

# KURUKSHETRA UNIVERSITY, KURUKSHETRA

## REVISED SCHEME OF EXAMS. & SYLLABI FOR B.SC. II

(3<sup>RD</sup> AND 4<sup>TH</sup> SEM)

EFFECTIVE FROM SESSION 2012-2013

### **Scheme of Examination:**

<b>Semester</b>	<b>Paper code and nomenclature of the papers</b>	<b>Marks Theory</b>	<b>Time</b>
<b>3<sup>rd</sup></b>	<b>PH -301 Computer Programming and Thermodynamics</b>	<b>40+10* =50</b>	<b>3 Hours</b>
	<b>PH- 302 Wave and Optics -I</b>	<b>40+10* =50</b>	<b>3 Hours</b>
<b>4<sup>th</sup></b>	<b>PH - 401 Statistical Physics</b>	<b>40+10* =50</b>	<b>3 Hours</b>
	<b>PH - 402 Wave and Optics II</b>	<b>40+10* =50</b>	<b>3 Hours</b>
	<b>Practical</b>	<b>50+50=100</b>	<b>3 + 3 Hours</b>
	<b>Total Marks</b>	<b>300</b>	

\* Internal Assessment.

**B.Sc.-II(Physics)  
Semester-III**

**Physics- PH-301**

**Paper V: Computer Programming and Thermodynamics**

**Max. Marks: 40  
Internal Assessment: 10  
Time: 3 Hours**

**Note:**

- 1. The syllabus is divided into 4 units. 9 questions will be set.**
- 2. Question no 1 will be compulsory, it contains 6 parts (form all the four units) and answer should be brief but not in yes / no.**
- 3. Four more questions are to be attempted, selecting one question from each unit. Questions 2-9 may contain two or more parts. All questions carry equal marks**
- 4. 20% numerical problems are to be set.**
- 5. Use of scientific (non-programmable) calculator is allowed.**

**UNIT-1: Computer Programming**

**Computer organization, Binary representation, Algorithm development, Flow charts and their interpretation. FORTRAN Preliminaries: Integer and floating point arithmetic expression, built in functions, executable and non-executable statements, input and output statements, Formats, IF, DO and GO TO statements, Dimension arrays, statement function and function subprogram.**

**UNIT –2: Applications of FORTRAN programming**

**Algorithm, Flow Chart and Programming for Print out of natural numbers, Range of the set of given numbers, Ascending and descending order, Mean and standard deviation, Least square fitting of curve, Roots of quadratic equation, Product of two matrices, Numerical integration (Trapezoidal rule and Simpson 1/3 rule) .**

### **UNIT-3: Thermodynamics-I**

**Thermodynamic system and Zeroth law of thermodynamics. First law of thermodynamics and its limitations, reversible and irreversible process. Second law of thermodynamics and its significance, Carnot theorem, Absolute scale of temperature, Absolute Zero and magnitude of each division on work scale and perfect gas scale, Joule's free expansion, , Joule Thomson effect, Joule-Thomson (Porous plug) experiment, conclusions and explanation, analytical treatment of Joule Thomson effect. Entropy, calculations of entropy of reversible and irreversible process , T-S diagram, entropy of a perfect gas, Nernst heat law(third law of thermodynamics), Liquefaction of gases, (oxygen, air, hydrogen and helium), Solidification of He below 4K, Cooling by adiabatic demagnetization.**

### **UNIT-4: Thermodynamics-II**

**Derivation of Clausius-Clapeyron and Clausius latent heat equation and their significance,specific heat of saturated vapours,phase diagraph and triple point of a substance, development of Maxwell thermodynamical relations. Thermodynamical functions: Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G) and the relations between them, derivation of Maxwell thermodynamical relations from thermodynamical functions,Application of Maxwell relations: relations between two specific heats of gas, Derivation of Clausius-Clapeyron and Clausius equation,variation of intrinsic energy with volume for (i) perfect gas (ii)Vanderwall gas (iii)solids and liquids , derivation of Stefans law, adiabatic compression and expansion of gas & deduction of theory of Joule Thomson effect.**

#### **References:**

- 1 Ian C and Malcon C, Interactive FORTRAN 77, Affiliated East West Press Pvt Ltd, New Delhi**
- 2 Rajaraman V, Computer Programming in FORTRAN 77, Prentice-Hall of India Pvt Ltd, New Delhi.**
- 3 Suresh C, Computer Applications in Physics, Narosa Publishing House, New Delhi 4 Roy S K, Thermal Physics and Statistical Mechanics, New Age International Publishers, New Delhi**
- 5 Sharma J K and Sarkar K K, Thermodynamics and Statistical Physics, Himalaya Publishing House, Bamba**
- 6 Stowe Keith, Introduction to Thermodynamics and its Applications, University press (India) Pvt Ltd, Hyderabad**

- 7 Infelta Pierre P. Introductory Thermodynamics Publisher: BrownWalker Press**
- 8 Johnson J. K, Fundamentals of Thermodynamics University of Pittsburgh 2009**
- 9 Jefferson Tester, Michael Modell, Thermodynamics and Its Applications 3rd Edition**
- 10 Thomas Engel, Philip Reid, Thermodynamics, Statistical Thermodynamics, & Kinetics 2nd Edition**

**B.Sc. –II (Physics)  
Semester-III**

**Physics- PH-302**

**Paper VI: Wave and optics I**

**Max. Marks: 40  
Internal Assessment: 10  
Time: 3 hours**

**Note:**

- 1. The syllabus is divided into 4 units. 9 questions will be set.**
- 2. Question no 1 will be compulsory, it contains 6 parts (form all the four units) and answer should be brief but not in yes / no.**
- 3. Four more questions are to be attempted, selecting one question from each unit. Questions 2-9 may contain two or more parts .All questions carry equal marks.**
- 4. 20% numerical problems are to be set.**
- 5. Use of scientific (non-programmable) calculator is allowed.**

#### **Unit-1: Interference I**

**Interference by Division of Wave front: Young's double slit experiment, Coherence, Conditions of interference, Fresnel's biprism and its applications to determine the wavelength of sodium light and thickness of a mica sheet, Lloyd's mirror, Difference between Bi-prism and Lyod mirror fringes, phase change on reflection.**

#### **Unit 2: Interference II**

**Interference by Division of Amplitude: Plane parallel thin film, production of colors in thin films, classification of fringes in films, Interference due to transmitted light and reflected light, wedge shaped film, Newton's rings, Interferometer: Michelson's interferometer and its applications to (i) Standardization of a meter (ii) determination of wavelength.**

#### **Unit- 3: Diffraction I**

**Fresnel's diffraction: Fresnel's assumptions and half period zones, rectilinear propagation of light, zone plate, diffraction at a straight edge, rectangular slit and circular aperture, diffraction due to a narrow slit and wire.**

#### **Unit -4: Diffraction II**

**Fraunhofer diffraction: single-slit diffraction, double-slit diffraction, N-slit diffraction, plane transmission grating spectrum, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating. Differences between prism and grating spectra.**

#### **References**

**1 Hecht, Optics, Pearson Education, New Delhi**

**2 Brooker G, Modern Classical Optics, Ane Books Pvt Ltd, New Delhi**

**3 Chaudhuri R N, Waves and Oscillations, New Age International Publishers, New Delhi 4  
Khandelwal D P, Text Book of Optics and Atomic Physics, Himalaya Publishing  
House, Bombay**

**5 Subrahmanyam N, Lal B, Avadhanulu M N, A Text Book of Optics, S Chand & Co, New Delhi**

**6 Barton A w, atext Book on Light, Longmans Green & Co London.**

**7 Longhurst R S, Geometrical and Physical Optics, University Press India Pvt.Ltd. Hyd.**

**B.Sc.- II (Physics)  
Semester-IV**

**Physics- PH-401**

**Paper VII: Statistical Physics**

**Max.Marks:40**

**Internal assessment:10**

**Time:3 Hours**

**Note:**

1. The syllabus is divided into 4 units. 9 questions will be set.
2. Question no 1 will be compulsory, it contains 6 parts (form all the four units) and answer should be brief but not in yes / no.
3. Four more questions are to be attempted, selecting one question from each unit.
4. Questions 2-9 may contain two or more parts. All questions carry equal marks.
5. 20% numerical problems are to be set.
6. Use of scientific (non-programmable) calculator is allowed.

#### **Unit –I: Statistical Physics I**

Microscopic and Macroscopic systems, events-mutually exclusive, dependent and independent. Probability, statistical probability, A- priori Probability and relation between them, probability theorems, some probability considerations, combinations possessing maximum probability, combination possessing minimum probability, Tossing of 2,3 and any number of Coins, Permutations and combinations, distributions of N (for N= 2,3,4) distinguishable and indistinguishable particles in two boxes of equal size, Micro and Macro states, Thermodynamical probability, Constraints and Accessible states, Statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, Condition of equilibrium between two systems in thermal contact--  $\beta$  parameter, Entropy and Probability (Boltzman's relation).

#### **Unit –II: Statistical Physics II**

Postulates of statistical physics, Phase space, Division of Phase space into cells, three kinds of statistics, basic approach in three statistics. M. B. statistics applied to an ideal gas in equilibrium- energy distribution law (including evaluation of  $\sigma$  and  $\beta$ ), speed distribution law & velocity distribution law. Expression for average speed, r.m.s. speed, average velocity, r. m. s. velocity, most probable energy & mean energy for Maxwellian distribution.

#### **Unit-III: Quantum Statistics**

Need for Quantum Statistics: Bose-Einstein energy distribution law, Application of B.E. statistics to Planck's radiation law B.E. gas, Degeneracy and B.E. Condensation, Fermi-Dirac energy distribution law, F.D. gas and Degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution law, Fermi Dirac gas and degeneracy,

**Fermi energy and Fermi temperature, Fermi Dirac energy distribution law for electron gas in metals, Zero point energy, Zero point pressure and average speed (at 0 K) of electron gas, Specific heat anomaly of metals and its solution. M.B. distribution as a limiting case of B.E. and F.D. distributions, Comparison of three statistics.**

#### **Unit-IV: Theory of Specific Heat of Solids**

**Dulong and Petit law. Derivation of Dulong and Petit law from classical physics. Specific heat at low temperature, Einstein theory of specific heat, Criticism of Einstein theory, Debye model of specific heat of solids, success and shortcomings of Debye theory, comparison of Einstein and Debye theories.**

#### **References:**

- 1. Prakash S and Agarwal J P, Statistical Mechanics, Kedar Nath Ram Nath & co, Meerur**
- 2. Reiff. statistical Physics, Berleley Physics Course Volume 5, Mc Graw Hill Book Co Ltd, New Delhi**
- 3. Mc Quarrie D A. Statistical Mechanics, Viva Books Pvt Ltd, New Delhi.**
- 4. Ashley Cmter (August 1999), Classical and Statistical Thermodynamics .**
- 5. Richard Fitzpatrick, Thermodynamics and Statistical Mechanics: An intermediate level course Lulu.com,2007**

**B.Sc.-II  
Semester-IV**

**Physics-PH- 402**

**Paper VIII: Wave and Optics II**

**Max. Marks:40  
Internal Assessment: 10  
Time: 3 Hours**

**Note:**

1. The syllabus is divided into 4 units. 9 questions will be set.
2. Question no 1 will be compulsory, it contains 6 parts (form all the four units) and answer should be brief but not in yes / no.
3. Four more questions are to be attempted, selecting one question from each unit. Questions 2-9 may contain two or more parts. All questions carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

**Unit-1: Polarization**

**Polarization: Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction, Huygen's wave theory of double refraction (Normal and oblique incidence), Analysis of polarized Light. Nicol prism, Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically polarized light. Optical activity, Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz).**

**Unit-II: Fourier analysis**

**Fourier theorem and Fourier series, evaluation of Fourier coefficient, importance and limitations of Fourier theorem, even and odd functions, Fourier series of functions  $f(x)$  between (i) 0 to  $2\pi$ , (ii)  $-\pi$  to  $\pi$ , (iii) 0 to  $\pi$ , (iv)  $-L$  to  $L$ , complex form of Fourier series, Application of Fourier theorem for analysis of complex waves: solution of triangular and rectangular waves , half and full wave rectifier outputs, Parseval identity for Fourier Series, Fourier integrals.**

### **Unit III: Fourier transforms**

**Fourier transforms and its properties, Application of Fourier transform (i) for evaluation of integrals, (ii) for solution of ordinary differential equations, (iii) to the following functions:**

1.  $f(x) = e^{-x^2/2}$

2.  $f(x) = \begin{cases} 1 & |X| < a \\ 0 & |X| > a \end{cases}$

### **Geometrical Optics I**

**Matrix methods in paraxial optics, effects of translation and refraction, derivation of thin lens and thick lens formulae, unit plane, nodal planes, system of thin lenses.**

### **Unit-IV: Geometrical Optics II**

**Chromatic, spherical, coma, astigmatism and distortion aberrations and their remedies.**

#### **Fiber Optics**

**Optical fiber, Critical angle of propagation, Mode of Propagation, Acceptance angle, Fractional refractive index change, Numerical aperture, Types of optics fiber, Normalized frequency, Pulse dispersion, Attenuation, Applications, Fiber optic Communication, Advantages.**

#### **References**

- 1 Born M and Wolf E, Principles of Optics, Pergaman Press
- 2 Jenkins and white, Fundamentals of Optics, McGraw Hill Book Co Ltd, New Delhi
- 3 Moller K D, Optics, University Science Books, Mill ally California
- 4 Tolansky, An Introduction to Interferometry, John Wiley & Sons, New Delhi
- 5 Shurcliff, Polarized Light Production and Use, Harward University Press, Cambridge, M A (USA)
- 6 Arora C L, Refresher Course in Physics Vol II, S Chand and Co, New Delhi.

**B.Sc.-II**

**Physics Practicals  
Paper- (Physics lab Practicals)**

**Max. Marks: 100**

**Time: 3 + 3 Hours (in two days)**

**SPECIAL NOTES**

- 1. Do any eight experiments from each Section.**
- 2. The students are required to calculate the error involved in a particular experiment.**

**Note:-**

**1 The Practical examination will be held in two sessions of 3 hours each (first session in the evening of first day and the second session in the morning of the next day).**

**2. Distribution of Marks:**

**Experiments (2): 25 + 25  
= 50**

**Viva-voce 15 + 15 = 30**

**Lab. Record 10 + 10 = 20**

**Total = 100**

**For giving marks under Lab. Record, each college will maintain practical assessment record by using the following procedure:-**

- I. Each student has to perform a minimum number of experiments prescribed in the syllabus.**
- II. After the completion of a practical, the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the Lab. Record.**
- III. To complete the final marks for Lab. Record a separate register for each class of B.Sc. will be maintained. The student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average, the total marks obtained will be divided by the total number of required practicals, instead of the number of practicals performed by the student.**

**This record will be signed by the concerned teacher.**

**IV. The Lab. record register will be presented to the external practical examiners for lab. record marks. The external examiners will verify the record randomly.**

#### **Section-A**

- 1. To measure the (a) area of a window  
(b) height of an inaccessible object.**
- 2. Refractive index and dispersive power of a prism material by spectrometer.**
- 3. To draw a graph between wave length and minimum deviation for various lines from a Mercury discharge source.**
- 4. Determination of wave length of Na light and the number of lines per centimeter using a diffraction grating.**
- 5. Wave length by Newton's Rings.**
- 6. Resolving power of a telescope.**
- 7. Comparison of Illuminating Powers by a Photometer.**
- 8. Measurement of (a) Specific rotation (b) concentration of sugar solution using polarimeter.**
- 9. Ordinary and extra ordinary refractive indices for calcite or quartz.**
- 10. To find the equivalent focal length of a lens system by nodal slide assembly.**

#### **Section -B**

**It will contain two parts (i) Electronics and (ii) Computer experiment.  
Students have to perform a minimum of four experiments from each part.**

##### **(i) Electronics.**

- 11. To draw common base and common emitter characteristics of a transistor and calculate transistor characteristics parameters.**
- 12. To study the ripple factor in a d.c. power supply.**
- 13. Study of Hartley oscillator (calibration of gang condenser).**
- 14. To find out the frequency of a tuning fork by Melde's experiment.**
- 15. Study of series and parallel resonance circuits.**
- 16. Electronic Voltmeter measurement of peak, average & R.M.S. value of signal.**
- 17. Study of voltage doubler and tripler circuits.**

##### **(ii) Computer Experiments.**

- 18. To print out all natural (even/odd) numbers between given limits using computer.**
- 19. To find maximum, minimum and range of a given set of numbers using computer.**
- 20 To evaluate sum of finite series.**
- 21. Find the roots of a quadratic equation.**
- 22. To find integration of a definite integral by trapezoidal rule.**
- 23. To find the area of a triangle, sphere and cylinder.**
- 24. Given values for a, b, c and d and a set of values for the variable x evaluate the function defined by.  $f(x)$**

$$= ax^2 + bx + c \text{ if } x < d$$

$$f(x) = 0 \quad \text{if } x = d$$

$$f(x) = ax^2 + bx - c \text{ if } x > d$$

For each value of  $x$  and print the value of  $x$  and  $f(x)$ . Write a program for an arbitrary number of  $x$  values.

#### References:

1 Worshnop and Flint, Advanced Practical Physics

2 Nelkon M and Ogborn, Advanced Level Practical Physics, Heinemann Education Bookd Ltd, New Delhi

3 Srivastava S S and Gupta M K, Experiments in Electronics, Atma Ran & Sons, Delhi 4 Gupta S L and Kumar V, Practical Physics, Pragati Prakashan, Meerut