UNIVERSITY OF JAMMU

NOTIFICATION
(18/March./Adp/69)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the Syllabi and Courses of Study in the subject of **B.Sc. Physics** for the Vth and VIth Semesters under the **Choice Based Credit System** at the Undergraduate level **(as given in the Annexure)** for the Examinations to be held in the years indicated against each semester as under:-

Subject	Semester	For the examinations to be held in the year
B.Sc.(Physics)	Semester-V	December 2018, 2019 and 2020
	Semester-VI	May 2019, 2020 and 2021

The Syllabi of the courses is available on the University website: www.jammuuniversity.in

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/18/2-58
Dated: 2-4-2018

Copy for information and necessary action to:

1. Special Secretary to the Vice Chancellor, University of Jammu for the kind information of the Worthy Vice-Chancellor please
2. Sr. P.A. to the Dean Academic Affairs/ Dean Research Studies
3. Sr. P.A. to the Registrar/Controller of Examinations
4. Dean, Faculty of Science
5. HOD/Convener, Board of Studies in Physics
6. All members of the Board of Studies
7. C.A to the Controller of Examinations
8. I/c Director, Computer Centre, University of Jammu
9. Asst. Registrar (Conf. /Exams. UG/ Inf./Pub.)
10. Incharge, University Website for necessary action please.

Assistant Registrar (Academic)

B.Sc. Semester –V

Discipline Specific Elective

Syllabus for Examinations to be held in Dec. 2018, 2019, 2020

Subject: Physics

Course Code/No: UPYTE-501

No of credits: 04

Duration 2.5 hours

Title of the course: Modern Physics

Total Marks: 100 (End Semester Examination: 80 Internal Assessment Test 20)

Unit-I: Quantum Mechanics-I

Limitations of classical laws, Quantum theory of radiation, Compton effect and its experimental verification, Wave–particle duality, Davisson and Germer experiment, Wave packets, Phase and group velocities, Wave packets and Uncertainty principle, Applications of Uncertainty Principle to (i) Particle in a box, (ii) Electron Diffraction from a single Slit, (iii) Non-existence of electron in the nucleus.

Derivation of Schrodinger Equation in time dependent and independent forms, Wave function and its physical Significance, Physical Observables and Operators, Probability current density and equation of continuity.

Unit-II: Quantum Mechanics-II

One Dimensional Problems: Solution of Schrodinger Wave equation for (i) Particle in a box (ii) Finite potential well (quantum mechanical tunneling) (iii) Harmonic oscillator

Three dimensional Problems: Schrodinger Equation for a Spherically Symmetric Potential in Spherical Polar Coordinates, its separation into angular, radial equations using variable separable method, Solution of Radial equation for Coulomb type of potential, Interpretation of Principal Quantum number (n), Solution of equations of Angular part and Interpretation of 'l' and 'm' quantum numbers, Hydrogen Atom Wave Functions.

Unit-III: Atomic Physics

Frank and Hertz Experiment, Space Quantization, Larmor's Precession, Bohr's Correspondence Principle, Electron spin, Stern Gerlach Experiment, Vector Atom Model (ls, jj coupling), Spectroscopic Terms and their notations, Spin-Orbit interaction, Fine Structure of Hydrogen Atom, Normal and Anomalous Zeeman Effect, D1 and D2 lines of Sodium Atom, Paschen Back Effect for one electron atoms.

Unit-IV: Nuclear Physics –I

Nuclear size, mass, charge, density, spin and magnetic moment, Measurement of nuclear radius by electron scattering method and Mirror Nuclei method, Packing Fraction, Mass Defect, Binding energy, Binding energy curve, Nuclear Stability, Liquid Drop Model of Nucleus, Weizsacker's Semi-Empirical Mass Formula, Nuclear Forces and their properties, α-decay, Discrete nature of α-particle energies, Measurement of velocity of α-particle, β-decay, β- particle energy spectrum, Pauli's neutrino hypothesis, Inverse Beta decay, γ-decay (brief idea), Internal conversion.

Unit-V: Nuclear Physics –II

Energy Loss of charged particle through matter, Bethe Bloch formula, Particle detectors like Ionization Chamber, Proportional Counter and G.M. Counter, Classification of elementary particles, Elementary particle quantum numbers-Baryon and Lepton numbers, Strangeness, Isospin, Quark as the basic constituent of matter, quark properties, Quark contents in low lying Baryons and Mesons, Fundamental Forces in nature.

Scheme for Internal Assessment Test: The internal assessment shall comprise of two parts :

Part A: Total weightage to this part shall be 50% of internal assessment marks i.e. 50 % of the total marks or 10 marks out of 20 marks reserved for internal assessment. It will have eight short questions selecting at least three from each of the two/three units (50% of syllabus) covered. A candidate has to attempt any five questions and each question carries 2 marks.

Part B: Total weightage to this part shall be 50% of the internal assessment marks i.e. 50 % of the total marks or 10 marks out of 20 marks reserved for internal assessment. It will have 2 Long questions, selecting one each from first two units/ 50% of the syllabus: A Candidate has to attempt any one question and the question shall carry 10 marks

Time duration : One hour

Note for examiners/paper setters

The External examination in theory shall consist of the following:

1. Five (5) short answers to the questions representing all units/syllabi i.e. at least one from each unit (without detail explanation having 70 to 80 words in approximately 6 minutes and having 3 marks for each answer to the question (All Compulsory).

2. Five (5) medium answers to the questions representing all units/ syllabi i.e. at least one from each unit (with explanation having 250-300 words in approximately 12 minutes and having 7 marks for each answer to the question (All Compulsory).

3. Five (5) long answers to the questions (two to be attempted) representing whole of the syllabi with detailed analysis/explanation/critical evaluation/solution to the stated problems within 500 - 600 words in approximately 30 minutes and having 15 marks each answer to the question.

Books for Study and Reference

1. Quantum Mechanics- SatyaParkash

2. Quantum Mechanics – L.I. Schiff, Mc.Graw Hill Books Company Inc.

3. Concepts of Modern Physics – A. Beiser, Tata McGraw Hill Publication.

4. Modern Physics-A.K. Sikri

5. Atomic Spectra – H.E. White, Tata McGraw Hill.

6. Fundamentals of Molecular Spectroscopy – C. N. Banwell and E. M. Mac Cash, Tata McGraw Hill.

7. Atomic Spectra – G. Heizberg.

8. Molecular Spectra & Molecular Structure – G. Heizberg.

9. Nuclear Physics – D.C.Tayal, Himalaya Publishing House.

10. Nuclear Radiation Detector – S.S.Kapoor.

11. Nuclear Physics – S.N. Ghoshal.

Physics (Semester-V)

(For examinations to be held in the years Dec 2018, 2019, 2020)

Course No. : UPHTE-502(Practical) **Title: Lab Course V**
Duration: 3 hours **Credits: 2**
Maximum Marks: 50
External Examination: 25 Marks **Internal Examination: 25 Marks**

Note: The candidates are required to complete atleast 5 practicals.

1. To find Dispersive power of a prism.
2. To find Brewster Angle and refractive index of material of given prism.
3. To find Self-inductance by Anderson Method.
4. Find Voltage regulating characteristic of Zener Diode.
5. Thyratron ball.
6. To find e/m by Helical Method.
7. Planck's constant using different filters

Instructions for Internal Assessment (25 marks)

(a) 20 percent attendance

(b) 40 percent practical work based on the practical done as per time table (Day to day performance)

(c) 20 percent internal test (to be conducted by the class teacher or a committee of subject teachers constituted by principal of the College)

(d) 20 percent Viva Voce

Instructions for External Examination (25 marks)

(a) 80 percent for practical paper

(b) 20 percent for Viva Voce

Note : Total marks (internal+external) in practical shall be 50 only

The concerned deptt. can add or delete practicals as per their need.

Reference Books

1. B. Sc Practical Physics - C. L. Arora.
2. Practical Physics - G L Squires Cambridge University Press
3. Practical Physics - R K Shukla
4. B.Sc Practical Physics - Harnam Singh

B.Sc. Semester --V

Syllabus for Examinations to be held in Dec. 2018, 2019, 2020
(Skill Enhancement Course)

Subject: Physics

Course Code/No: UPHTS-503

No of credits: 04

Duration 2.5 hours

Title of the course: Basic Instrumentation Skills

Total Marks: 100 (Internal Assessment (Minor): 20 marks and External Examination (Major): 80 marks)

Unit-I

Basics of Measurement: Multimeter: Principles of measurement of dc voltage, dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage measurement (Block diagram only). Specifications of an electronic voltmeter/multimeter and their significance. AC millivoltmeter: Types of AC millivoltmeters—amplifier-rectifier and rectifier-amplifier. Block diagram of ac millivoltmeter, specifications and their significance.

Unit-II

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (explanation only—no mathematical treatment), brief discussion on screen phosphor, visual persistence and chemical composition. Time base operation, synchronization. Front Panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac), frequency, time period. Special features of dual trace, introduction to digital oscilloscope.

Unit-III

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. Pulse generator and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

Impedance Bridges and Q-Meters: Block diagram of bridge. Working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram and working principles of a Q-Meter. Digital LCR bridges.

Unit-IV

Digital Instruments: Principle and working of digital meters. Comparison of analog and digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time-base stability, accuracy and resolution.

Laboratory Skills:

1. Use of an oscilloscope
2. CRO as a versatile measuring device
3. Circuit tracing of laboratory electronic equipment
4. Use of digital multimeter/VTVM for measuring voltages
5. Winding a coil/transformer
6. Balancing of bridges

Laboratory Exercises:

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. Measurement of voltage, frequency, time period and phase angle using CRO
4. Measurement of rise, fall and delay times using a CRO
5. Measurement of R, L and C using LCR bridge/universal bridge.

Reference Books:

1. A text book in Electrical Technology – B.L. Threja--S. Chand and Co.
2. Performance and Design of AC Machines--MG Say ELBS Edn.
3. Digital Circuits and Systems, Venugopal, 2011, Tata McGraw Hill.
4. Logic Circuit Design, Shimon P. Vingron, 2012, Springer
5. Digital Electronics, Subrata Goshal, 2012, Cengage Learning.
6. Electronic Devices and Circuits, S. Salivahanan and N.S. Kumar, 3rd Ed., 2012, Tata McGraw Hill.
7. Electronic Circuits: Handbook of Design and Applications, U. Tietze, Ch. Schenk, 2008, Springer.
8. Electronic Devices, 7/e Thomas L. Floyd, 2008 Pearson India.

Scheme for Internal Assessment(Minor) (20 marks; internal evaluation):

Setting of Question Paper and Evaluation of answer scripts by the teacher concerned:

The internal assessment shall comprise of two parts:

Part A: Test based on practical knowledge of the candidate/Subject tour (Total weightage: 10 marks)

Part B: Test based on Theoretical knowledge of the candidate (Total weightage: 10 marks)

Scheme for External Examination(Major) (80 marks; internal evaluation)

Setting of Question Paper by the concerned Subject Head of the College

The External Examination in theory shall consist of the following:

1. Five short answer questions representing all units/syllabi (without detail explanation, 70 to 80 words, 3 marks for each question) (All compulsory)
2. Five medium answer questions representing all units/syllabi (with explanation having 200-250 words, 7 marks for each question) (All compulsory)
3. Four/Five long answer questions representing whole syllabi (with detailed analysis/explanation/critical evaluation/ solution to problems within 400-500 words, 15 marks for each question) (The candidate have to attempt any two questions)

B.Sc. Semester –VI

Discipline Specific Elective

Syllabus for Examinations to be held in ~~April~~ May 2019, 2020, 2021

Subject: Physics

Course Code/No: UPYTE-601

No of credits: 04

Duration :2.5 hours

Title of the course: Solid State Physics, Quantum Optics and Electronics

Total Marks: 100 (End Semester Examination: 80 ,Internal Assessment Test :20)

Unit-I: Crystallography

Crystal Lattices and Translation Vectors, basis, Unit cell and Wigner –Seitz cell, Symmetry operations, Bravais lattices in two and three dimensions, Miller Indices, Some examples of identification of crystal planes, Interplanar spacing between lattices, Reciprocal lattice and its application to simple cubic, bcc and fcc. Laue's theory of X-ray diffraction, Bragg's law, Experimental methods in X-ray diffractions (laue, Rotating crystal and powder method)

Unit-II: Lattice vibrations , Superconductivity and Crystal Defects

Lattice vibrations: Normal modes of lattice, vibration of one-dimensional monoatomic lattice,Phonons, density of modes, specific heat of solids, Einstein's Theory and Debye's model of specific heat of solids

Superconductivity: Experimental Observation , Meissner effect, Type I & II superconductors, BCS theory (Qualitative idea)

Crystal defects: Types of defects, Schottky and Frankel defects, Equilibrium number of Frankel and Schottky defects

Unit-III: Magnetic Properties of Materials

Introduction, Response of substance to Magneic Field, Dia-, Para-, Ferri- and Ferromagnetic Materials.Classical Langevin Theory of dia – and Paramagnetic Domains, Quantum Mechanical Treatment of Paramagnetism, Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains, Discussion of B-H Curve, Hysteresis and Energy Loss

Unit-IV: Quantum Optics

Fibre Optics: Optical fibre and its types, Critical angle of propagation, modes of propagation, Acceptance
angles, Numerical aperture, Pulse dispersion, Attenuation and its various mechanism,
Advantages and applications of optical fibres.

LASER: Interaction of light with matter,(absorption, spontaneous, Einstein's prediction, stimulated emission), Einstein's relations, Light amplification,

Population inversion, Pumping, Principal pumping schemes (three and four levels),Optical resonant cavity, conditions for laser action.
Types of lasers (Ruby& He- Ne), Characteristics and applications of laser

Unit-V: Electronics

Classification of amplifiers, General principles of operation of small signal amplifiers, Distortion in amplifiers, Review of BJT'S, Equivalent Circuit and Hybrid parameters , Gain and frequency response(low, mid, high) of R-C couple and transformer coupled amplifiers, feedback in amplifiers and its types, voltage gain of feedback amplifiers.
Classification of transistor oscillators, Barkhausen criteria, Hartley, Colpitt and Phase shift oscillators.

Scheme for Internal Assessment Test: The internal assessment shall comprise of two parts :

Part A: Total weightage to this part shall be 50% of internal assessment marks i.e. 50 % of the total marks or 10 marks out of 20 marks reserved for internal assessment. It will have eight short questions selecting at least three from each of the two/three units (50% of syllabus) covered. A candidate has to attempt any five questions and each question carries 2 marks,

Part B: Total weightage to this part shall be 50% of the internal assessment marks i.e. 50 % of the total marks or 10 marks out of 20 marks reserved for internal assessment. It will have 2 Long questions, selecting one each from first two units/ 50% of the syllabus: A Candidate has to attempt any one question and the question shall carry 10 marks

Time duration : One hour

Note for examiners/paper setters

The External examination in theory shall consist of the following:

1. Five (5) short answers to the questions representing all units/syllabi i.e. at least one from each unit (without detail explanation having 70 to 80 words in approximately 6 minutes and having 3 marks for each answer to the question (All Compulsory).

2. Five (5) medium answers to the questions representing all units/ syllabi i.e. at least one from each unit (with explanation having 250-300 words in approximately 12 minutes and having 7 marks for each answer to the question (All Compulsory).

3. Five (5) long answers to the questions (two to be attempted) representing whole of the syllabi with detailed analysis/explanation/critical evaluation/solution to the stated problems within 500 - 600 words in approximately 30 minutes and having 15 marks each answer to the question.

Books for Study and Reference:

1. A Text Book of Electrical Technology - B. L. Theraja, S. Chand & Co.
2. Principles of Electronics - V. K. Mehta, S. Chand & Co.
3. Solid State Physics & Electronics - Babbar & Puri, R. Chand
4. Introduction to Solid State Physics - C. Kittel, John wiley & Son 7 th Editio.
5. Solid State Physics - S.O. Pillai, New Age International
6. Solid State Physics - A. J. Decher, Macmillan
7. Elementary Solid State Physics - R. Raramaswamy, Lakshmi Publications, Madhurai
8. Superconductivity - T. V. Ramakrishnan and N. R. Rao, Wiley Eastern Ltd.
9. Solid State Physics - R. L. Singhal, Kedar Nath and Co.
10. Solid State Physics - G. I. Epifanov, Mir Publishers, Mowcow