PKT. No. 12.

12

UNIVERSITY OF MUMBAI

No.UG/ 59 of 2004

CIRCULAR :

Attention of Principal of the affiliated colleges in the faculty of Science is hereby invited to the Ordinances, Regulations and Syllabus relating to the B.Sc. degree course vide Circular No.UG/346 of 1997 dated 29th September, 1997 and they are hereby informed that the recommendation made by the Board of Studies in Physics at its meeting held on 14th November, 2003 has been accepted by the Academic Council at its meeting held on 3rd January, 2004 vide item No. 4.9 and that in accordance therewith the syllabus in the subject of Physics at the T.Y.B.Sc.(Single/Twin major subjects) examination has been revised as per Appendix and that the same will be brought into force with effect from the academic year 2004-2005.

Mumbai 400 032,
24th February, 2004.

for REGISTRAR.

A.C.4.9/03.01.2004

To,

The Principal of the affiliated Colleges in Science.

No.UG/ 59-A of 2004 24th February, 2004.

Copy forwarded with Compliments to for information

1) The Dean, Faculty of Science.
2) The Chairman, Board of Studies in Physics,

for REGISTRAR.

Copy to :

The Director, Board of College and University Development, the Controller of Examinations/the Deputy Registrar (Eligibility & Migration Section), the Director of Students Welfare, the Personal Assistants to the Vice-Chancellor, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar, Administrative sub-centre, Ratnagiri, for informations.

The Controller of Examinations (10 copies), F. & A. O., (Accounts Section) Fort, (2 copies), Record Section (5 copies), Publication Section (5 copies), D.R., (Enrollment, Eligibility & Migration Section - 3 copies), D.R., (Statistical Unit) (2 copies), D. R., Accounts Section), Vidyanagari, (2 copies), D. R. (Affiliation Section) (2 copies), A. A. A. Unit (2 copies) He is requested to treat this as Action taken report on the concerned resolution adopted by the

A.C. Item No. 4.9 dt. 3/1/2004

UNIVERSITY OF MUMBAI

Revised Syllabus
for
T.Y.B.Sc. (Physics)

(with effect from the academic year 2004-2005)

REVISED SYLLABUS FOR T.Y.B.Sc. (PHYSICS) 2004-05

1. The revised syllabus in the subject of Physics at the Third Year B.Sc. Physics (Single/Twin major subjects) Examination will be implemented from the academic year 2004-05.
2. The scheme of examination for the revised course in Physics at the Third Year B.Sc. examination will be as follows:
3.

Paper	Section	Topic	Marks
Paper (I) (100 marks)	Section-I Section-II	Solid State Physics Electronics	50 50
Paper (II) (100 marks)	Section-I Section-II	Atomic & Molecular Physics Nuclear Physics	50 50
Paper (III) (100 marks)	Section-I Section-II	Mechanics Statistical & Thermal Physics	50 50
Paper (IV) (100 marks)	Section-I Section-II	Relativity & Cosmology Electrodynamics	50 50
Practicals	Practicals - I	Practical Paper-I (Group-I Experiments)	40
	Practicals – II	Practical Paper-II (Group-II Experiments)	40
	Practicals - III	Practical Paper-III (Group-III Experiments)	40
	Practicals - IV	Practical Paper-IV(3 short Experiments :Group-IV)	40
		Certified Journal (Regular Experiments + Demonstration Experiments)	20
		VIVA	20
	Total Marks:	**Theory** **Practicals**	**400** **200**
		Aggregate marks in the subject of Physics	**600**

4. For 6 unit stream (Single major) all four theory papers are compulsory
   For 3 unit stream (Twin major) Paper-I and Paper-II are compulsory.
5. Each theory paper shall be of THREE hour duration. The candidates shall be required to attempt SIX questions in all. Since each of the four papers at T.Y. B.Sc. has two sections of equal weightage, with three units per section, the question paper shall consist of twelve questions in all, with two questions per unit. The candidate shall have an option of questions answering any ONE of the two questions set in a given unit only, so as to make up a total of six questions to be answered in all.
6. The details of scheme of practical examination for both 6 unit and 3 unit streams will be found along with the syllabus for practicals.
7. A candidate will be allowed to appear for the practical examination only if the candidate submits certified journal of T.Y.B.Sc. Physics or a certificate from the Head of the Department to the effect that the candidate has completed the practical course of T.Y.B.Sc. Physics as per the minimum requirements.

PAER I : SECTION-I
SOLID STATE PHYSICS

UNIT-1 (20)

1. Crystal Physics : Lattice points and space lattice, Unit cells, Primitive cells, Crystal systems, Directions, Planes, Miller indices, Distributions, of atoms in atomic planes in a simple cubic crystal, The Bravias space lattices, separation between planes in a cubic crystal.
2. Electrical Properties of Metals : Classical free electron theory, Drawbacks, Relaxation time, Quantum theory, Density of energy states and Fermi energy, Fermi distribution, Heat Capacity, Mean energy at 0 K, Effect of temperature, Electrical conductivity from Q. M. considerations. Thermionic emission.
3. Superconductivity: A survey, Mechanism of superconductivity, Effects of magnetic fields, Messiner effect, Penetration depth, Type-I and Type-II superconductors.

UNIT-2 (20)

1. Band theory of Solids: Band theory of solids, Kroning Penny model (omit eq. 6.184 to 6.188) Brillouin zones, Number of wavefunctions per band, motion of electrons in one dimensional periodic potential. Distinction between metals, insulators and semiconductors.
2. Magnetic properties of matter: Diamagnetism, Paramagnetism, Origin of permanent magnetic dipoles, Larmor precession, Static paramagnetic susceptibility, Ferromagnetism-Weiss molecular field, Comaparison of Weiss theory with experiment, Qualitative remarks about domains, Qualitative idea about antiferromagnetism and ferrites.

UNIT-3 (20)

1. Conduction in semiconductors : Electrons and holes in semiconductors, Conductivity, Carrier concentration, Donor and acceptor impurities, Charge densities, Fermi levels in extrinsic semiconductors, Diffusion, carrier lifetime, Continuity equation, Hall effect.
2. Semiconductor Diode Characteristics: Qualitative theory, p-n junction as a diode, Band structure, Current components in a p-n junction, Qualitative theory of currents, Volt-ampere characteristics, Diode resistance, Transition capacitance, diffusion capacitance, Temperature dependence of p-n characteristics.

REFERENCES:

UNIT-1

1. SOP : Ch. 4, Art. II to VI, XIV to XXII
2. SOP : Ch.6, Art. I to V, XIV to XX, XXXI
3. SOP : Ch. 8, Art. VII, XII & XIII, Additional Ref: Ali Omer : Introduction to Solid State Physics.

UNIT-2

1. SOP : Ch. 6 Art. XXXVI to XXXXI
2. D : Art. 18.1 to 18.4 to 19.3, 19.5, 19.9, 19.12

UNIT-3

1. MH : Ch. 5, Art 5.1 to 5.10
2. MH : Ch. 6, Art 6.1 to 6.10

REFERENCES:

1. SOP : " Solid State Physics" (Wiley Eastern Ltd.) by S O Pillai.
2. MH : " Electroni Devices and Circuits" (McGraw Hill International) by Millman & Halkias.
3. D : " Solid State Physics" by A J Dekker

4. For problem Solving : Problems & Solutions in Solid State Physics (Willey Eastern) by S O Pillai.

PAER I : SECTION-II
ELECTRONICS

UNIT-4 **(20)**

1. Filed Effect Transistors : JFET : Basic Ideas, Drain curve, the transconductance curve, Biasing in ohmic region and the active region, Transconductance, JFET common source amplifier, JFET analog Multiplexer, voltage controlled resistor, current sourcing MOSFETs : Depletion and Enhancement mode MOSFET, operation and characteristics,Digital Swichting.
2. Thyristors and Optoelectronic Devices:
   SCR: Working, Equivalent circuit, I-V characteristics, Half-wave rectifier using SCR.
   TRIAC and DIAC: Construction, Operation, i-v characteristics, Application of TRIAC and DIAC
   Optoelectronic Devices: Photo-diode, Photo-transistor, Optocoupler.

UNIT-5 **(20)**

1. Differential Ampilfier using Transistors:
   DC and AC analysis, Effect of input bias and offset current and input offset voltage on output, Common mode gain, CMRR, Current mirror.
2. OPAMP applications:
   Log amplifier, Instrumentation amplifier, Voltage controlled current source (grounded load), Integrator, Differentiator, Active filters, (1^{st} order), Astable using OPAMP, Square wave and triangular wave generator using OPAMPS, Wein's bridge oscillator using OPAMP.
3. Transistor Multivibrators:
   Astable, monostable and bistable multivibrators, Schmitt trigger.
4. 555 Timer
   Block digram, Astable and Monostable (with VCO), Triggered linear Ramp generator.

UNIT-6 **(20)**

1. Logic Families
   Standard TTL NAND, TTL NOR, Open collector gates, Tri-state inverter, CMOS inverter, CMOS NAND and NOR gates, CMOS characteristics.
2. Applications of JK filp flops
   Asynchronous counters : MOD-3, MOD-5 and Decade counters, Up-Down counter, Synchronous MOD-8 binary counter, 4-bit shift register(serial-in), Johnson counter
3. Regulated DC power supply
   Supply characteristics, Series voltage regulator, Short-circuit protection (current limit and fold back) monolithic linear IC voltage regulators (LM 78XX, LM 79XX and LM 317)
4. Electronic Communication Techniques
   Amplitude modulation and demodulation, Modulation factor, Analysis of A.M., Side band frequencies, Transistor amplitude modulator, Power in A. M., Limitations of A. M., Frequency modulation(qualitative)

REFERENCES:

UNIT-4

1. M : Ch. 13.1 to 13.8, 14.1, 14.2, 14.4
2. VKM : Ch. 22.1 to 22.10, 23.1 to 23.8, 5.8 & 7.10

UNIT-5

1. M : Ch. 17 (omit 17.6 & 17.8)

2. M : Ch. 20.5, 20.8, 21.4, 22.5, 22.7, 22.8, 22.10, 23.2
3. KVR : Ch. 14.5.2.1, 14.5.2.5, 14.5.2.6, 14.5.4.1
4. M : Ch. 23.7, 23.8, 23.9

UNIT-6

1. M. L. : Ch. 7.2, 7.3, 7.4
2. M. L. : Ch. 10.2, 10.3, 11.2 to 11.5, 11.7, 13.1, 13.2, 13.4, 13.6
3. M. : 24.1, 24.3, 24.4
4. VKM : Ch. 18.1 to 18.18

REFERENCES:

1. M : Electronic Principles (6 th Ed.) TMH – A. P. Malvino
2. VKM : Principles of Electronics (7th Ed.) S. Chand – V K Mehata
3. M. L. : Digital Principles and Applications (4th Ed) TMH – Malvino-Leach
4. KVR : Functional Electronics (th Ed.) TMH – K. V. Ramanan.

PAER II : SECTION - I
ATOMIC AND MOLECULAR PHYSICS

UNIT-1 **(20)**

1. (i) Schrodinger's equation for harmonic oscillator, its solution by operator method
   (ii) Graphical representation of its energy level wavefunctions (Ψ^2_0 , Ψ^2_1).
2. Hydrogen Atom : Schrodinger's equation for hydrogen atom, separation of variables, Quantum numbers-total, orbital, magnetic, Angular momentum, Electron-probability density (Radial Part)
3. Electron Spin : The Stern-Gerlac experiment, Pauli Exclusion principle, Symmetric and Antisymmetric wavefunctions.

UNIT-2 **(20)**

1. (i) Spin orbit coupling, Hund's Rule, Total Angular Momentum, Vector Atom Model, L-S and J-J coupling, Equivalent and Non-equivalent electrons.
   (ii) Origin of spectral lines, Selection rules.
   (iii) Optical Spectral Series : Principal, Sharp, Diffuse and Fundamental, Spectrum of Sodium.
2. Effect of magnetic field on atoms, the normal Zeeman effect, its explanation using magnetic quantum number. The Lande-g factor, Anomalous Zeeman effect.
3. Paschen back effect of principle series doublet, Selection rules for Paschen-Back effect.

UNIT-3 **(20)**

1. Molecular Spectra(Diatomic Molecules) : Rotatinal energy levels, Rotational Spectra, Vibrational energy levels, Vibrational-rotation spectra.
   Electronic Spectra of diatomic molecules, vibrational course structure, Intensity of vibrational electronic spectra, The Frank-Condon principle.
2. Raman Effect: Quantum Theory of Raman Effect, Classical Theory of Raman Effect, Pure Rotational Raman Spectra, Rotational Fine Structure, Experimental Setup fro Raman Effect.

REFERENCES:

UNIT-1

1. (i) M - 5.2 (ii) B - 8.7
2. B – 9.1 to 9.9
3. B – 10. 1, 10.3, 10.4, 10.5

UNIT-2

1. (i) B- 10.2, 10.6, 10.7, 10.8, 10.9, W : 13.11
   (ii) B-11.1 and 11.2
   (iii) S.A. 9.2, 9.12

2. S. A.-9.14, 9.15, 9.16, 9.17
3. W : 10.7, 10.8 and 10.9

UNIT-3

1. B - 14.1, 14.3, 14.7
   Ba - Ch. 6 Art 1.1, 1.2, 1.3
2. Ba – Ch. 4 Art 4.1.2, 4.2.1, 4.3.4, 4.3.5, 4.6

REFERENCES:

1. B : Perspectives of Modern Physics – Arthur Beiser
2. SA : Introduction to Atomic and Nuclear Physics – H. Semat and J. R. Albright (5th Ed.)
3. W : Introduction to atomic Spectra – White H. E.
4. Ba : Fundamental of molecular spectroscopy – Barnwell (TMH)
5. M : Introduction to Quantum Mechanics by Mathews

PAPER-II : SECTION-II
NUCLEAR PHYSICS

UNIT-4 **(20)**

1. Nuclear Properties: Nuclear mass and binding energy and stability of nucleus, mass defect and packing fraction, nuclear size, B/A vs. A (mass number) curve, nuclear magnetic moments, electric quadruple moment, nuclear parity.
2. Nuclear Forces : Properties nuclear forces, meson theory of nuclear forces, mass of meson using Heisenberg's uncertainty principle, Yukawa's Potential.
3. Nuclear Radiation Detectors: Ionization Chamber, Proportional Counter, GM counter, cloud chamber, bubble chamber, sing lens magnetic β-ray spectrometer photographic emulsions.

UNIT-5 **(20)**

1. Alpha decay : Determination of velocity of alpha particles, determination of range of α-particles, straggling of range, stopping power, Geiger-Nuttal law, energy of α-decay, α-ray spectra, long range α-particles, tunneling features of α-decay, Gamow's theory .
2. Beta decay : β ray spectrum, determination of β-ray energy, energetics of β-decay, difficulties in interpretation of β ray spectrum. Pauli's neutrino hypothesis, Fermi's theory of β-decay (qualitative only), Electron capture or K-capture, detection of neutrinos.
3. Gamma rays : γ-ray spectrum, determination of γ-ray energies, internal conversion, nuclear isomerism, Mossbauer effect.

UNIT-6 **(20)**

1. Nuclear Models : Liquid drop model, Semi-empirical mass formula, application of semi-empirical mass formula.
2. Nuclear energy :Nuclear fission, energy released in fission, Bhor-Wheeler theory, Prompt & delayed neutrons, nuclear chain reaction, Four factor formula, nuclear reactors, breeder reactor, power reactor. Atomic Energy in India
3. Elementary Particles: Discovery, Classification of particles, particles and antiparticles (concept), Quark Theory.

REFERENCES:

UNIT-4

1. Kaplan: Ch.8.5, 8.6, 9.5, 17.1, Patel Ch.4.I.2, 4.I.3
2. Patel :Ch. 8.2 & 8.6
3. Ghoshal : 7.3, 7.4, 7.5, 7.11, 7.12

UNIT-5

1. Kaplan: Ch.13. Patel : 4.II
2. Kaplan : 14.1 to 14.8, Patel : 4.III.1 to 4.III.4
3. Patel : 4.IV.1, 4.IV.3, 4.IV.4 & 9.4

UNIT-6

1. Kaplan : 17.7, 17.8, 17.9. Patel :-5.3, 5.4, 5.5
2. Ghoshal : 14.1 to 14.7 & 14.12, Patel : 9.6, 9.7, India 2003 pp.145-152 (Publication Division., Misntry of information & Broadcasting Corpn., India),www.dae.gov.in
3. Tayal : 16.1, 16.2, 16.20

REFERENCES:

1. Kaplan: Nuclear Physics – Irving Kaplan
2. Patel : Nuclear Physics – S. B. Patel (New Age Publishers)
3. Ghoshal : Atomic & Nuclear Physics – S.Chand & Co.
4. Tayal : Nuclear Physics – D. C. Tayal – Himalyan Publishing House.

PAPER –III : SECTION-I
MECHANICS

UNIT-1 **(20)**

1. Moving coordinate Systems & Pseudo forces : Moving origin of coordinates, rotating coordinate system, Laws of motion on the rotating earth, Focault's pendulum, Larmor's theorem.
2. Two coupled harmonic oscillators.
3. Mechanics of continuous media : The equation of motion of vibrating string, The normal modes of vibrating string, Kinematics of moving fluids, Equation of motion for an ideal fluid, Conservation laws for moving fluids, Steady flow

UNIT-2 **(20)**

1. Lagrangian equations: Generalized coordinates, Lagrange's equations, constraints, constants of motion and ignorable coordinates, examples
2. Rotation of Rigid Body : Motion of rigid body in space, Euler's equation of motion, Pinsot's solution for a freely rotating body, Euler's angles, Symmetrical top.

UNIT-3 **(20)**

Nonlinear Mechanics : Qualitative approach to Chaos, anharmonic oscillator, approximately steady state solution, numerical solution to Duffing's equation, transition to chaos: bifurcation & strange attractors, aspects of chaotic behaviour.

REFERENCES:

UNIT-1

1. KRS : Ch. 7, Art. 7.1 to 7.5
2. KRS : Ch. 4, Art. 4.10
3. KRS : Ch. 8, Art. 8.6 to 8.9

UNIT-2

1. KRS : Ch. 9, Art. 9.1 to 9.6
2. KRS : Ch. 11, Art.11.1 to 11.5

UNIT-3

BO : Ch. 11,Art. 11.1 to 11.5

Baker & Gollup, Chaotic Dynamics : An Introduction

REFERENCES:

1. KRS : Mechanics by K R Symon (Addison Wesely, 3rd Ed.)
2. BO : Classical Mechanics – A Modern Perspective by V D Berger and M G Olsson

3. Baker & Gollup : Chaotic Dynamics : An Introduction.

PAPER-III : SECTION-II
STATISTICAL AND THERMAL PHYSICS

UNIT- **(20)**

1. Description of a System: Particle States, system states, Microstates and macrostates of a systems, Equillibrium and fluctuations, Irreversibility, The equiprobability postulate, Statistical ensemble, The number of states accessible to a system, Phase space
2. Thermal & Adiabatic Interactions : Thermal Interactions, Canonical distributions, Energy Fluctuations, Entropy of a system in a Heat Bath, Helmholtz Free Energy, Adiabatic interactions and Enthalpy, Infinitesimal General Interactions, Gibb's Free energy, Phase Transitions.

UNIT-5 **(20)**

1. Thermodynamics : Magnetic work, Thermodynamic potentials, Maxwell's Thermodynamic relations, The difference Cp-Cv, Joule Expansion, Joule Thomson Process, Adiabatic Demagnetization
2. Specific Heat of Solids : Thermal vibrations- Frequencies, Thermal vibrations- Amplitude, Specific Heats of Solids, The Einstein Theory, The Debye Theory, Electronic Specific Heat.

UNIT-6 **(20)**

1. Statistical Mechanics : The probability of distribution, The most probable distribution, Maxwell-Boltzmann statistics, Molecular speeds.
2. Quantum Statistics: The Bose-Einstein Statistics, Black Body Radiation, The Rayleigh-Jean's Formula, The Planck Radiation Formula, Fermi Dirac Statistics, Transition between states.

REFERENCES:

UNIT-4

1. LG : Ch. 1, Art. 1.1 to 1.11
2. LG : Ch. 2, Art. 2.1, 2.3 to 2.11

UNIT-5

1. LG : Ch. 4, Art. 4.3, 4.7 to 4.12
2. AB : Ch. 19, Art. 19.1 to 19.5, 19.8

UNIT-6

1. AB : Ch. 15, Art. 15.1 to 15.5
2. AB : Ch. 6, Art. 16.1 to 16.7

REFERENCES:

1. LG : Statistical and Thermal Physics, An Introduction (Prentice Hall of India1991) by S. Lokanathan and R S Gambhir.
2. AB : Perspective of Modern Physics (McGraw Hill International) by Arthur Beiser

Additional Readings:

1. A treaties on Heat by Saha & Srivastava
2. Heat & Thermodynamics by Zeemansky

PAPER-IV : SECTION-I
RELATIVITY & COSMOLOGY

UNIT- **(20)**

1. The postulates of Special Theory of Relativity, Simultaneity, Derivations of Lorentz Transformation equations, Some consequences of L. T. Equations, Length contraction, time dilation, meson experiments.
2. Velocity and acceleration transformation equations, relativistic addition of velocities,
3. Doppler effect & Aberration in relativity
4. Relativistic mechanics : Accleration, force, equivalence of mass and energy, transformation properties of momentum, energy, mass, force and power.

UNIT-2 **(20)**

1. Relativity and Electromagnetism : Interdependence of electric and magnetic field of uniformly moving point charge, forces between moving point charges, Invariance of Maxwell's equation
2. Geometric representation of space time : Space-Time diagrams, Simultaneity, length contraction and time dilation, time order and space separation of events, Twin paradox.
3. Principle of equivalence and General relativity, gravitational red shift.

UNIT-3 **(20)**

1. Cosmology : The large scale structure of the Universe, types of galaxies, radio sources, quasars, Doppler shift and expansion, Hubble's law, radiation background
2. From relativity to cosmology, Newtonian cosmology, Weyl's Postulates, Cosmological principle, Red shift, Cosmological models.
3. Relics of the Big-Bang, Radiation dominated Universe, matter v/s radiation, neutrino decoupling, synthesis of light nuclei, microwave background.

REFERNCES:

UNIT-1

1. 1 To 4 RR : Ch. 2 & 3

UNIT-2

1. RR : Ch 4
2. RR : Suppl. Topic A , B
3. RR : Suppl. Topic C

UNIT-3

1. JVNI : Ch. 1, JVNE : Ch. 1
2. JVNI : Ch. 3 (omit 3.3, 3.4), JVNE :Ch. 2
3. JVNI : Ch. 5, JVNE :Ch.3

REFERENCES:

1. RR : Introduction to Special Relativity by Robert Resnick (Wiley Eastern Pvt. Ltd. New Delhi, 1972 or later
2. JVNI : An Introduction to Cosmology- by J V Naralikar, 3rd Ed. 2002, Cambridge University Press
3. JVNE : Elements of Cosmology-by J V Naralikar, 1996 University Press.

UNIT-4 (20)

1. Gauss's Law, Divergence and Curl of E, Scalar potential, Poisson's equation, Laplace's equation
2. Laplace's equation in one, two, three dimensions: boundary conditions and uniqueness theorems, conductors and second uniqueness theorem.
3. The image problems of a point charge near a grounded infinite conducting plane and a grounded conducting sphere: induced charge, force and energy
4. Dielectrics, induced dipoles, alignment of polar molecules, polarization, potential due to a polarized object: bound charges and their physical interpretation, Gauss's law in the presence of dielectrics, linear dielectrics: susceptibility, permittivity and dielectric constant; Energy in Dielectric system, forces on dielectrics,

UNIT-5 (20)

1. The Divergence and Curl of B, Applications of Ampere's law in the case of a long straight wire, a solenoid and a toroidal coil; comparison of electrostatics and magnetostatics.
2. Magnetization, potential due to magnetized object, bound currents and their physical interpretation, Ampere's law in a magnetized materials, linear and nonlinear media: magnetic susceptibility, permeability;
3. Energy in magnetic fields, energy and inductance of a long coaxial cable.
4. Electrodynamics before Maxwell, Maxwell's correction to Ampere's law, Maxwell's equations, Magnetic charge, Maxwell's equations in matter, boundary conditions.

UNIT-6 (20)

1. The continuity equation: Poynting's theorem
2. Electromagnetic (EM) waves in one dimension, polarization of the wave, the wave equation for E and B in vacuum, monochromatic plane waves, energy and momentum in EM waves, propagation of EM waves in linear media, reflection and transmission of EM waves, normal and oblique incidence.
3. EM waves in conductors, Reflection at a conducting surface

REFERNCES:

UNIT-4

1. DG : Ch.2:- 2.2.1-2.2.4, 2.3.1-2.3.4
2. DG : Ch.3:- 3.3.1-3.1.6
3. DG : Ch.3:- 3.2.1-3.2.4
4. DG : Ch.4:- 4.1.1- 4.1.4, 4.2.1, 4.2.2, 4.3.1, 4.3.2, 4.4.1, 4.4.3, 4.4.4

UNIT-5

1. DG : Ch. 5 :- 5.3.1, 5.3.2, 5.3.3, 5.3.4
2. DG : Ch. 6 :- 6.1.1, 6.1.4, 6.2.1, 6.2.2, 6.3.1, 6.3.2, 6.4.1
3. DG : Ch. 7 :- 7.2.4
4. DG: : Ch. 7:- 7.3.1-7.3.6

UNIT-6

1. DG : Ch. 8 :- 8.1.1, 8.1.2
2. DG : Ch. 9 :- 9.2.1, 9.2.2, 9.2.3
3. DG : Ch. 9 :- 9.3.1, 9.3.2, 9.3.7, 9.4.1, 9.4.2

REFERENCES:

1. DG: Introduction to Electrodynamics by David J Griffiths, PHI-3rd Ed.

Additional Ref.: 1. Introduction to Electrodynamics by A Z Capria and P V Parat.
2. Engineering Electromagnetics by William Hayt, Jr. and John H Buck (TMH)

REVISED SYLLABUS IN T.Y.B.Sc. PHYSICS PRACTCALS

The new T.Y.B.Sc. syllabus integrates the rgular practical work with a series of demonstaration experiments. The demonstration experiments are to be performed by the teacher in the Laboratory and students should be encouraged to participate and take observatiuons whrerever possible. 'Demonstartions' should bring about interest and excitement in Physics. Students are required to enter details of these 'demo' experiments in their journals. In addition students will also practice and be tested on common Laboratory skills.

There will be four groups of experiments as given below. A minimum of 8 experiment from each of the groups I, II, III and IV (minimum 4 from each subgroup) are to be done and reported in the journal. From Group IV minimum 6 experiments, with at least two demos from each group, are to be performed and reported in the journal. The certified journal must contain a minimum of 24 regular experiments and 6 demonstration experiments.

There will be four turns of four periods each for practical in one week. Three of these turns will be for regular experiments from Groups I, II, III and the fourth turn is for demo experiments and skills. All the skills are compulsory and can be tested during the examinations (as short experiments) A few simple modifications of experimental parameters should be attempted.

During the teaching and examination of physics laboratory work, attention should be given to basic skills of experimentation, which include : understanding the relevant concepts, planning of the experiments, layout and adjustments of the equipments, recording of the observations, plotting of graphs, calculation of results and estimation of possible errors in observations of results.

NOTE: For students taking three unit course in Physics

There shall be two practical groups (I, III) and a minimum of 8 experiments from each group (four experiments from each subgroup) have to be performed and reported in the journal. In addition the students will observe and participate in a minimum of 2 demo experiments chosen from group IV. These are also to be reported in the journal. The examination procedure is stated latter in this proposed draft.

T.Y.B.Sc. PHYSICS PRACTICAL COURSE
GROUP-I

Group A : Properties of matter, Mechanics, Heat

1. Kater's Pendulum
2. Quincke's Method
3. Searle's Method : Y, η & σ
4. Flat spiral spring
5. Lee's method
6. Calibration of Platinum wire resistance Thermometer using Post Office Box.

Group B : Sound and Optics

7. Resolving power of Prism
8. Goniometer
9. Lloyd's mirror
10. Rydberg's constants
11. Double refraction

12. Velocity of sound using speaker, microphone & CRO
13. Kundt's tube

GROUP-II

Group-A : Electricity Magnetism

1. Self inductance by Rayleigh's method
2. Mutual Inductance by B.G.
3. Hysterisis using magnetometer
4. Capacitor bridge Series & Parallel
5. Hall effect measurement
6. Maxwell's bridge

Group-B : Solid State Devices

7. FET characteristics & its use as VVR
8. SCR characterisitics
9. SCR half wave rectifier
10. Energy band gap of a Ge diode
11. Photodiode and phototransistor characteristics
12. Diode temperature sensor.

GROUP-III

Group-A : Transistorised and OPAMP based circuits

1. CMRR of differential amplifier (OPAMP)
2. FET amplifier
3. Transistorised multivibrators
4. OPAMP multivibrators
5. LOG amplifier using OPAMP
6. OPAMP Integrator/Differentiator
7. Wein Bridge Oscillator (OPAMP)
8. HP/LP active filters using OPAMP (first order only)

Group – B : Voltage Regulator, 555 Timer, Digital Circuits

9. Transistor Voltage Regulator with current limi/fold back limit
10. Three terminal current/voltage regulator
11. Half Adder/Full adder (7486, 7408) using breadboard
12. 555 Timer, linear triggered Ramp Generator, Astable, Monostable and VCO
13. Counters Divide by 2,5,10
14. 4-bit D to A converter

GROUP-IV

Demonstartion Experiments :

Group-A

1. Open CRO, PS, Signal Genrator. Show the Block Diagram
2. Data Sheet Reading for Diodes, Transistors, OPAMP & Optoelectronic Devices
3. Use of PC/Microprocessor to control Real World parameters (e.g. temp, light etc.)
4. PC simulation 8085 simulator, Tina, Workbench, Labview etc.
5. Standing waves inliquid using Ultrasonic waves.

Group-B

6. Zeeman Effect.
7. C-N Spectra

8. Iodine Absorption Spectra
9. Comparison of OPAMP parameters using different Ics
10. AM Modulation
11. FM Modulation using 555 as VCO
12. FSK Modulation
13. h/e using Photocell
14. e/m
15. Two channel Analog Multiplexer using CMOS bilateral switch IC-4016, 4066
16. Equation solver
17. Millikan's Oil Drop Experiment
18. Circuit designing : Transistor Multivibrator, Single stage amplifier, series Transistor Regulator (low current)etc. and testing on breadboard

Skills

1. Bread board circuit using Ics
2. Soldering Advanced circuits
3. Offser Null Adjustment of OPAMP : Inverting, Non-Invering Terminals & Internal adjustments
4. B.G. C1/C2 by comparing θ 1/ θ 2
5. Dual Trace CRO : Phase shift measurement
6. Laser beam profile
7. Biprism fringes (d1, d2)
8. Microscope : Radius of bore using Hg column
9. Use of single pan balance : radius of small ball bearings.
10. Estimation of error
11. Troubleshooting on Breadboar
12. Drawing advanced level graphs.

REFERENCES:

1. An Advanced course impractical Physics.
   D. Chattopadhyay, P.C. Rakshit and B.Saha-
   Books and Allied (P) Ltd., Sixth Ed.
2. B.Sc. Practical Physics
   Harnam Singh- S. Chand & Co. Ltd. (2001)
3. A Text Book of Advnced Practical Physics
   Samir Kumar Ghosh – New Central Book Agency. 3rd Ed.
4. B.Sc. Practical Physics
   C. L. Arora – S. Chand & Co. Ltd. 2001-20th Ed.
5. Practical Physics
   C.L. Sqires-Cambridge University Press, 3rd Ed.
6. University Practical Physics
   D.C. Tayal- Himalay Publication

PRACTICAL EXAMINATION

A candidate will not be allowed to appear for practical examination without a certified journal. In case the journal is lost, the candidate will be allowed to appear for the examination only on the production of a relevant certificate from the Principal/Head of the Physics Department of the college.

The final Examination in Physics will be as follows:

1. One long experiment of 3 hours (carrying 40 marks) Group – I
2. One long experiment of 3 hours (carrying 40 marks) Group – II
3. One long experiment of 3 hours (carrying 40 marks) Group – III
4. Three short experiments of 40 minutes each (carrying 13, 13 & 14 marks) on lab skills as in Group-IV
5. VIVA on full year's work including 'demo' experiments (20 marks)
6. Journal inspection total 20 marks including 8 marks for the demo experiments record.

Total: 200 Marks.

A few simple modifications of experimental parameters may be expected during the examination.

Note : For candidates offering 3 units of Physics. The practical examination will be as follows.

1. One long experiment of 3 hours (carrying 40 marks) Group – I
2. One long experiment of 3 hours (carrying 40 marks) Group – III
3. VIVA on full year's work including 'demo' experiments (10 marks)
4. Journal inspection: total 10 marks including 8 marks for the demo experiments record.

Total : 100 Marks