Asian Educational Institute, Patiala (Punjab)

(An Autonomous College)

School of Science & Mathematics

Programme Structure: B.Sc. /B.Sc. (Honours) Physical Sciences

Semester-III

Session: 2025-2026 (NEP 2020 Implementation)

S. No	Course Type NEP 2020	Subject Code	Course Title	Credits	Hours per week	Marks
1.	Major-Physics	BPHY201T	Wave & Vibrations	03	4	100
2.	Major -Physics Lab	BPHY201L	Physics Laboratory	01	2	50
3.	Major-Mathematicss	BMATH201T	Calculus-II	04	4	100
4.	Major-Chemistry	BCHEM201T	Physical Chemistry-I	03	4	100
5.	Major-Chemistry Lab	BCHEM201L	Chemistry Laboratory	01	2	50
6.	Minor-Computer Science	BCOMP201	Programming with - C	04(3T+ 01L)	4	100
7.	AEC (language)	BENG201	English-III	02	2	50
8.	SEC	BSEC201	Data handling using Spreadsheet/ Presentation Using Power point.	03 (1T+2L)	3	100
9.	VAC	BVAC-3	Yoga and Meditation	02	2	50
10.	PBI	BPBI201	Punjabi Compulsory	04	4	100
			Total	27		

Asian Educational Institute, Patiala (Punjab)

(An Autonomous College)

School of Science & Mathematics

Programme Structure: B.Sc./B.Sc. (Honours) Physical Sciences

Semester-IV

Session: 2025-26 (NEP 2020 Implementation)

S. No	Course Type NEP 2020	Subject Code	Course Title	Credits	Hours per week	Marks
1.	Major-Physics	BPHY202T	Thermodynamics and Statistical Physics	03	4	100
2.	Major -Physics Lab	BPHY202L	Physics Laboratory	01	2	50
3.	Major-Mathematics	BMATH202T	Ordinary & Partial Differential Equation	04	4	100
4.	Major-Chemistry	BCHEM202T	Organic Chemistry-II	03	4	100
5.	Major-Chemistry Lab	BCHEM202L	Chemistry Laboratory	01	2	50
6.	Minor-Computer Science	BCOMP202	Computer Science	04(3T+ 01L)	4	100
7.	AEC (language)	BENG202	English	02	2	50
8.	IDC/MDC	BIDC202	Cyber Security / Fundamental of Green Chemistry	03	3	100
9.	VAC	BVAC-4	Indian Knowledge System	02	2	50
10.	PBI	BPBI201	Punjabi Compulsory	04	4	100
			Total	27		

ASIAN EDUCATIONAL INSTITUTE, PATIALA (PB)

UG PROGRAMME (Bachelor of Science) MULTIDISCIPLIANARY

B.Sc. / B.Sc. (HONOURS)

SESSION: 2025-2026

Subject- Physics

Code	Title of Paper	Hours (Per Week)	Max. Marks			Credits	Examination Time(Hours)
SEMESTR-III			**Total**	**Ext.**	**Int.**		
BPHY201T	**MAJ:** Wave & Vibrations	03	100	70	30	03	03
BPHY201L	**MAJ:** Physics Laboratory	02	50	35	15	01	03
BPHY201T	**MIN:** Wave & Vibrations	03	100	70	30	03	03
BPHY201L	**MIN:** Physics Laboratory	02	50	35	15	01	03
BSEC201	**SEC:** Optics WorkShop (2T+1L)	04	100	70	30	03	03
SEMESTR-IV							
BPHY202T	**MAJ:**Thermodynamics & Statistical Physics	03	100	70	30	03	03
BPHY202L	**MAJ:** Physics Laboratory	02	50	35	15	01	03
BPHY202T	**MIN:**Thermodynamics & Statistical Physics	03	100	70	30	03	03
BPHY202L	**MIN:** Physics Laboratory	02	50	35	15	01	03
BALP202	**IDC/MDC:** Applied Physics-I	03	100	70	30	03	03

- **MAJ:** Discipline Specific Core Course: **MIN**: Minor Core Course; **IDC/MDC:** Inter Disciplinary Course/Multi-Disciplinary Course, **AEC:** Ability Enhancement Course, **VAC:** Value Added Course, **SEC:** Skill Enhancement Course.

Semester-3rd

Waves and Vibrations

Subject Code: BPHY201T

(Major Theory)

Max. Marks: 100

End-Semester Exam: 70

Internal Evaluation: 30

Credits: 03

Total load: 40 Hours

Pass Marks: 35%

Course Outcomes: On successful completion of this course students will:	
CO1	Understand physical characteristics of SHM and obtaining solution of the oscillator using differential equations.
CO2	Understand the distinction between Undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.
CO3	Calculate logarithmic decrement, relaxation factor and quality factor of a harmonic oscillator. Figure out the formation of harmonics and overtones in a stretched string.
CO4	Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems
CO5	Will be able to define and explain the characteristics of different types of waves, including transverse and longitudinal waves, and their propagation in various media.
CO6	Solve wave equation and understand significance of transverse waves, Impedance Matching.

Instructions for Paper Setter:

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short- answer type questions of 2 marks each covering the entire syllabus.

Instructions for students:

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

SECTION –A

Simple harmonic motion, Differential equation and its solution for Simple harmonic oscillations, Energy of a Simple Harmonic Oscillation (SHO), Transverse vibrations of a mass on a string, Compound pendulum, Superposition of two perpendicular SHM of same period and of period ratio 1 : 2, Anharmonic oscillations, Decay of free vibrations due to damping. Differential equation for damped oscillations, types of damping. Determination of damping Co-efficient-logarithmic decrement, Relaxation time and Q-Factor. Electromagnetic damping (Electrical oscillator).

Forced Oscillators, Differential equation for forced mechanical and electrical oscillators, Transient and steady state oscillation. Displacement and velocity variation with driving force frequency, Q value of a forced oscillator and band width, Q-value as an amplication factor of low frequency response.

SECTION -B

Coupled oscillators, types of coupling, Normal co-ordinates and normal modes of vibration. Inductance coupling of electrical oscillators, Types of waves, Wave equation (transverse) and its solution, The string as a forced oscillator, Characteristic impedance of a string, Impedance matching, Energy transport in transverse waves, Reflection and transmission of waves on the string, Reflection and Transmission of Energy, Reflection and transmission of Energy coefficients, Standing waves on a string of fixed length. Energy of vibrating string, Wave and group velocity. Electromagnetic waves and wave equation in a medium having finite permeability and permittvity but with conductivity $\sigma=0$.

Text Books:

1. Fundamentals of Vibrations and Waves by S. P. Puri, Tata McGraw Hill, New Delhi.
2. Physics of Vibrations and Waves by H. J. Pain, Wiley & Sons, New Delhi.
3. Waves and Oscillations, by E. Crawford, Berkeley Physics Course, McGraw-Hill Publications, New Delhi.
4. EM Waves and Radiating Systems by Edward C. Jordan and K. G. Balmain, Prentice Hall of India.
5. Vibrations and Waves by A.P. French (Arnold Heinemann India, New Delhi).
6. The Mathematics of Waves and Vibrations by P.K. Ghosh (Mcmillan India).
7. Waves and Oscillations by N. Subrahmanayam & B. Lal (Vikas Pub., Delhi)

Semester-3rd

Physics Laboratory (Major)

Subject Code: BPHY201L

Max. Marks: 50 **Credits**: 01

End-Semester Exam: 35 **Total load**: 26 Hours

Internal Evaluation: 15 **Pass Marks**: 35%

General Guidelines for End-Semester Examination:

1 .The student will be allotted one experiment out of the experiments mentioned in syllabus and asked to perform. Examination Time duration will be of 3 Hours.

2. The distribution of marks is as a follows:

(i) One full experiment, student to take some data, analyzes it and draw conclusions. (10 Marks)

(ii) Brief theory (05Marks)

(iii) Viva-Voce (10 Marks)

(iv) Record (Practical File) (10 marks)

LIST OF EXPERIMENTS:

1. Simple Pendulum- Normal distribution of error- estimation of time period and the error of the mean by statistical analysis.
2. Dependence of the time period of a pendulum on length, Amplitude and mass.
3. Determination of 'g' by simple pendulum.
4. Determination of Force constant of spring by Static and Dynamic.
5. Verification of Laws of Vibrations of Stretched spring –Sonometer.
6. Coupled Oscillators
7. To study the variation of time period with distance between centre of suspension and centre of gravity for a bar pendulum and to determine
   i) Radius of gyration of bar pendulum about an axis through its Centre of Gravity and perpendicular to its length. ii) Value of Centre of Gravity, g.
8. Determination of ' g' by Kater's pendulum.
9. Measurement for logarithmic decrement, co-efficient of damping, relaxation time and quality factor of a damped simple pendulum.
10. To determine the frequency of AC mains using a Sonometer and an electro magnet.
11. Study the phase relationships between voltage and current using impedance triangle.

Text and Reference Books:

1. A Laboratory Manual of Physics for Undergraduate Classes, D. P. Khandelwal
2. B.Sc. Practical Physics, C.L. Arora

Semester-3rd

Waves and Vibrations

Subject Code: BPHY201T

(Minor- Physics Theory)

Max. Marks: 100 **Credits**: 03

End-Semester Exam: 70 **Total load**: 40 Hours

Internal Evaluation: 30 **Pass Marks**: 35%

Course Outcomes: On successful completion of this course students will:	
CO1	Understand physical characteristics of SHM and obtaining solution of the oscillator using differential equations.
CO2	Understand the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.
CO3	Calculate logarithmic decrement, relaxation factor and quality factor of a harmonic oscillator. Figure out the formation of harmonics and overtones in a stretched string.
CO4	Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems
CO5	Will be able to define and explain the characteristics of different types of waves, including transverse and longitudinal waves, and their propagation in various media.
CO6	Solve wave equation and understand significance of transverse waves, Impedance Matching.

Instructions for Paper Setter:

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short- answer type questions of 2 marks each covering the entire syllabus.

Instructions for students:

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

SECTION –A

Simple harmonic motion, Differential equation and its solution for Simple harmonic oscillations, Energy of a Simple Harmonic Oscillation (SHO), Transverse vibrations of a mass on a string, Compound pendulum, Superposition of two perpendicular SHM of same period and of period ratio 1 : 2. Anharmonic oscillations, Decay of free vibrations due to damping. Differential equation for damped oscillations, types of damping. Determination of damping Co-efficient-logarithmic decrement, Relaxation time and Q-Factor. Electromagnetic damping (Electrical oscillator).

Forced Oscillators, Differential equation for forced mechanical and electrical oscillators, Transient and steady state oscillation. Displacement and velocity variation with driving force frequency, Q value of a forced oscillator and band width, Q-value as an amplication factor of low frequency response.

SECTION -B

Coupled oscillators, types of coupling, Normal co-ordinates and normal modes of vibration. Inductance coupling of electrical oscillators, Types of waves, Wave equation (transverse) and its solution, The string as a forced oscillator, Characteristic impedance of a string, Impedance matching, Energy transport in transverse waves, Reflection and transmission of waves on the string, Reflection and Transmission of Energy, Reflection and transmission of Energy coefficients, Standing waves on a string of fixed length. Energy of vibrating string, Wave and group velocity. Electromagnetic waves and wave equation in a medium having finite permeability and permittvity but with conductivity $\sigma=0$.

Text Books:

1. Fundamentals of Vibrations and Waves by S. P. Puri, Tata McGraw Hill, New Delhi.
2. Physics of Vibrations and Waves by H. J. Pain, Wiley & Sons, New Delhi.
3. Waves and Oscillations, by E. Crawford, Berkeley Physics Course, McGraw-Hill Publications, New Delhi.
4. EM Waves and Radiating Systems by Edward C. Jordan and K. G. Balmain, Prentice Hall of India.
5. Vibrations and Waves by A.P. French (Arnold Heinemann India, New Delhi).
6. The Mathematics of Waves and Vibrations by P.K. Ghosh (Mcmillan India).
7. Waves and Oscillations by N. Subrahmanayam & B. Lal, Vikas Publication, Delhi.

Semester-3rd

Physics Laboratory (Minor)

Subject Code: BPHY201L

Max. Marks: 50 **Credits:** 01

End-Semester Exam: 35 **Total load:** 26Hours

Internal Evaluation: 15 **Pass Marks:** 35%

General Guidelines for End-Semester Examination:

1 .The student will be allotted one experiment out of the experiments mentioned in syllabus and asked to perform. Examination Time duration will be of 3 Hours.
2. The distribution of marks is as a follows:
(i) One full experiment, student to take some data, analyzes it and draw conclusions. (10 Marks)
(ii) Brief theory (05Marks)
(iii) Viva-Voce (10 Marks)
(iv) Record (Practical File) (10 marks)

LIST OF EXPERIMENTS:

1. Simple Pendulum- Normal distribution of error- estimation of time period and the error of the mean by statistical analysis.
2. Dependence of the time period of a pendulum on length, Amplitude and mass.
3. Determination of 'g' by simple pendulum.
4. Determination of Force constant of spring by Static and Dynamic.
5. Verification of Laws of Vibrations of Stretched spring –Sonometer.
6. Coupled Oscillators
7. To study the variation of time period with distance between centre of suspension and centre of gravity for a bar pendulum and to determine
   i) Radius of gyration of bar pendulum about an axis through its Centre of Gravity and perpendicular to its length. ii) Value of Centre of Gravity, g.
8. Determination of 'g' by Kater's pendulum.
9. Measurement for logarithmic decrement, co-efficient of damping, relaxation time and quality factor of a damped simple pendulum.
10. To determine the frequency of AC mains using a Sonometer and an electro magnet.
11. Study the phase relationships between voltage and current using impedance triangle.

Text and Reference Books:

1. A Laboratory Manual of Physics for Undergraduate Classes, D. P. Khandelwal
2. B.Sc. Practical Physics, C.L. Arora

Semester-4th

Thermodynamics and Statistical Physics

Subject Code: BPHY202T

(Major Theory)

Max. Marks: 100 **Credits**: 03

End-Semester Exam: 70 Marks **Total Load**: 40 Hours

Internal Evaluation: 30 Marks **Pass Marks**: 35%

Course Outcomes: On successful completion of this course students will:	
CO1	After taking this course students are able to determine the probability of any type of events and interpret different types of events.
CO2	Students have understood the concept of phase space and its volume. They can easily distinguish between different types of particles and statistics and can easily distribute bosons, fermions and classical particles among energy levels.
CO3	After studying Fermi Dirac statistics, students have learned to deal with much electron system in real life.
CO4	Students are able to define thermodynamic terminology and Understand fundamental thermodynamic properties.Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency.
CO5	Understand the concepts of entropy and its applications in analyzing thermal efficiencies.
CO6	Students state the first Law of Thermodynamics and understand its implications. Students describe heat engines, they state the Second Law of Thermodynamics and understand its implications

Instructions for Paper Setter:

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short- answer type questions of 2 marks each covering the entire syllabus.

Instructions for students:

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

SECTION - A

Statistical definition of entropy, Change of entropy of a system, Additive nature of entropy, Law of increase of entropy, Reversible and irreversible process and their examples. Work done in a reversible process. Examples of increase of entropy in natural processes, Entropy and disorder, Brief review of terms and laws of thermodynamics, Carnot's cycle, Entropy changes in Carnot cycle. Applications of thermodynamics to thermoelectric effect. Change of entropy along a reversible path in a P.V. diagram, Entropy of a perfect gas, Equation of state of an ideal gas from simple statistical consideration, Heat death of the universe.

Derivation of Maxwell's thermo dynamical relations, Cooling produced by adiabatic stretching, Adiabatic compression, Change of internal energy with volume, specific heat at constant pressure and constant volume, Expression for Cp -Cv , Change of state and Clayperon equation, Thermo dynamical treatment of Joule-Thomson effect, Use of Joule-Thomson effect, liquefiction of helium, Production of very low temperature by adiabatic demagnetization.

SECTION - B

Basic ideas of statistical physics, Scope of statistical physics, Basic ideas about probability, distribution of four distinguishable particles in two compartment of equal size. Concept of macro states, microstates, thermodynamic probability, Effects of constraints on the system, Distribution of n particles in two compartments, Deviation from the state of maximum probability, Equilibrium state of dynamic system, Distribution of distinguishable n particles in k compartments of unequal sizes.

Phase space and its division into elementary cells, Three kinds of statistics. The basic approach in the three statistics, Maxwell Boltzman (MB) statistics applied to an ideal gas in equilibrium. Experimental verification of Maxwell Boltzman law of distribution of molecular speeds, Need for quantum statistics-Bose-Einstein (B.E.) statistics, Derivation of Planck's law of radiation, Deduction of Wien's displacement law and Stefan's law from Planck's law, Fermi-Dirac (F.D.) statistics, Comparison of M.B., B.E. and F.D. statistics.

Text and Reference Books:

1. Statistical Physics and Thermodynamics, V.S. Bhatia (Sohan Lal Nagin Chand, Jalandhar)
2. Statistical Physics and Thermodynamics, A.K. Sikri (Pardeep Publication, Jalandhar)
3. A Treatise on Heat, M.N. Saha & B.N. Srivastava, (The Indian Press Pvt. Ltd., Allahabad) 1965.
4. Statistical Mechanics: An Introductory Text, Bhattacharjee, J.K. (Allied Pub., Delhi) 2000.
5. Statistical Mechanics, B.B. Laud (Macmillan India Ltd), 1981.

Semester-4th

Physics Laboratory

Subject Code: BPHY202L

(Major Laboratory)

Max. Marks: 50 **Credits:** 01

End-Semester Exam: 35 **Total load:** 26 Hours

Internal Evaluation: 15 **Pass Marks:** 35%

General Guidelines for End-Semester Examination:

1 .The student will be allotted one experiment out of the experiments mentioned in syllabus and asked to perform. Examination Time duration will be of 3 Hours.

2. The distribution of marks is as a follows:

(i) One full experiment, student to take observations, analyzes it and draws conclusions. (10)

(ii) Brief theory (05Marks)

(iii) Viva-Voice (10 Marks)

(iv) Record (Practical File) (10 Marks)

LIST OF EXPERIMENTS

1. Experiment on first and Second Law of Thermodynamics.
2. Adiabatic expansion of a gas
3. Thermal expansion of crystal using interference fringes
4. Probability distribution using colored dice coins.
5. Study the photoelectric effect and determine the value of Planck's constant
6. To study the gas discharge spectrum of hydrogen
7. Thermal conduction in poor conductor (variation with geometry) by Lee's method
8. Thermo e.m.f. calibration comparison
9. Total radiation law, temperature dependence of radiation
10. To measure an inaccessible height using sextant
11. To study the absorption spectra of iodine vapors.
12. To determine the specific heat of given material.

Text and Reference Books:

1. A Laboratory Manual of Physics for Undergraduate Classes, D. P. Khandelwal
2 B.Sc. Practical Physics, C. L. Arora.

Semester-4th

Thermodynamics and Statistical Physics

Subject Code: BPHY202T

(Minor – Physics Theory)

Credits: 03

Max. Marks: 100

End-Semester Exam: 70 Marks

Total teaching hours: 40 Hours

Internal Evaluation: 30 Marks

Pass Marks: 35%

Course Outcomes: On successful completion of this course students will:	
CO1	After taking this course students are able to determine the probability of any type of events and interpret different types of events.
CO2	Students have understood the concept of phase space and its volume. They can easily distinguish between different types of particles and statistics and can easily distribute bosons, fermions and classical particles among energy levels.
CO3	After studying Fermi Dirac statistics, students have learned to deal with much electron system in real life.
CO4	Students are able to define thermodynamic terminology and Understand fundamental thermodynamic properties. Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency.
CO5	Understand the concepts of entropy and its applications in analyzing thermal efficiencies.
CO6	Students state the first Law of Thermodynamics and understand its implications. Students describe heat engines, they state the Second Law of Thermodynamics and understand its implications

Instructions for Paper Setter:

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short- answer type questions of 2 marks each covering the entire syllabus.

Instructions for students:

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

SECTION - A

Statistical definition of entropy, Change of entropy of a system, Additive nature of entropy, Law of increase of entropy, Reversible and irreversible process and their examples. Work done in a reversible process. Examples of increase of entropy in natural processes, Entropy and disorder, Brief review of terms and laws of thermodynamics, Carnot's cycle, Entropy changes in Carnot cycle. Applications of thermodynamics to thermoelectric effect. Change of entropy along a reversible path in a P.V. diagram, Entropy of a perfect gas, Equation of state of an ideal gas from simple statistical consideration, Heat death of the universe.

Derivation of Maxwell's thermo dynamical relations, Cooling produced by adiabatic stretching, Adiabatic compression, Change of internal energy with volume, specific heat at constant pressure and constant volume, Expression for Cp -Cv , Change of state and Clayperon equation, Thermo dynamical treatment of Joule-Thomson effect, Use of Joule-Thomson effect, liquefiction of helium, Production of very low temperature by adiabatic demagnetization.

SECTION - B

Basic ideas of statistical physics, Scope of statistical physics, Basic ideas about probability, distribution of four distinguishable particles in two compartment of equal size. Concept of macro states, microstates, thermodynamic probability, Effects of constraints on the system, Distribution of n particles in two compartments, Deviation from the state of maximum probability, Equilibrium state of dynamic system, Distribution of distinguishable n particles in k compartments of unequal sizes.

Phase space and its division into elementary cells, Three kinds of statistics. The basic approach in the three statistics, Maxwell Boltzman (MB) statistics applied to an ideal gas in equilibrium. Experimental verification of Maxwell Boltzman law of distribution of molecular speeds, Need for quantum statistics-Bose-Einstein (B.E.) statistics, Derivation of Planck's law of radiation, Deduction of Wien's displacement law and Stefan's law from Planck's law, Fermi-Dirac (F.D.) statistics, Comparison of M.B., B.E. and F.D. statistics.

Text and Reference Books:

1. Statistical Physics and Thermodynamics, V.S. Bhatia (Sohan Lal Nagin Chand, Jalandhar)
2. Statistical Physics and Thermodynamics, A.K. Sikri (Pardeep Publication, Jalandhar)
3. A Treatise on Heat, M.N. Saha & B.N. Srivastava, (The Indian Press Pvt. Ltd., Allahabad) 1965.
4. Statistical Mechanics: An Introductory Text, Bhattacharjee, J.K. (Allied Pub., Delhi) 2000.
5. Statistical Mechanics, B.B. Laud (Macmillan India Ltd), 1981.

Semester-4th

Physics Laboratory

Subject Code: BPHY202L

(Minor- Physics Laboratory)

Max. Marks: 50 **Credits**: 01

End-Semester Exam: 35 **Total Load :** 26 Hours

Internal Evaluation: 15 marks **Pass Marks**: 35%

General Guidelines for End-Semester Examination:

1 .The student will be allotted one experiment out of the experiments mentioned in syllabus and asked to perform. Examination Time duration will be of 3 Hours.

2. The distribution of marks is as a follows:

(i) One full experiment, student to take observations, analyzes it and draws conclusions. (10)

(ii) Brief theory (05Marks)

(iii) Viva-Voce (10 Marks)

(iv) Record (Practical File) (10 Marks)

LIST OF EXPERIMENTS

1. Experiment on first and Second Law of Thermodynamics.
2. Adiabatic expansion of a gas
3. Thermal expansion of crystal using interference fringes
4. Probability distribution using colored dice coins.
5. Study the photoelectric effect and determine the value of Planck's constant
6. To study the gas discharge spectrum of hydrogen
7. Thermal conduction in poor conductor (variation with geometry) by Lee's method
8. Thermo e.m.f. calibration comparison
9. Total radiation law, temperature dependence of radiation
10. To measure an inaccessible height using sextant
11. To study the absorption spectra of iodine vapors.
12. To determine the specific heat of given material.

Text and Reference Books:

1. A Laboratory Manual of Physics for Undergraduate Classes, D. P. Khandelwal
2. B.Sc. Practical Physics, C. L. Arora.

Semester -III

APPLIED PHYSICS - I

Subject code – BALP202
(IDC/MDC)

Max. Marks: 100
External Marks: 70
Internal Marks: 30

Credit: 03
Total Load: 40
Pass Marks: 35%

Instructions for Paper Setter:

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short- answer type questions of 2 marks each covering the entire syllabus.

Instructions for students:

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

SECTION-A

Measurements and Errors: Measure and, Accuracy, Precision, Resolution, certainty; Errors, Types of errors and sources of errors -Systematic error, Random error , Ambiguity error, Dynamic error, Drift, Noise. Errors based on Magnitude- Absolute, Mean absolute, relative and percentage errors with examples. Combination of errors.

Data Analysis - Elements of statistics including bell shaped curve and Variance, Graphical representation of scientific data.

Dielectric Properties: Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Types of polarizations: Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities (Electronic & Ionic) -Internal Fields in Solids, Clausius -Mossotti Equation, Piezo-electricity and Ferro- electricity.

Magnetic Properties: Magnetic Permeability, Magnetic Field Intensity, Magnetic Field Induction, Intensity of Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment-Orbital & Spin magnetic moment-Bohr Magnetron, Classification of Dia, Para and Ferro Magnetic

Fundamentals of Laser: Characteristics of Laser, Energy levels in atoms, radiation matter interaction, absorption of light, spontaneous and Stimulated emission of light, Einstein A and B coefficients, Metastable state, population inversion, resonant cavity, excitation mechanisms, Lasing action.

Types of Lasers & Applications: Solid State Laser- Ruby laser, Gas Laser- He-Ne Laser, Semiconductor Laser. Applications of Lasers: Drilling, welding, micro machining, measurement of long distances, CD write devices & printers.

Imaging Techniques: Classification (visible, IR, electron, magnetic, UV/X-rays, gamma rays, microwaves); Imaging importance, Types of imaging - Microscopes, Telescopes- Working and Calculation of Magnification factors, Camera, Comparative study of different types of imaging with respect to magnification, resolution, image quality, applications.

Reference Books:

1. Fundamentals of physics: Halliday, Resnick, Walker.
2. Solid State Physics: Charles Kittel, Wiley & Sons (Asia) Pvt. Ltd.
3. Engineering Physics: S. O. Pillai, New age International.
4. Problem in LASER Physics by O. Sevolt et.al. Publisher : Kluwer Academic/Plenum Publishers; 1st ed. 2001 edition (31 October 2001)
5. Modern Engineering physics-I & II: S. Chandralingam, K. Vijayakumar, S Chand Co.
6. Engineering Physics: P. K. Palanisamy, Scitech Publishers.
7. Francis A. Jenkins, Harvey E. White, Fundamentals of Optics, McGraw Hill.
8. Eugene Hecht & A.R Ganesan (2009), Optics, Pearson
9. Instruments and Measurements by M. R Bottaccini , E.E. Merill, , Bell and Howell

Semester IV

APPLIED PHYSICS - II

Subject code – BALP201
(IDC/MDC)

Max. Marks: 100
External Marks: 70
Internal Marks: 30

Credit: 03
Total Load: 40
Pass Marks: 35%

Instructions for Paper Setter:

The end-semester examination will be of 70 marks and of 3 hours duration. The question paper will consist of three sections, namely Section A, B and C. Section A and B will have four questions each from the respective sections of syllabus. Each question will carry 12 marks and may be segregated into sub-parts. Section C will be compulsory with 11 short- answer type questions of 2 marks each covering the entire syllabus.

Instructions for students:

Students have to attempt four questions in all from Section A and B by selecting 2 questions from each Section. Section C will be compulsory, Use of scientific calculator is allowed.

SECTION-A

Semiconductor Physics: Intrinsic and Extrinsic Semiconductors, Fermi Level, Fermi level in Intrinsic and Extrinsic Semiconductors, Direct and Indirect Band gap semiconductors, Hall Effect and Applications.

Physics of Semiconductor Devices: LED materials- Construction and Working of LED,

Advantages and Disadvantages. LCD-Characteristics of LCD, Action of LCD display device. Solar Cells-Photovoltaic effect, Efficiency Issues, Solar materials, Advantages of Solar Cells.

Fundamentals of Fiber Optics: Structure and Principle of Optical Fiber, Acceptance Angle, Numerical Aperture. Types of Optical Fibers-Step Index and Graded Index fibers; Modes of fibers SMSI, MMSI, MMGI, Attenuation and dispersion in Optical Fibers, Optical fiber Communication System with block diagram.

Superconductivity: Zero resistance, Critical temperature Tc, Critical field Hc. Perfect diamagnetism, Meissner effect, Type I and Type II superconductors. Formation of Cooper pairs, Electron-Phonon interaction and BCS theory. Applications of Superconductors.

Reference Books:

1. Modern Engineering physics-I & II by S. Chandralingam, K. Vijayakumar, published by S Chand Co.
2. Engineering Physics: P. K. Palanisamy, Scitech Publishers.
3. Engineering Physics: S. O. Pillai, New age International.
4. Solid State Physics: Charles Kittel, Wiley & Sons (Asia) Pvt. Ltd.
5. Solar Photovoltaics – Fundamentals, Technologies and Applications 3rd Edition, PHI