10	40	50	2
26.	BOP 605	Practical		20	80	100	4
						300	12

Semester- I
Semester-I, Paper-I:Mechanics
Unit-1.MathematicalBackground :
BackgroundofVectorCalculus,Conceptofline,surfaceandvolumeintegral,Physicalsignificance ofGradient, Divergenceand Curl.
Unit-2: SpecialTheory ofRelativity:
FrameofReference,InertialandNon-inertialframes,Galileantransformation,Galileaninvariance,Pseudoforces,Rotatingreferenceframe,Centrifugalforce,CoriolisForce.InertialandGravitationalmass,PrincipleofEquivalence.InferenceofMichelson-MorleyExperiments.Postulatesofspecialrelativity,Lorentztransformations,Lengthcontraction,Timedilation,Simultaneityinrelativitytheory,
Unit-3: Relativisticdynamics:
Additionofvelocities,Relativisticdynamics,Variationofmasswithvelocity,mass-energyrelation. Relativistic Dopplershift.
Unit-4.Mechanics ofRigidBodies:
Systemofparticles,Centre ofMass,Linearmomentum,Centre ofmassframe,Rotationalmotionintwoandthreedimensions,Angularmomentum,Momentofinertiatensor,Centralforces,Conservativeforces, Potentialenergy,Gravitationalpotentialandfieldduetoauniformsphericalshellandsolidsphere,ConservationLaws.
Unit-5.MotionUnderA CentralForce:
Two-particlecentralforceproblemreducedmass,labandCenterofmassco-ordinate systems, Motion in an inversesquarefield, Kepler's laws.

Reference Books:
1. *BerkeleyPhysicsCourse2/e,Vol1:MechanicsbyC.Kittel,W.D.Knight,M.A.Ruderman, C. A. Helmholz,B. J. Moyer (McGraw-Hill).*
2. *TheFeynmanLecturesonPhysics,Volume1byR.P.Feynman, R.B.Leightonand M. Sands(NarosaPublishingHouse)*
3. *IntroductiontoSpecialRelativity1/ebyR.Resnick(WileyIndiaPvtLtd)*
4. *Mechanics byJ. C.Uppadhyaya(RamPrasad&Sons)*
5. *Mechanics by D. S. Mathur (S. Chand&Company Ltd)*

Semester I, Paper-II:ThermalPhysics
Unit-1. Basic Concept:
Thermodynamicsystems,MacroscopicandMicroscopicvariables,ThermodynamicalState,ThermalEquilibrium,Zeroth LawofThermodynamicsandConcept of Temperature.HeatandWorkandtheirpath-dependence,Thermalprocesses,
Unit-2. First LawofThermodynamics:
Firstlawofthermodynamics and internalenergy, Joule's law,Applications of firstlaw.
Unit-3.Second LawofThermodynamics& Entropy:
Carnotcycle,CarnotEngineandRefrigerator,Reversibleandirreversibleprocesses,Carnot'sTheorem.Thermodynamicalscaleoftemperature,Clausius-Clapeyron'sequation,Specificheatofsaturatedvapour,Clausiustheorem,Clausiusinequality,
Unit-4. Entropy:
Entropy,Calculationofentropyinvariousprocesses,Entropyandunavailableenergy,Physicalsignificanceofentropy,SecondLawofthermodynamics**.**
Unit-5.ThermodynamicRelations:
Conditionsfor naturalchanges,ThermodynamicpotentialsandMaxwell'sequation,ApplicationsofMaxwell'sequations,Joule-Thomsoneffect,InversionTemperature.ThirdLawofThermodynamics.ChangeofPhase,Firstandsecondorder phase transitions,Ehrenfest's equations.

ReferenceBooks:
1. *Thermal Physics2/ebyC.Kittel,H.Kroemer (W.h. Freeman &Company).*
2. *FundamentalsofStatisticaland ThermalPhysicsbyF.Reif (WavelandPrInc)*
3. *HeatandThermodynamics(SIE)byM.W.Zemansky,Phillips,DittmanR.H.(TataMcgraw*

HillEducationPrivateLimited).
4. *Thermal PhysicsbyB. K.Agarwal(LokbharatiPrakashan).*
5. *ThermalPhysicsbyGarg,Ghose&Bansal(TataMcgrawHillEducationPrivateLimited).*
6. *Treatise on HeatbyM. N.Saha, B. N.Srivastava(UnknownPublisher)*
7. *Heat,ThermodynamicsandStatisticalPhysics12/ebyBrijLal,N.Subrahmanyam,*
   P. S. Hemne(S.ChandPublisher).

Semester 1, Paper-III:Electrical Circuits

Unit-I: Electrical Circuits

Circuitparameters,R,L&C.KirchoffsLawforaloopandjunction,Solutionsby determinantandmatrixmethods.ApplicationstoT,□□andbridgecircuits,NortonandThevenin'stheorems, Maximum powertransfer theorem.

Unit-II: Growth & decay of current

Differencebetweensteadystate&transients;Growth&decayofcurrentinaninductivecircuit,Charginganddischargingofacapacitorthrougharesistor,C$\underline{S}$andthroughaninductor and resistorin series.

Unit-III: Galvanometer

BallisticGalvanometer,andQ$\underline{S}$,Measurementof acapacityand ofa high resistancebyleakagemethod.

Unit-IV: A.C. Analysis

A.C.Analysis(Vectortreatmentonly):Compleximpedanceandphasornotations.Impedance&Admittance&Admittanceoperators,vectordiagramsforVoltageandCurrentinRL,CRandLCRinseries&parallel,Powerconsumedinthecircuit,Series andparallelresonance,Qofacoil,Transformer-itsequivalentcircuitand turn ratio.

Unit-V:A.C.Bridges

*A.C. Bridges:*BalanceandsensitivityconditionsforA.C.bridge,Measurementof LbyMaxwell's Bridge, Measurement ofC bySchering'sbridge.

ReferenceBooks:

1. *ElectronicDevicesAndCircuits(SIE)(Schaum'sOutlineSeries)byJ. J. Cathey(TataMcgraw HillEducationPrivateLimited).*
2. *Millman'sElectronicDevices and Circuits byJ.Millman(TataMgrawHill)*
3. *ElectronicDevicesand CircuitsTheory10/e by R. L. Boylestad,L. Nashelsky (Pearson).*
4. *EletricalCircuitsandIntroductoryElectronicsby Vinod Prakash(LokbharatiPrakashan).*
5. *BasicElectronicsandLinearCircuitsbyN.Bhargava,D.Kulshreshtha,S.Gupta(TataMcgrawHillEducationPrivateLimited).*
6. *Introductory CircuitAnalysis 12/ebyR. L.Boylestad(Pearson)*
7. *ElectronicDevicesandCircuits5/e byD. A. Bell(OxfordUniversityPress).*
8. *Electricity&Magnetism3/e by K.K.Tiwari(S.ChandPublisher).*

B.Sc. Semester–1: PracticalPhysics
List ofExperiments
(Mechanics,GeneralProperties of Matter)

1. **Flywheel**:TodeterminethemomentofInertia(□)ofafly-wheelabouttheaxisofrotation.
2. **CompoundPendulum**:Todeterminethevalueof'g'withthecompoundpendulumandtheradiusofgyration(k)ofthependulumaboutanaxispassingthroughthecentreofgravityand perpendicular toitslength./
   RectangularLamina:Todetermine:
   (i) Thevalueof'g'with arectangularlamina.
   (ii) TheMomentofInertia(□)andRadiusofGyration(k)ofarectangularlaminaaboutanaxispassingthroughthecentreofgravityandperpendiculartotheplaneofthelamina.
3. **SpiralSpring**:Todeterminetheforceperunitextension(K)andeffectivemass(m_e)of a spiral-spring(staticanddynamicmethod).
4. **Maxwell'sNeedle**:Todeterminethe rigidity modulusofthematerialintheformofawire byMaxwell'sneedle./
   Searle'sApparatus:TodetermineY,η andσ ofthematerialofagivenwirebySearle'sapparatus.
5. **SurfaceTension**:To determine the surfacetension(T) ofwater byJaeger'smethod.

6. **Yby bending**:To determinetheYoung'smodulus (Y) ofthe materialofthebeam.
7. **Viscosity**:Todeterminetheviscosityof aliquidbyPoiseuille'smethod.
8. **TorsionTable**:Todeterminethemodulusofrigidityofthematerialofthegivenwireand momentofinertiaof anirregular bodywiththehelp ofa torsiontable./ **StatisticalMethod**:Todeterminethemodulusofrigidityofthegivenmaterialintheformof a wire bystatisticalmethod.

Reference Books:

1. PracticalPhysicsby S. K.Kor, R. P. Khare&S. K.Jain (UnitedBookDepot,Allahabad)
2. PracticalPhysicsbyArora(S.ChandPublisher)

Semester- II
Semester II, Paper-I:Elasticity and Fluid Mechanics
Unit-1.Mechanics ofNon-RigidBodies
Strainandstressinanisotropichomogeneousmedium,Elasticmoduliandrelationsbetweenthem,Torsionofcylinders,
Unit-2.Bending of beams
Bendingofbeams,Internalenergyofastrainedbody.
Unit-3.Streamline flow:
Idealfluids,Equationofcontinuity,Streamlineflow,Rotationalandirrotationalflows,
Unit-4.Equations of motion:
Euler'sequationsofmotion,Bernoulli'stheorem,Viscousfluids
Unit-5.Poiseuillie's equation:
Poiseuillie'sequation, Viscositybyrotatingcylindermethod.
Reference Books:

1. BerkeleyPhysicsCourse2/e,Vol1:MechanicsbyC.Kittel,W.D.Knight,M.A.Ruderman, C. A. Helmholz,B. J. Moyer (McGraw-Hill).
2. TheFeynmanLecturesonPhysics,Volume1byR.P.Feynman, R.B.Leightonand M. Sands(NarosaPublishingHouse)
3. IntroductiontoSpecialRelativity1/ebyR.Resnick(WileyIndiaPvtLtd)
4. Mechanics byJ. C.Uppadhyaya(RamPrasad&Sons)
5. Mechanics by D. S. Mathur (S. Chand&Company Ltd)

Semester II, Paper-II:Conduction and Radiation of Heat
Unit-1.KineticTheoryofGases
MaxwellBoltzmanlawofdistributionofmolecularvelocities,Equationofr.m.s.velocityandaverageandmostprobablespeeds,Meanfree path, Transport phenomena.
Unit-2. Conduction ofHeat
Fourierequationforone-dimensionalflowofheatanditssteady-state solution, Periodic flow of heat (onlysinusoidal heatcurrent).
Unit-3.Emission and Absorption of Radiation
Radiationaselectromagneticwaves,EmissiveandAbsorptivepowers,Radiationinahollowenclosure,Black-bodyradiation,Kirchoff'sLaw,Intensityandenergydensity,Pressureandenergydensity,StefanBoltzmannlaw,
Unit-4. Solar Radiation
Solarconstantandtemperatureofsun,TemperatureofNon-blackbodies.
Unit-5. Radiation's Spectrum
Distributionofenergyinthespectrumofblackbodyradiation,Adiabaticexpansionofblack-bodyradiation,Wein'sdistributionlaw,Wein'sdisplacementlaw,Wein'sformula,Rayleigh-Jean'slaw,Planck'slaw.
ReferenceBooks:

1. Thermal Physics2/ebyC.Kittel,H.Kroemer (W.h. Freeman &Company).
2. FundamentalsofStatisticaland ThermalPhysicsbyF.Reif (WavelandPrInc)
3. HeatandThermodynamics(SIE)byM.W.Zemansky,Phillips,DittmanR.H.(TataMcgraw HillEducationPrivateLimited).
4. Thermal PhysicsbyB. K.Agarwal(LokbharatiPrakashan).
5. ThermalPhysicsbyGarg,Ghose&Bansal(TataMcgrawHillEducationPrivateLimited).

6. *Treatise on HeatbyM. N.Saha, B. N.Srivastava(UnknownPublisher)*
7. *Heat,ThermodynamicsandStatisticalPhysics12/ebyBrijLal,N.Subrahmanyam,*
   P. S. Hemne(S.ChandPublisher).

Semester II, Paper-III:Basic Semiconductor Electronics
Unit-1. Conduction in Solid
Conductor,InsulatorandSemiconductor,electronsandholesaschargecarriers,Intrinsicandextrinsic
semiconductorsConductivityandmobility,Conductionby diffusionanddrift.
Unit-2. P.N. Junctions
Built-in-
voltageandchargedepletionregion,Statementofdiodeequationanddiodecharacteristics,Forwardandreverseresistances,
Zenerdiode:itscharacteristics,Halfwave,FullwaveandBridgerectifiers,Ripplefactor,filteringbyRC,□□ andLCcircuit.R
egulation:voltageregulationusingZenerdiode,Photo-diode, Solarcell.
Unit-3.*BJT:*
  NPNandPNPtransistoraction,CharacteristicsinCB,CEandCCconfigurations.Hybrid,alphaandbetaparameters,theirin
  ter-
  relationship,Loadline,smallsignalhybridequivalentcircuit,CEamplifier,Midfrequencyresponse,Practicalamplifiercir
  cuit
Unit-4. Oscillators
Barkhausencriteriaforsustainedoscillations,Qualitativediscussionofcollectortunedoscillator,CircuitsofHartleyandCol
pittsoscillator,sweeposcillator.
Unit-5. Modulation and CRO
  *Modulation:*Needformodulation,threetypesofmodulation,Amplitudemodulation,Frequencyspectrumandpowerin
  A.M.wavetypicalA.M.circuit,Linear diodedetector.
*CRO:*Workingofcathoderaytube,blackdiagramofCRO,typicalapplications of CRO.
  ReferenceBooks:
1. *ElectronicDevicesAndCircuits(SIE)(Schaum'sOutlineSeries)byJ.   J.   Cathey(TataMcgraw
   HillEducationPrivateLimited).*
2. *Millman'sElectronicDevices and Circuits byJ.Millman(TataMgrawHill)*
3. *ElectronicDevicesand CircuitsTheory10/e by R. L. Boylestad,L. Nashelsky
   (Pearson).*
4. *EletricalCircuitsandIntroductoryElectronicsby Vinod Prakash(LokbharatiPrakashan).*
5. *BasicElectronicsandLinearCircuitsbyN.Bhargava,D.Kulshreshtha,S.Gupta(TataMcgrawHillEducationPr
   ivateLimited).*
6. *Introductory CircuitAnalysis 12/ebyR. L.Boylestad(Pearson)*
7. *ElectronicDevicesandCircuits5/e byD. A. Bell(OxfordUniversityPress).*
8. *Electricity&Magnetism3/e by K.K.Tiwari(S.ChandPublisher).*

B.Sc. Semester–2: PracticalPhysics
(Thermal, Electricity &Electronics)

1. **PN-JunctionDiode**:To draw thecharacteristiccurvesof a PNjunctiondiode.
2. **ZenerDiode:** Tostudythebreakdowncharacteristicofa Zenerdiode.
3. **P.O.Box:**(i)Tomeasureresistancesof bya Ammeter P. O.Box.
   (ii) To measureresistancesof voltmeter bya P. O.Box.
   (iii) To determineinternal resistanceof acellbyMance'sconstantdeflectionmethod.
   (iv) To measurethe galvanometerresistanceby Thomson'sconstantdeflectionmethod.
4. **EnergyMeter:**TocalibrateanelectricalenergymeterwiththehelpofaJoule'scalorimeter.
5. **Stefan-Boltzmannlaw:**To verifytheStefan-Boltzmann lawforradiation.
6. **KofRubber**:Todeterminethethermalconductivity(K)ofarubbergivenintheformof atube.
7. **KofCopper**:Todeterminethethermalconductivity(K)ofthegivenmaterialintheformof   a   rod
   bySearle'sapparatus.
8. Transistor Characteristics

Reference Books:
 3. PracticalPhysicsby S. K.Kor, R. P. Khare&S. K.Jain (UnitedBookDepot,Allahabad)
 4. PracticalPhysicsbyArora(S.ChandPublisher)

Semester- III
Semester III, Paper-I:Optics-1
 Unit-1.GeometricalOptics
Cardinalpointsofcoaxialopticalsystems.Simpleproblemoncombinationofthinlenses,eyepieces,Aplanticpoints.Natur
eoflight,
 Unit-2.ElementaryIdeaofEMWave
Elementaryideasofelectromagneticwaveandphotontheoriesoflight.Complexrepresentationofwavesand   its
application (to be usedin thetheoryof various phenomenon).
 Unit 3. Interference
Conditionsforobservinginterference,Degreeofcoherenceandvisibilityoffringes.Productionofinterferencefringesandd
eterminationof wavelength,Michelsoninterferometeranditsuses,Color of thinfilms,
Unit 4. Newton's Rings
Newton'sRings,Theoryofmultiple reflections,F.P.Etalon.
 Unit-5.Laser
TemporalandSpatialCoherence.MichelsonStellar   interferometer.Stimulatedemission,Basicideasabout
laseremission,Rubyand He-Nelasers as examples.

 ReferenceBooks:
   1. FundamentalsofOptics4/e byF. A. JenkinsandF. E. White(McGraw-HillInternationalEditions).
   2. Geometrical&PhysicalOptics by R. S. Longhurst(PrenticHallPress).
   3. Optics4/e by A.Ghatak(TataMgrawHill).
   4. GeometricalandPhysicalOpticsbyB.K.MathurandT.P.Pandya(NewGopalPrintingPress).
   5. Optics(Schaum'sOutlineSeries)byE.Hhecht(TataMcgrawHillEducationPrivateLimited).
   *6. ATextbookofOptics4/ebyM.NAvadhanulu,NSubrahmanyam,BrijLal(S.Chand
      &Company Ltd)*

Semester III, Paper-II: Waves and Oscillation
Unit-1.Oscillations
SimpleHarmonicMotion,DampedMotion,SteadyForcedOscillations.Resonance.
Unit-2. Fourier Series
FourierSeriesDecomposition.Simplecasesofsquare,Saw-toothandRectified Sinusoidal Waves.
Unit-3. Ultrasonics
Generationanddetection.MeasurementofvelocityinLiquids,Applications.
Unit-4. One-dimensionalWave-motion in non-dispersivemedia
WaveEquation,ProgressiveWavesolution,ParticleVelocityandWaveVelocity.EquationsforWaveinfluidsandonStrings
.SpecificAcousticImpedanceoffluidsandCharacteristicImpedanceofstrings.Energydensity.IntensityofEnergyTransfer
.
Unit 5. Propagation of Plane Waves
Reflectionandtransmissionofplanewavesatadiscontinuity,StandingWaveSolutions. Modesof Natural Oscillations.
EnergyConsiderations.

 ReferenceBooks:
   1. PhysicsofVibrationand Waves6/eby H. J. Pain(WileyIndiaPvtLtd).
   *2. TheFeynmanLecturesonPhysics,Volume2byR.P.Feynman, R.B.Leightonand
      M. Sands(NarosaPublishingHouse).*
   3. PhysicsofOscillations andWaves by R. B.Singh(United Book Depot,Allahabad).
   4. ATextBookOscillations,Waves&AcousticsbyM.M.Ghosh,D.Bhattacharya(S.ChandPublisher).

Semester III, Paper-III: Atomic Physics
 Unit-1: Spectra of hydrogen atom
 Bohr-
Summerfield Model(Historicaldevelopments),Bohrmodelandthespectraofhydrogenicatoms,criticalresonanceandthei

onizationpotential.Frank-Hertzexperiment.

Unit-2: X-rays

CharacteristicandcontinuousX-rays.Moseley'slaw, Bragg'sLaw.

Unit-3: Basic Atomic Physics

SpaceQuantization,Magneticmomentoftheelectronsandmagneton,LarmorPrecession,ElectronSpin,Stern-Gerlachexperiment,Quantativeconceptofvariousquantumnumbersofanelectron,Pauli'sexclusionprincipleandelectronicconfigurations of atoms.

Unit-4: MegneticProperties ofMaterials

Diamagnetism,Larmor'stheoryanddiamagneticsusceptibility.Paramagentism,Langvin'stheoryandCurieWeissLaw.QualitativediscussionofFerromagnetism and anti-ferromagnetism.

Unit-5: QuantumConcepts

ParticlenatureofradiationPhotoelectriceffectandComptoneffect.Wavenatureofparticles.De-BroglieWaves,Davisson-Germerexperiment,WavePackets,Phasevelocityandgroupvelocity,Heisenberg'sUncertaintyPrincipleandapplications,One dimensionalSchrodinger'sWaveEquationandconceptofprobabilities,amplitude,applicationtoone-dimensionalpotentialstepandbarrier,QuantumMechanicalTunneling.

ReferenceBooks:

1. *ConceptofModernPhysics6/e(SIE)byA.Beiser,S.Mahajan,S.RaiChoudhury(TataMcgrawHillEducationPrivateLimited).*
2. *Atomicand NuclearPhysics-AnIntroduction byT. A.Littlefield(LittlefieldPress).*
3. *Introduction toElementaryParticles2/eby D. Griffiths(Wiley-vchVerlagGmbh).*
4. *ModernPhysics by R.Murugeshan,KiruthigaSivaprasath(S.ChandPublisher).*
5. *NuclearPhysics by D.C.Tayal(VarietyBookDepot).*

B.Sc. Semester–III: Practical Physics

List ofExperiments

(Electricity)

1. **SelfInductance(byBG):**Todeterminetheself–inductanceofagivencoilbyRayleigh'smethodusingpost-office box.
2. **MutualInductance(byBG):**Todeterminethemutualinductanceofagivenpairofcoilsusinga ballisticgalvanometer.
3. **Capacityofcondenser(byBG):**Todeterminethecapacityofcondenserusingaballisticgalvanometer.
4. **HighResistancebyleakagemethod(byBG):**Todeterminethehighresistancebythe methodofleakage ofcondenser.
5. **Search Coil (byBG):**To determine fieldofan electromagnetwitha searchcoil.
6. **EarthInductor(byBG):**Todeterminethevalueofhorizontal(H)andvertical(V)componentsoftheearth'smagneticfieldandtheangle ofdip($\square$) byan earthinductor.
7. **Maxwell'sBridge**:Tomeasuremutualinductanceofa pair of coilswith a Maxwell'sbridge.
8. **ScheringBridge**:Withthehelp ofScheringbridge:
   a) To measurethecapacityandpowerfactorofthe givencondenser.
   b) To verifythelawsofseriesand parallelarrangementofcapacities.
9. **A.C.Frequency:** To determine the frequency(f)ofAC mains bysonometer.
10. **IonizationPotential**:
    (i) To drawthefiringvoltage Vs gridvoltagecurveforthethyratron.
    (ii) To observe thebreakdown of Child-Langmuir'slaw, usingthyratronas adiode.
    (iii) Toobservetheriseofplatecurrentwithpositivegridbiasgreaterthantheionizationpotential(applyingnegativeplatevoltage).

Semester IV
Semester IV, Paper-I:Optics-2
Unit-1. Fresnel's diffraction
Fresnel'stheoryofdiffraction,Half-

Periodelements.Diffractionfromcircularobstacleandaperture(Elementarytheory),Zoneplate,Cornu'sSpiral,Fresneldiffractionbystraightedgeandsingle slit.

Unit-2. Fraunhofer's diffraction
Fraunhofer'sdiffractionbysingleslitanddoubleslit,

Unit-3. Grating
Theoryofplanegrating,Widthofprincipalmaxima,Rayleigh'scriterionofresolution,Resolvingpowerofprism,gratingandFPetalon.Limitofresolution for telescope.Concavegrating(elementarytheory)and its mountings.

Unit-4.Polarization
Unpolarised,polarizedandpartiallypolarizedlights.Polarisationbyreflection,Doublerefractionbyuni-axialcrystals,Polaroids,Huygen'stheoryofdoublerefraction.Halfandquarterwaveplates.

Unit-5.Analysis of Polarized Light
Productionofellipticallypolarizedlight.Babinetcompensator,Analysisofellipticallypolarizedlightusingа Nicolandaquarterwaveplate,andbyusingBaninetcompensator.Opticalactivity.Fresnel'stheoryofopticalrotation,Specificrotation.BiquatzandLaurent'shalfshadepolarimeters.

ReferenceBooks:

1. *FundamentalsofOptics4/e byF. A. JenkinsandF. E. White(McGraw-HillInternationalEditions).*
2. *Geometrical&PhysicalOptics by R. S. Longhurst(PrenticHallPress).*
3. *Optics4/e by A.Ghatak(TataMgrawHill).*
4. *GeometricalandPhysicalOpticsbyB.K.MathurandT.P.Pandya(NewGopalPrintingPress).*
5. *Optics(Schaum'sOutlineSeries)byE.Hhecht(TataMcgrawHillEducationPrivateLimited).*
6. *ATextbookofOptics4/ebyM.NAvadhanulu,NSubrahmanyam,BrijLal(S.Chand &Company Ltd)*

Semester IV, Paper-II: Electromagnetism

Unit-1: Electrostatics in Free Space
CoulombLaw,ElectricField.Simplecaseofchargedistributions.GaussFluxLaw(IntegralandDifferentialforms).ElectricDipoleinElectrostaticField.IrrotationalNature of ElectricPotential.SimpleCasesofChargeDistributions.

Unit-2: Electrostatics in Dielectrics
Polarization,
PolarizationCharges.DisplacementVectorD.GaussFluxLaw(IntegralandDifferentialforms)andsimpleApplications.EnergyofChargeDistribution.EnergyasanintegralovertheField.SimpleProblems(ParallelPlateCondenser,Uniformlychargedsphericalsurfaceandvolume).

Unit-3: Electric Current
CurrentDensityVector.EquationofContinuity,OhmandJoule's Laws(Integraland differentialforms).

Unit-4: Magnetostatics
Ampere'sLaw,Biot-Savart'sLaw,LawofforceinMagneticFieldonCurrentsandchargedparticles.MagneticFieldduetoastraightinfinitewire.MagneticFieldduetocircularloopandsolenoidataxialpoints.VectorpotentialanditsevaluationforuniformMagneticFieldduetoaLoopofCurrent.MagneticMoment.MagneticMaterialsandMagnetization.MagnetizationCurrentdensityJ,Magnetic Field**H**, Curl of**H** andCalculation of **H**.

Unit-5. Time Varying Fields& ElectromagneticWaves inFree-Space
*TimeVaryingFields:*DisplacementCurrent,Curl**H**Faraday'sLaw(IntegralandDifferentiaforms).SelfandMutualInductances.EnergyofCoupledCircuitsandcurrentdistribution.M□□L$_1$L$_2$.Energy
asanintegralovertheMagneticField.EnergyofSolenoid.
*ElectromagneticWavesinFree-Space:*MaxwellEquations,PlanepolarizedPlaneWavesolution.Characteristics   of these Electromagnetic waves.

ReferenceBooks:

1. *Introduction toElectrodynamics3/eby D. J. Griffiths(PhiLearning).*
2. *BerkeleyPhysicsCourse,Vol 2: ElectricityandMagnetismby E. M. Purcell(McGraw-Hill).*
3. *Electromagneticsby B. B.Laud (NewAgeInternationalPvt.Ltd.New Delhi).*

Semester IV, Paper-III:NuclearPhysics

Unit-1. Radioactivity
Natural radioactivity, Laws of radioactive disintegration, radioactive series,

Unit-2. Counters
Detection of radiation, GM Counter and Bubble Chamber, Scintillation Counter.

Unit-3. Nuclear reactions and decay
Kinematics of nuclear reactions, artificial nuclear transmutation, discovery of neutron, radioactive tracers, transuranic elements. Cyclotron. Constitution of nucleus, Binding energy, liquid drop model and the semiempirical mass formula, Elementary theory of

□-decay, □-decay and discovery of neutrino.

Unit-4. Magic numbers
Magic numbers and the shell model, exchange forces in nuclei and Yukawa theory (qualitative), Fission and fusion, Nuclear reactors (qualitative), Thermonuclear energy.

Unit-5. Elementary Particles
Classification of Elementary Particles, Leptons, Mesons and Baryons and their quantum numbers, Conservation Laws.

ReferenceBooks:
1. *Concept of Modern Physics 6/e (SIE) by A. Beiser, S. Mahajan, S. Rai Choudhury (Tata Mcgraw Hill Education Private Limited).*
2. *Atomic and Nuclear Physics-An Introduction by T. A. Littlefield (Littlefield Press).*
3. *Introduction to Elementary Particles 2/e by D. Griffiths (Wiley-vch Verlag Gmbh).*
4. *Modern Physics by R. Murugeshan, Kiruthiga Sivaprasath (S. Chand Publisher).*
5. *Nuclear Physics by D. C. Tayal (Variety Book Depot).*

B.Sc. Semester–IV: Practical Physics
List of Experiments
(OPTICS)

1. **Nodal Slides:** To locate the cardinal points of an optical system with the help of a nodal slide and hence to determine the focal length of the system.
2. **Sextant:** With the help of a sextant to determine the following
   (i) Variation of Zero-Error of the sextant with distance.
   (ii) Height of the tower.
   (iii) Horizontal distance between two objects or points.
3. **Dispersive Power of the Prism:** To determine the refractive index (μ) of the material of the prism for a given wavelengths and dispersive power (□) of the materials of the prism with a spectrometer.
4. **Newton's Rings:** To determine the wavelength (□) of sodium light by Newton's ring method.
5. **Fresnel's Bi-prism:** To determine the wavelength of sodium light with Fresnel's Bi-prism.
6. **Single Slit Diffraction:** To determine the width of an arrow slit (□) by observing the diffraction bands.
7. **Plane Transmission Grating:** To determine the wavelength (□) of different spectral lines emitted by light source with a plane transmission grating.
8. **Brewster's Law:** To measure the angle of polarization for glass and to measure the refractive index using Brewster's law.
9. **Polarimeter:** To determine the specific rotation (□) of an optically active substance (cane sugar solution) with the help of a polarimeter.

Reference Books:
1. *Practical Physics by S. K. Kor, R. P. Khare & S. K. Jain (United Book Depot, Allahabad).*
2. *Practical Physics by Arora (S. Chand Publisher).*

Semester V
Semester V, Paper-I: Quantum Mechanics-1
Unit-1. Quantum Theory & Schrödinger's Wave Mechanics
Need of Quantum Mechanics, Schrödinger Equation and interpretation of wave function.
Unit-2. Operators

ObservablesandOperators,Hermitian,operator,Parityoperator,commutationrelations.Eigenvaluesandeigenfunctions orthonormalityandcompleteness.DiracDelta function. Measurementinquantummechanics,Non-Commutability

Unit-3. Uncertainty Principle
Uncertainty Principle,Expectationvalues,Ehrenfest'sTheorem.

Unit-4. Time-DependentSchrödinger equation
SeparationofvariablesinTime-DependentSchrödingerequation.Densityofstates,One-dimensionalPotentialBarrierproblems.Tunnelingthroughsquirewellpotential.

Unit-5. Harmonic Oscillator Problem
One-dimensionalHarmonicOscillator,HermitePolynomials,Zero-pointenergy, Correspondencewith Classical theory.

ReferenceBooks:
1. *Introduction toQuantum Mechanics2/eby D. J. Griffiths(Pearson).*
2. *QuantumMechanics:ConceptsandApplications2/ebyN.Zettili(JohnWiley&Sons).*
3. *Quantum Mechanics byJ.L. Powell, B. Crasemann(NarosaPublishingHouse).*
4. *Quantum Mechanics3/e byL. Schiff(TataMcgraw HillEducationPrivateLimited).*
5. *Introduction toQuantum Mechanicsby A. Ghatak(MacmillanPublishersIndia).*
6. *Quantum Mechanicsby H.Prakashand B. K.Agarwal(PhiLearning).*
7. *ModernQuantum Mechanics,2/e byJ.J. Sakurai(PearsonEducationIndia).*

Semester V, Paper-II:StatisticalMechanics
Unit-1. Basic Concept of StatisticalMechanics
ElementaryconceptsofLagrangianandHamiltonian,HamiltonequationsofMotion,MicroscopicandMacroscopicsystems,Phasespacerepresentation,Divisionofphasespaceintocells,Liouvilletheoremanditsconsequences,

Unit-2: ensembles
Statisticalensembles,Equilibriumandfluctuations,Distributionprobability,Equilibriumbetween two macroscopic systems inthermal diffusive andmechanicalcontacts,

Unit-3: Statistical Mechanics-I
Postulatesofquantumstatisticalmechanics,Entropyandprobability,Entropyofaperfectgasusingtheconceptofmicrocanonicalensemble,GibbsParadox,Partitionfunctions,Thermodynamicalfunctions,

Unit-3: Statistical Mechanics-II
Calculationsofentropyofperfectmonoatomicgasusingcanonicalandgrandcanonicalensemble.PrincipleofEquipartitionoftheenergy,Maxwell'svelocitydistribution,

Unit-5. Bose–EinsteinandFermi-Dirac Distribution
Distributionfunctionfortwotypesofquantumstatistics(Bose–EinsteinandFermi-Dirac):Simpleapplications(Black – bodyradiations,andElectronic specific heat).

ReferenceBooks:
1. *BerkeleyPhysicsCourse,Vol5:StatisticalPhysics byF. Rief(McGraw-Hill).*
2. *Elementary StatisticalPhysicsby C. Kittel(Dover).*
3. *FundamentalsofStatisticalMechanicsby B. B. Laud (NewAge InternationalPublishersLtd.-NewDelhi).*
4. *StatisticalPhysicsby Hermann(SpringerIndia).*
5. *StatisticalMechanics2/e by B. K.Agarwal(NewAgeInternational(p)Limited).*
6. *Introduction toSolidState Physics7/eby C. Kittel(WileyIndiaPvtLtd).*
7. *SolidStatePhysics by A.J.Dekker(MacmillanIndiaLimited).*
8. *SolidStatePhysics6/eby S.O.Pillai(NewAgeInternational(p)Limited)*

Semester V, Paper-III:BasicDigitalElectronics

Unit-1. RTL, DTL & TTL
Thediode-transistorgate,fanout,I/Ocharacteristics.Thetransistor-transistorlogic,caparisonbetweenTTLandDTL.Theactivepull-up,I/Ocharacteristics.TheResistance-transistorlogic,RTL-ORgates,pull-upresistors,fanout.I/Ocharacteristics, noise margin, rise time,RTL, Ex.-OR gate.
Unit-2:Basic Logic Gates

AND,OR,NOR,NOT,NANDandEx-ORoperation.Truthtables,theirrepresentations,
Unit 3. Booleanalgebra
Venndiagrams.BinaryNotation,Booleanalgebra,
Unit 4. Karnaughmapping
Karnaughmapping., Min and Max terms
Unit-5. Combinational logic circuits
Half-Adder,Full-Adder,ParallelandSeriesaddition.Halfandfullsubtractor.BCD adder.

ReferenceBooks:
1. *DigitalIntegratedElectronicsby H.Tauband D.Schilling(McGraw-HillInternationalEditions).*
2. *Millman'sIntegratedElectronics:Analog&DigitalCircuits&Systems2/ebyJ.Millman,C.Halkias,C.D. Parikh(TataMcgraw HillEducationPrivateLimited).*
3. *DigitalLogicAndComputerDesignbyM.M.Mano(Prentice-HallofIndiaPvt.Ltd.).*
4. *ElectronicDevicesandCircuits:AnIntroduction by A.Mottershead(PHILearning)*
5. *Millman'sElectronicDevices and CircuitsbyJ.Millman(TataMgrawHill)*
6. *ElectronicFundamentalsandApplications:Integrated andDiscreteSystems5/ebyJ. D. Ryder (PhiLearning).*
7. *ElectronicDevicesandCircuitsTheory10/eby R. L. Boylestad,L. Nashelsky(Pearson).*
8. *PhysicsofSemiconductorDevices2/eby S.M. Sze(Wiley).*
9. *PhysicsofPhotonicDevices 2/eby S. L.Chuang(JohnWiley&Sons).*
10. *ModernDigitalElectronics4/ebyR.P.Jain(TataMcgrawHillEducationPrivateLimited).*
11. *BasicElectronicsandLinearCircuitsbyN.Bhargava,D.Kulshreshtha,S.Gupta(TataMcgrawHillEducationPrivateLimited).*

Semester V, Paper-IV: Electromagnetic Theory
Unit-I: Electrostatics
Electrostatic potential due to a charge distribution, Multipoles and their interaction with electrostatic field, Solution of Lapalce equation by separation of variables in Cartesian Spherical and Polar Coordinates.
Unit-II: Electromagnetic Energy
Poynting's Theorem, Conservation of energy and momentum for a system of charged particles and electromagnetic fields, Maxwell's stress tensor.
Unit-III: Solution of Electromagnetic Wave
Plane wave solution of Maxwell's equations in source free space and simple dielectrics.
Unit-IV: Electromagnetic Dispersion
Polarization of electromagnetic waves. Plane wave propagation in metal and plasma. Elementary theory of dispersion.
Unit-V: Boundary condition
Boundary condition at a discontinuity, Fresnel's formula. Total internal reflection, Metallic reflection and skin depth.

Reference Books:
1. Electromagnetic Wave and Radiating Systems 2/e by E. C Jordan, K. G Balmain (PHI Learning).
2. Introduction to Electrodynamics 3/e by D. J. Griffiths (Phi Learning).
3. Berkeley Physics Course, Vol 2: Electricity and Magnetism by E. M. Purcell (McGraw-Hill).
4. Electromagnetics by B. B. Laud (New Age International (p) Ltd N Delhi).

Semester V:PracticalPhysics
List ofExperiments
- (Optics)
1. **Spectrometer:**Refractiveindexofwaterandofprismmaterialby(a)Totalinternalreflection(b)grazingincidencemethods.
2. **MichelsonInterferometer:**Determinationofwavelengthandseparationofwavelength ofsodiumlightbyMichelsonInterferometer.
3. **Ultrasonic:**Determinationofvelocityofultrasonicinkeroseneoilbydiffractionmethod.
4. **BabinetCompensator:**Todetermine(1)phasedifferenceintwoorthogonalplanepolarizedcomponents,(2)Ori

entationandratioofaxisofellipticallypolarizedlightby(a)□,□□method(b)directmethod.
5. **Carnuesfringe:**TodeterminetheYoung'smodulusofarectangularglass-platebyCarnuesfringemethod.
6. **Thicknessofmicasheet:**TodeterminethethicknessofmicasheetusingFresnel'sBi-Prism.
7. **PlaneReflectionGrating:**Todeterminewavelengthoflaserlightusingplanereflectiongrating(inchscale&cmscale).
8. **RefractiveIndexGradient:**Gradientofrefractiveindexinamixtureoftwoliquids,to find,
   (a) DifferenceBetweenrefractiveindecesoftwoliquids
   (b) variationofrefractiveindex andrefractiveindexgradientwithheight.
   (c) maximum(dN/dy)and
   (d) widthoftransitionregion athalfmaximum.
9. **FraunhofferDiffraction:**FraunhofferDiffractionatdoubleslit.
   (a) Plottingtheintensityvariation indiffractionpattern.
   (b) Todeterminethe wavelength of He-Ne/Diodelaser.
   (c) Findingtheratioofmaximumintensityand observationof missingorder.

Reference Book:
1. AdvancedPracticalPhysicsbyH.B.Lal,U.S.Pandey&R.B.Singh(UnitedBookDepot,Allahabad).

Semester VI
Semester VI, Paper-I:Quantum Mechanics-2
Unit-1. : Angular Momentum& H-Atom Problem

AngularMomentum,CommutationRelations.EigenValuesandEigenfunctions ofL^2,Lzand ladder (L+L-)operators.
Unit-2. H-Atom Problem
Sphericallysymmetricpotentials,CompletesolutionsoftheHydrogen-AtomProblem,Hydrogen Spectrum.
Unit-3.Time-IndependentPerturbationTheory
Time-independent,non-degenerate,first-
orderPerturbationTheory,SpinOrbitcoupling.Groundandexcitedstatesofheliumatomandexchangedegeneracy.Qualitativeand elementaryidea aboutLamb shift.
Unit-4: Spin
Elementaryconceptofspin,PauliMatricesandspinwavefunctions.Totalangularmomentum
Unit-5: IdenticalParticles.
   IdenticalParticles,SymmetricandAnti-symmetricwavefunction,Pauli'sExclusion Principle.

ReferenceBooks:
   1. Introduction toQuantum Mechanics2/eby D. J. Griffiths(Pearson).
   2. QuantumMechanics:ConceptsandApplications2/ebyN.Zettili(JohnWiley&Sons).
   3. Quantum Mechanics byJ.L. Powell, B. Crasemann(NarosaPublishingHouse).
   4. Quantum Mechanics3/e byL. Schiff(TataMcgraw HillEducationPrivateLimited).
   5. Introduction toQuantum Mechanicsby A. Ghatak(MacmillanPublishersIndia).
   6. Quantum Mechanicsby H.Prakashand B. K.Agarwal(PhiLearning).
   7. ModernQuantum Mechanics,2/e byJ.J. Sakurai(PearsonEducationIndia).

Semester VI, Paper-II: Solid StatePhysics

Unit-1:Basics of Solid State Physics
Crystalline,amorphousandglassystateofsolids,Latticestranslationvector,Crystallattices,Primitivelatticecell,Millerindices, interplanerspacing,Bravaislattices,Crystal structures of s.c.,b.c.c.,f.c.c.,diamond and h.c.p.
Unit 2. ReciprocalLattice:
s.c.,b.c.c.andf.c.c.lattices,BrillouinDiffractionconditions in reciprocal lattice, Bragg's law.
Unit-3: Interatomicforces andclassificationofsolids
Inertgassolids,VanderWaals-
Londoninteraction,Repulsiveinteractionandequilibriumlatticeconstant,CompressibilityandBulkmodulus,Latticeenergyofioniccrystals.Madelungconstant,Cohesiveenergy,GeneralizedHooke'slaw,Elasticconstantofcubiccrystals,Vibrationsofmonatomiclinearchain,Dispersionrelation,densityofmodes,GroupVelocity,VibrationalSpectrumoflatticewithtwoatomsperprimitivecell,acousticandopticalmodes.Latticespecificheat,EinsteinandDebye models.

Unit-4:Free electrontheory
Freeelectrongasinonedimension,Energylevelsanddensityofstates,FermiEnergy,Electricalconductivity,Pauliparamag
netism,Halleffect.
Unit-5:Band theory ofsolids
EnergyBands;Kronig-
Pennymodelinonedimension,Energygap,Numberofstateinabranch,Distinctionbetweenmetal,Semi-
conductorandinsulator.Intrinsicsemiconductors.VariationofFermilevelwittemperature,Effective mass.

ReferenceBooks:
1. *BerkeleyPhysicsCourse,Vol5:StatisticalPhysics byF. Rief(McGraw-Hill).*
2. *Elementary StatisticalPhysicsby C. Kittel(Dover).*
3. *FundamentalsofStatisticalMechanicsby B. B. Laud (NewAge InternationalPublishersLtd.-NewDelhi).*
4. *StatisticalPhysicsby Hermann(SpringerIndia).*
5. *StatisticalMechanics2/e by B. K.Agarwal(NewAgeInternational(p)Limited).*

Semester VI, Paper-III: PhotonicDevices
Unit-1.: Diode& BJT
Reviewofcharacteristicsofasemiconductordiode:cutin voltage,explanation of storage and transitioncapacitances.
BJTasaswitch,AnalyticexpressionusingEbers-Mollmodel,saturationpropertiesfornormal,   inverse
andemitterfollowermodeandtheircomparisons.Switchingspeedofdiode,storageandtransitiontime,switchingspeedofa
BJT.Metal-semiconductor junction, Schottkydiode andtransistor.
Unit-2:FET
Fieldeffecttransistor,principleofoperation,apracticalFETstructure,
Unit-3:MOSFET
MOSFET,enhancementanddepletionmodes, their representations. TheMOS switch.
Unit-4:Integrated Circuits
Varioustechniquesoffabrication,LSIandMSI,metalsemi-conductorcontact.
Unit-5:PhotonicDevices
*PhotonicDevices:*Photoelectriceffectinsemiconductors,photoresistersandphotoconductor,visiblelightemittingdiodes
anddisplays,Photodiode,Phototransistor,PN-Junction, solar celland its characteristics.
ReferenceBooks:
1. *DigitalIntegratedElectronicsby H.Tauband D.Schilling(McGraw-HillInternationalEditions).*
2. *Millman'sIntegratedElectronics:Analog&DigitalCircuits&Systems2/ebyJ.Millman,C.Halkias,C.D. Parikh(TataMcgraw HillEducationPrivateLimited).*
3. *DigitalLogicAndComputerDesignbyM.M.Mano(Prentice-HallofIndiaPvt.Ltd.).*
4. *ElectronicDevicesandCircuits:AnIntroduction by A.Mottershead(PHILearning)*
5. *Millman'sElectronicDevices and CircuitsbyJ.Millman(TataMgrawHill)*
6. *ElectronicFundamentalsandApplications:Integrated andDiscreteSystems5/ebyJ. D. Ryder (PhiLearning).*
7. *ElectronicDevicesandCircuitsTheory10/eby R. L. Boylestad,L. Nashelsky(Pearson).*
8. *PhysicsofSemiconductorDevices2/eby S.M. Sze(Wiley).*
9. *PhysicsofPhotonicDevices 2/eby S. L.Chuang(JohnWiley&Sons).*
10. *ModernDigitalElectronics4/ebyR.P.Jain(TataMcgrawHillEducationPrivateLimit.*

Semester VI, Paper-IV: Laser, Holography and Optical Instruments

Unit-I: Laser Emission
Stimulated and spontaneous emission. Einstein's coefficients, relative contribution of stimulated and spontaneous
emission,
Unit-II: Laser Action Conditions
Population inversion, Laser emission, characteristic of Laser light (including temporal), Amplification in an
inverted medium, threshold condition for lasing.
Unit-III: Holography

Basic principles, Recording a Hologram, Viewing a hologram, Thick hologram, Multiple holograms, white light reflection holograms.

Unit-IV: Optical Instruments-I

Introduction of multiple beam interferomety, Fabry-Perot interferometer and etalon (resolving power and determination of wavelengths),

Unit-V: Optical Instruments-II

Resolving power of Lummer-Gehreck plate, Grating and prisms, spectrograph for visible, IR and UV regions.

Reference Books:

1. Fundamentals of Optics 4/e by F. A. Jenkins and F. E. White (McGraw-Hill International Editions).
2. Geometrical & Physical Optics by R. S. Longhurst (Ol).
3. Optics 4/e by A. Ghatak ((Tata Mgraw Hill).
4. Geometrical and Physical Optics by B. K. Mathur and T. P. Pandya (New Gopal Printing Press).
5. Optics (schaum's Outline Series) by E. Hhecht (Tata Mcgraw Hill Education Private Limited).
6. Introduction to Optics by F. L. Pedrotti, L. M. Pedrotti, L. S. Pedrotti (Pearson).
7. Lasers: Theory and Applications by K. Thyagarajan and A. K. Ghatak (Macmillan Publishers India Ltd

Semester VI:PracticalPhysics
List ofExperiments
- *(Electronics)*

1. **Phototransistorandphotodiode:**(1)CalibrationofOPAM(2)Todrawcharacteristicofphotodiode/transistorforatleastthreedifferentdistances(3)Verificationofinversesqure law.
2. **e/m:**Todeterminee/mofelectronandalsocheckfromgraphandcalculation(plotBvs l/i, Ivs l, Bvsi).
3. **CEAmplifier:**To(1)tracethecircuitandwritethevalueofresistancesbycolourcode,(2)NoteD.C.Voltagesandcurrents,(3)Studyinput-outputcharacteristicsat1KHz,(4)Studyfrequencyresponse&obtainmidfrequencygainandcutofffrequencies.
4. **FET:**To(1)tracethecircuitforamplifierwithvalueofresistance bycolourcodeandnoteD.C.voltagesandcurrents,(2)findthevoltageamplification'A' given0.2V A.C.voltageof1khz,(3)FindQpoint,(4)DrawcharacteristiccurvesatdifferentgatevoltagestakingcarethatcurvesnearQpointisalsoplotted,(5)DrawA.C.& D.C.loadlines(6)Find'A'fromA.C.loadlinealso(7)CalculatesaturationcurrentfordifferentVgs,Plotagraph&obtainoutofvoltages,(8)Calculateg(m),R(on)& Rd(9) verify $I(ds)=I(dss)(1-V_{gs}/V_p)^2$
5. **RTLgate:**toverify(1)TruthtableforNOR-NOTgates,(2)switchingactionoftransistor&drawVL–V0,IB–I_c,$\square\square$VsV,R_{switch}VsV_{CE}curves,(3)Tofindoutthefanoutusingdriverdrivenconditionin(a)singleinputRTL gate(b)doubleinputRTL gate.
6. **DTL:**(1)ToverifytruthtableforDTLgates,(2)Todrawinput-outputcharacteristic &voltages atdifferentpointsforDTLgates,(3)Tofind fan out.
7. **TTL:**(1)ToverifytruthtableforTTLgates,(2)Todrawinput-outputcharacteristic &voltages atdifferentpointsforTTL gates,(3)Tofind fan out.
8. **Hysteresis:**Todrawhysteresisloopforthematerialof given anchorringandtofind:
   (i)Hysteresisloss (ii)Retentivity(iii) Coercivity(iv)B_{max}(v)H_{max}
9. **BiasStabilization:**(i)To Calculatethebandgap by plottingI_B Vs

   (I_B+I_C)forcollectorbiasingcaseattwotemperatures:(1) atroomtemperature(2) at55^{0}C
   (ii) Tocalculatestabilityfactorforfixedbiasing,collectorbiasing,emitterbiasingand potentialdividerbiasing.
   (iii) TostudythevariationofI_B,I_C,V_{CC} andV_{BE}withtemperaturefordifferentbiasing.
   (iv) PlottemperatureVsV_{CE},V_{BE},I_B,I_C(atroomtemperature).

Reference Book:
1. AdvancedPracticalPhysicsbyH.B.Lal,U.S.Pandey&R.B.Singh(UnitedBookDepot,Allahabad).