AC/04.08.2018/RS1

SIES College of Arts, Science & Commerce

RISE WITH EDUCATION

SIES College of Arts, Science and Commerce

University of Mumbai

Syllabus Under Autonomy

for

SEM III & IV

Program: B.Sc. Course: Physics

(Credit Based Semester and Grading System with effect from the academic year 2018–2019)

Title: Syllabus for the B.Sc. Course in Physics (from academic year 2018-19) for Semester III & IV

Course Code:**USPHP**

Preamble:

This is a revised part of the undergraduate programme (Six Semesters) in Physics, to be taught in Semester III & IV from the academic year 2017-18 onwards.
Developing Curriculum that is progressive and purposeful to create positive improvement in the education system is the logic behind this revision.
Across the Six courses in Semesters 3 and 4, **Five**courses are devoted to core Physics, catering to Mechanics, Mathematical Physics, Optics,Digital and Analog Electronics, Thermodynamicsand Quantum Mechanics. These have been tailored to fit in with the existing FYBSc syllabus (SEM I and SEM II) in terms of continuity and to ensure delivery of quality content to the learner.
One paper of applied science is included in the fourth semester
The 'practical' component in the applied course will be seen as a combination of laboratory sessions , a visit to a Research Institute/Industry, mini project, an assignment on a relevant topic etc.
For the various units, experts will guide as '**Resource Persons**' and their laboratories/ departments could serve as **Resource Centers**. Faculty members/Teachers can avail of their expertise to train themselves in the delivery of these courses whenever required.

Objective:
Upon completion of the course, students should have acquired the following knowledge and skills:

1. A thorough quantitative and conceptual understanding of the core areas of physics, including mechanics, , thermodynamics, quantum mechanics, electronics at a level compatible with graduate programs in physics at peer institutions.
2. The ability to analyze and interpret quantitative results, both in the core areas of physics and interdisciplinary areas.
3. The ability to use contemporary experimental apparatus and analysis tools to acquire, analyze and interpret scientific data.
4. The ability to apply the principles of physics to solve new and unfamiliar problems.
5. The ability to communicate scientific results effectively in presentations or posters.

Eligibility: Passed semester 1 and Semester II**;**as **per** rules of passing

Revised Syllabus in Physics (Theory and Practical)

as perChoice based Credit and Grading system

Second year B.Sc. 2018-2019

The revised syllabus in Physics as per credit based system (with choice) of theSecond Year B.Sc.course will be implemented from the academic year 2018-2019.

Objectives:

- To develop analytical abilities towards real world problems
- To familiarize with current and recent scientific and technological developments
- To enrich knowledge through problem solving hands on activities, study visits, projects etc.

Semester	Paper	Title	Credits
III	USPH301	Mathematical physics and Mechanics	2
III	USPH302	Analog and digital Electronics	2
III	USPH303	Optics and lasers	2
III	USPHP3	Practical course -3 (Group A,B,C and Skill)	3
		Total	**9**
IV	USPH401	Thermodynamics	2
IV	USPH402	Quantum Mechanics	2
IV	USPH403	Applied Physics-I	2
IV	USPHP4	Practical course -4 (Group A,B,C and Demo)	3
		Total	**9**

Scheme of examination:

(i) Theory:

(A) **Internal Examination: 40 marks**

Sr.No	Particulars	Marks
1.	One Class Test/online examination to be: conducted in the given semester	20
2.	One assignment based on the curriculum: to be assessed by the teacher concerned	10
3.	Active Participation in routine class instructional deliveries	10

(B) **Semester End Examination: 60 marks**

Each theory paper shall be of two and half hour duration. Each paper shall consist of FOUR questions. All questions are compulsory and will have internal option.

Q – I is from Unit - 1

Q – II is from Unit - 2

Q - III is from Unit - 3

Q - IV will consist of questions from all the THREE units with equal weightage of marks allotted to each unit.

ii) **Practicals**:(PAPER 1, 2&3) There will not be any internal examination for practical.

The SEMESTER END examination per practical course (For Paper 1, 2) will be conducted as per the following scheme

Sr.No	Particulars	Marks
1.	Laboratory Work	80
2.	Journal	10
3.	Viva	10
	TOTAL	100

A candidate will be allowed to appear for the practical examination only if the candidate submits a certified journal of FYBSc Physics or a certificate from the Head of the Department to the effect that the candidate has completed the practical course of F Y BSc Physics as per the minimum requirements.

Proposed syllabus of SYBSc(2018-19)

USPH301: Mechanics & Mathematical Physics

Learning Outcomes:

On successful completion of this course, students will be able to:

i) Understand the concepts of mechanics & properties of matter & to apply them to problems.

ii) Comprehend the basic concepts of mechanics& mathematical physics and its applications.

iii) Demonstrate tentative problem solving skills in all above areas.

UNIT – I: Vector Calculus: 15Lectures

1 Line, Surface and Volume Integrals, The Fundamental Theorem of Calculus, The Fundamental Theorem of Gradient, The Fundamental Theorem of Divergence, The Fundamental Theorem of Curl (Statement and Geometrical interpretation is included, Proof of these theorems are omitted). Problems based on these theorems are required to be done.

2 Curvilinear Coordinates: Cylindrical Coordinates, Spherical Coordinates

UNIT – II: Mechanics 15 Lectures

1 Compound Pendulum: Expression for period, maximum and minimum time period, centers of suspension and oscillation, reversible compound pendulum. Kater's reversible pendulum, compound pendulum and simple pendulum- a relative study.

2 Oscillations**,** The Simple Harmonic Oscillator, Relation between Simple Harmonic Motion and Uniform Circular Motion, Two Body Oscillations,
Damped Harmonic Motion, Forced Oscillations and Resonance.

Unit III: Mechanics of System of particles 15 Lectures

1 Center of Mass , Motion of the Center of Mass , Linear momentum of a Particle
Linear momentum of a System of Particles , Linear momentum w.r.t. CM coordinate (i.e. shift of origin from Lab to CM), Conservation of Linear Momentum , Some Applications of the Momentum Principle , System of Variable Mass
Torque Acting on a Particle; Angular Momentum of a Particle; Angular Momentum of System of Particles;Total angular momentum w.r.t. CM coordinate. Conservation of Angular Momentum

2 Collisions: Introduction, types of collisions, laboratory and centre of mass systems, relationship between displacements and velocities, relationship between angles.

References:

Resnick and Halliday: Physics – I

Mechanics – H. S. Hans and S. P. Puri, Tata McGraw Hill (2_{nd} ED.)

Additional reference:

1. KRS: Mechanics by K.R Symon.
2. Classical Dynamics of particles and systems by Thornton and Marian, (CENGAGE Learning)
3. Basic Thermodynamics : Evelyn Guha (Narosa Publications)
4. Classical mechanics by Kleppener , Kollenkov
5. A treatise on heat:MeghanadSaha and BN Srivastava, 1969, India Press.
6. Mechanics and Electrodynamics Rev Edn. 2005 by Brijlal and Subramanyanand JeevanSeshan.

USPH302: OPTICS

Learning Outcomes:

On successful completion of this course students will be able to:

1) Understand the basic concepts of optics and its applications in physical situations.
2) Understand the basic laws of optics and be able to perform calculations using them.
3) Demonstrate quantitative problem solving skill in all the topics covered.

UNIT I: Diffraction 15 Lectures

1 **Review:** Introduction, Huygens's - Fresnel theory, Distinction between interference and diffraction, Fresnel and Fraunhoffer types of diffraction.

2 **Fresnel's Diffraction**: Fresnel's assumptions, Rectilinear propagation (Half period zones) of light, Diffraction pattern due to straight edge, Positions of maxima and minima in intensity, Intensity at a point inside the geometrical shadow(straight edge), Diffraction due to a narrow slit, Diffraction due to a narrow wire

3 **Fraunhoffer Diffraction :** Introduction, Fraunhoffer diffraction at a single slit, Intensity distribution in diffraction pattern due to a single slit, Fraunhoffer diffraction at a double slit,Distinction between single slit and double slit diffraction pattern and missing orders, Plane diffraction Grating, Theory of plane transmission grating, Width of principal maxima.

Unit II: Polarization 15 Lectures

1 **Review:** Introduction of Polarization, Natural light is unpolarized, unpolarized and polarized light, Brewster's law, and Polaroid sheets

2 **Polarization:** Types of polarization, Plane polarized light, Circularly polarized light, Elliptically polarized light, Partially polarized light, Production of Plane polarized light, Polarization by reflection from dielectric surface, Polarization by refraction –pile of plates, Polarization by scattering, Polarization by selective Absorption, Polarization by double refraction, Polarizer and Analyzer, Malus' Law, Anisotropic crystal, Calcite crystal, Optic Axis, Double refraction in calcite crystal, Huygens' explanation of double

refraction, Ordinary and Extra ordinary rays, Positive and Negative crystals, Superposition of waves linearly polarized at right angles,Superposition of e-Ray and o-Ray, Retarders, Quarter wave plate, Half wave plate, Production of linearly polarized light, Production of elliptically polarized light, Production of circularly polarized light, Analysis of polarized light, Applications of polarized light.

Unit 3: Resolving Power and Lasers **15 Lectures**

1 **Resolving Power**: Introduction, Raleigh's criterion, resolving power of optical instruments, criterion for resolution according to Lord Rayleigh's; Resolving power of telescope, resolving power of a prism, resolving power of a plane transmission grating.

2 **LASER**: Introduction, transition between atomic energy states(without derivation), Principle of LASER, Properties of LASER, Helium –Neon LASER, Ruby LASER, Applications of LASER to Holography and other applications.

References:

A Text book of Optics by Dr. N Subrahmanyam, Brijlal, Dr M N Avadhaanulu (S Chand, 25th Revised Edition 2012, Reprint 2013)
Optics by AjoyGhatak
Modern Physics: Concepts and Applications---Sanjeev Puri, Narosa Publications

Additional reference:

Optics by Eugene Hecht and A R Ganesan (Pearson, 4th Edition)

USPH303:Electronics &Communication

Learning Outcomes:

Unit I: Analog Electronics **15 Lectures**

1 Transistor Biasing, Inherent Variations of Transistor Parameters, Stabilization, Essentials of a Transistor Biasing Circuit, Stability Factor, Methods of Transistor Biasing, Base Resistor Method, Emitter Bias Circuit, Circuit analysis of Emitter Bias, Biasing with Collector Feedback Resistor, Voltage Divider Bias Method, Stability factor for Potential Divider Bias.

2 General amplifier characteristics: Concept of amplification, amplifier notations, current gain, Voltage gain, power gain, input resistance, output resistance, general theory of feedback, reasons for negative feedback, loop gain.

3 Practical circuit of transistor amplifier, phase reversal, frequency response, Decibel gain and Band width.

Unit II: Analog Electronics **15 Lectures**

1 Oscillators: Introduction, effect of positive feedback. Requirements for oscillations, phase shift oscillator, Wien Bridge Oscillator, Colpitt's oscillator, Hartley oscillator.(All oscillator mentioned transistorized)

2 Operational Amplifiers: Introduction, Schematic symbol of OPAMP, Output voltage from OPAMP, AC analysis, Bandwidth of an OPAMP, Slew rate, Frequency Response of an OPAMP, OPAMP with Negative feedback, Inverting Amplifier, Non-Inverting Amplifier, Voltage Follower, Summing Amplifier, Applications of Summing amplifier, OPAMP Integrator and Differentiator, Critical frequency of Integrator, Comparator

Unit – III Digital Electronics: (15 Lectures)

Background knowledge (devote one lecture at commencement):

1 Binary number system , Arithmetic building blocks , Types of registers

2 Digital IC signal levels, Binary to Decimal, Decimal to binary, hexadecimal number, Hexadecimal to decimal Conversion, Decimal to hexadecimal conversion, Hexadecimal to binary conversion, Binary to hexadecimal conversion, Binary addition.

3 RS Flip-Flops (only NOR gate latch, NAND gate latch) , Gated Flip-Flops, Edge-Triggered RS Flip-Flop, Edge- Triggered D Flip-Flop

4 OPAMP Astable multivibrator, Monostable multivibrator and OPAMP Schmitt trigger.

5 Basics of Communication

6 Block diagram of communication system, types of communication system: simplex, duplex, analog and digital communication,

7 Electromagnetic spectrum, base band and broad band communication.

8 Noise: Concept and types, signal to noise ratio, noise figure, noise temperature.

References:

Principles of Electronics – V. K. Mehta and Rohit Mehta, (S. Chand – Multicolored illustrative edition)

Electronic devices and circuits – An introduction Allan Mottershead (PHI Pvt. Ltd.– EEE – Reprint – 2013)

USPHP3: Practical course -3

Instructions:

i) All the measurements and readings should be written with proper units in SI system only.

ii) After completing all the required number of experiments in the semester and recording them in journal, the student will have to get their journal certified and produce the certified journal at the time of practical examination.

iii) While evaluating practical, weight age should be given to circuit/ray diagram, observations, tabular representation, experimental skills and procedure, graph, calculation and result.
iv) Skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result.

Learning outcomes:

On successful completion of this course students will be able to:

i) Understand &practice the skills while performing experiments.
ii) Understand the use of apparatus and their use without fear& hesitation.
iii) Correlate the physics theory concepts to practical application.
iv) Understand the concept of errors and their estimation.

Note: Exemption of two experiments from section C may be given if student carries out any one of the following activity.

1) Collect the information of at least five Physicists with their work or any three events on physics, report that in journal.
2) Execute a mini project to the satisfaction of teacher in-charge of practical.
3) Participate in a study tour or visit & submit a study tour report.

For practical examination in group A and group B the learner will be examined in twoexperiments (one from each group). Each experiment will be of three hours'duration, Minimum 6 from each group and in all minimum 12 experiments must be reported in journal.
Practical examination in group C will be based on industrial visit (report and viva) /Project and presentation. However a learner must perform at least two experiment and report in the journal.
All the skill experiments are required to be completed compulsorily. Students are required to report all these experiments in the journal. Evaluation in viva voce will be based on regular experiments and skill experiments.

A learner will be allowed to appear for the semester and practical examination only if he submits a certified journal of Physics or a certificate that the learner has completed the practical course of Physics Semester III as per the minimum requirements.

Group A

1. Y by bending.
2. Helmholtz resonator- determination of unknown frequency.
3. Verification of Stefan’s law (electrical method)
4. Charging and discharging of capacitor.
5. LCR parallel resonance.
6. Figure of merit of a mirror galvanometer.
7. Determination of absolute capacitance using BG

8. Measurement of resistance of galvanometer (G by shunting)
9. R.P of telescope.
10. Biprism

Group B

1. Passive low pass filter
2. Passive high pass filters.
3. Passive band pass filter.
4. OPAMP: Inverting amplifier with different gains
5. OPAMP: Non-inverting amplifier with different gains and voltage follower
6. CE amplifier: variation of gain with load
7. Phase shift oscillator
8. Transistor Wien bridge oscillator
9. Transistor Colpitt's oscillator
10. Lissajous figure using CRO

Group C

1. Laser experiments: straight edge, single slit, grating
2. Optical fibre: transmission of signal
3. Concept of beats
4. Coupled oscillations and resonance
5. Synthesis of materials - mini project - thin film/nano materials/bulk powders using different routes etc.(equivalent to 2 practical sessions)
6. Visit to research institutes (equivalent to 2 practical sessions).
7. Assignment & literature survey (equivalent to 2 practical sessions).

Skill experiments

1. Soldering technique
2. Wiring of a simple circuit using bread board
3. Use of oscilloscope
4. Travelling microscope (radius of capillary)
5. Spectrometer: mean μ of yellow doublet of mercury source.
6. Spectrometer: optical leveling and Shuster's method
7. Component testing, color code of resistors, capacitors etc.
8. Drawing of graph on semi logarithmic / logarithmic scale.

References:

1) Advanced course in Practical Physics D. Chattopadhya, PC Rakshit& B Saha. (6^{th} Edition) Book and Allied Pvt.Ltd.

2) B.Sc Practical Physics – Harnam Singh S.Chand& Co. Ld. 2001
3) A test book of advanced practical PHYSICS _ SAMIR Kumar Ghosh, New Central Book Agency (3rd edition)
4) B.Sc. Practical Physics – CL Arora (1st Edition) -2001 S.Chand and Co Ltd.
5) Practical Physics CL Squires (3rd Edition) Cambridge University
6) University Practical Physics – DC Tayal. Himalaya Publication
7) Advanced Practical Physics – Worsnop&Flint.

USPH401 : Optics and Digital Electronics

UNIT –I **15 Lectures**

(Review of zeroth and first law of thermodynamics)

I Reversible and irreversible process, heat engines, Conversion of heat into work, Carnot's cycle: its efficiency.Carnot engine as refrigerator, Coefficient of performance.

ii Steam engine, Rankine cycle, Otto engine, Efficiency of Otto cycle, Diesel cycle, Efficiency of Diesel cycle, Otto and diesel comparison

UNIT –II15 Lectures

i Second law of thermodynamics, Statements, Equivalence of Kelvin and Plank statement, Carnot's theorem, Absolute scale of temperature.

ii Clausius theorem, Entropy, Entropy of a cyclic process, Reversible process, Entropy change, Reversible heat transfer, Principle of increase in entropy, generalized form of first and second law, entropy change of an ideal gas, entropy of steam, entropy and unavailable energy, entropy and disorder, absolute entropy.
TS diagram for Carnot engine

UNIT –III **15 Lectures**

i Third law of thermodynamics, Nernst heat theorem, Consequences of the third law, Maxwell's thermodynamic relations, Clausius – Clapeyron equation, Thermal Expansion.

ii Low temp Physics: Different methods of liquefaction of gases, methods of freezing, Cooling by evaporation, cooling by adiabatic expansion
Joule - Thompson effect, JT effect of Van der Waal's gas, Liquefaction of helium, properties and uses of liquid Helium

USPH402: QUANTUM PHYSICS

Learning Outcomes:

On successful completion of this course students will be able to :

1) Understand the postulates of quantum mechanics and to understand its importance in explaining significant phenomena in Physics.

2) Demonstrate quantitative problem solving skills in all the topics covered.

Background Reading (Review):

Origin of Quantum Mechanics:
1) Review of Black body radiation, b) Review of photoelectric effects.
2) Matter waves-De Broglie hypothesis. Davisson and Germer experiment.
3. Wave particle duality
5. Concept of wave packet, phase velocity, group velocity and relation between them
6. Heisenberg's uncertainty principle with thought experiment, different forms of uncertainty.

Unit –I: The Schrodinger wave equation: 15Lectures

1. Concept of wave function, Born interpretation of wave function.
2. Concepts of operator in quantum mechanics examples – position, momentum and energy operators.
3. Eigenvalue equations, expectation values of operators.
4. Schrodinger equation.
5. Postulates of Quantum Mechanics.
6. Analogy between Wave equation and Schrodinger equation.
7. Time dependent and time independent (Steady State) Schrodinger equation, Stationary State
8. Superposition principle.
9. Probability current density, Equation of continuity and its physical significance.

Unit-II: Applications of Schrodinger steady state equation-15Lectures
1. Free particle.
2. Particle in infinitely deep potential well (one - dimension).
3. Particle in finitely deep potential well (one - dimension).
4. Step potential.
5. Particle in three dimension rigid box, degeneracy of energy state.

Unit-III: Applications of Schrodinger steady state equation – II 15Lectures

1. Potential barrier (Finite height and width) penetration and tunneling effect (derivation of approximate transmission probability)
2. Theory of alpha particle decay from radioactive nucleus.

[Note: A good number of numerical examples are expected to be covered during the prescribed lectures].

Reference Books:

1. Concepts of Modern Physics – A. Beiser (6th Ed.) Tata McGraw Hill.
2. Quantum Mechanics – S P Singh, M K Bagade, Kamal Singh, - S. Chand : 2004 Ed.
3. Quantum Mechanics of Atoms, Molecules, Solids, Nuclei and particles. - By R. Eisberg and R. Resnik Published by Wiley.
5. Introduction to Quantum Mechanics. - By D. Griffiths Published by Prentice Hall.
6. Quantum Mechanics. - By Ghatak and Lokanathan Published by Mc. Millan.
7. Quantum Mechanics. - By L. I. Schiff.
8. Quantum Mechanics. - By Powell and Crasemann, Addison-Wesley Pub. Co.

USPH403: Applied Physics II

Learning Outcomes:

On completion of this, it is expected that

i) Students will be exposed to contextual real life situations.
ii) Students will appreciate the role of Physics in 'interdisciplinary areas related to materials, Bio Physics, Acoustics etc.
iii) The learner will understand the scope of the subject in Industry & Research.
iv) Experimental learning opportunities will faster creative thinking & a spirit of inquiry.

Unit 1: Acoustics & Ultrasonics 15 Lectures

Acoustics of Buildings

Reverberation, Sabine's formula with derivation, Absorption coefficient, Acoustics of Buildings, factors affecting Acoustics of Buildings, Sound distribution in an auditorium.

Ultrasonics

Piezoelectric effect, Production of Ultrasonic waves: Piezoelectric Crystal Method, Magnetostriction Method;Detection, Properties and applications of Ultrasonic Waves

References:

Properties of matter and Acoustics – R Murugeshan and K. Shivaprasath, S Chand &Co.Ltd. (2005-Ed)

Unit II: Biophysics 15 Lectures

Introduction, definition, History & scope of biophysics, biological fluids, physico-chemical properties, viscosity, surface tension, pH, osmosis, osmotic pressure. Diffusion, Ficks' laws of diffusion, dialysis, Cell is unit of life, fundamental understanding prokaryotic and eukaryotic cell structure and function, eukaryotic cell membrane, Fundamentals of transport process through

biological membrane, membrane channels. electrical properties of cell, Action potential, propagation of action potential, methods of measurement of action potential, Nernst equation, Golman equation, The Hodgkin-Huxely model of action potential, voltage clamp technique, Patch clamp technique, cell impedance and capacitance.

References:

1. Cellular and Molecular Biology: Concept and Experiment by Gerald Karp
2. The Cell: A Molecular Approach by Geoffery Cooper
3. Introductory Biophysics: Perspective on living state by James Claycomb
4. Medical Physiology by Guyton
5. Molecular Biology of Cell by Bruce Albert
6. Text Book of Biophysics by R N Roy

Unit III: Materials – properties and applications 15 Lectures

Introduction to Materials

Classification of Materials based on structures (Crystalline and Amorphous, single crystal, polycrystalline and nanomaterials) and Functionality (Conducting, insulating, superconducting, reflecting, transmitting etc)

Types of Materials: Metals and alloys, Ceramics, Polymers and Composites, Thin Films, Nanomaterials; Some Physical and Chemical methods of materials synthesis

Properties of materials

Electrical Properties: Review of energy band diagram for materials - conductors, semiconductors and insulators, Electrical conductivity in metals, semiconductors and insulators (dielectrics), effect of temperature on conductivity

Optical Properties: Reflection, refraction, absorption and transmission of electromagnetic radiation in solids.

Magnetic Properties: Origin of magnetism in solids (basic idea), Types of magnetic order (paramagnetism, diamagnetism, antiferro-magnetism, ferromagnetism, ferrimagnetism), magnetic hysteresis

Applications

Optical materials: LEDs, OLEDs, LCDs, Flat Panel Displays, optical fibers

Dielectric materials: Piezoelectric, ferroelectric and pyroelectric materials

Magnetic Materials: Soft magnets (Transformer steels), Hard magnets for permanent magnets, Magnetic Recording and Storage

References:

1. Electronic Properties of Materials, Rolf E Hummel
2. Materials Science and Engineering: A First Course by V. Raghavan

USPHP4: Practical course -4

Instructions:

i. All the measurements and readings should be written with proper units in SI system only.
ii. After completing all the required number of experiments in the semester and recording them in journal, student will have to get their journal certified and produce the certified journal at the time of practical examination.
iii. While evaluating practical, weight age should be given to circuit/ray diagram, observations, tabular representation, experimental skills and procedure, graph, calculation and result.
iv. Skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result.

Learning Outcomes:

On successful completion of this course students will be able to :

i) Understand &practice the skills while performing experiments.
ii) Understand the use of apparatus and their use without fear & hesitation.
iii) Correlate their physics theory concepts to practical application.
iv) Understand the concept of errors and their estimation.

Note: Exemption of two experiments from section C may be given if student carries out any one of the following activity.

1) Collect the information of at least five Physicists with their work or any three events on physics, report that in journal.
2) Execute a mini project to the satisfaction of teacher in-charge of practical.
3) Participate in a study tour or visit & submit a study tour report.

For practical examination in group A and group B the learner will be examined in two experiments (one from each group). Each experiment will be of three hours' duration, Minimum 6 from each group and in all minimum 12 experiments must be reported in journal.
Practical examination in group C will be based on industrial visit (report and viva) /Project and presentation. However a learner must perform at least two experiment and report in the journal.
All the skill experiments are required to be completed compulsorily. Students are required to report all these experiments in the journal. Evaluation in viva voce will be based on regular experiments and skill experiments.

A learner will be allowed to appear for the semester and practical examination only if he submits a certified journal of Physics or a certificate that the learner has completed the practical course of Physics Semester III as per the minimum requirements.

Group A

1. Optical lever: determination of μ
2. Cylindrical obstacle: determination of λ

3. Single slit diffraction using Sodium Lamp
4. G By shunting
5. R.P. of grating
6. Brewster's law: determination of μ
7. Bar pendulum
8. Laser beam profile
9. De' Sauty's bridge
10. Wedge shaped film

Group B

1. Schmitt Trigger using OPAMP (inverting)
2. Half adder and full adder (7486, 7408) To study Exor Gate
3. Study of MS-JK flip flop
4. Study of RS flip-flop using NAND and NOR gates
5. OPAMP difference amplifier
6. Passive integrator
7. OPAMP Astable multivibrator
8. OPAMP Monostable multivibrator
9. Phase shift oscillator (OPAMP/Transistor)
10. Clipper circuit

Group C

1. Velocity of sound using CRO.
2. Standardization of pH meter & acid-base titration.
3. Determination of Isoelectric point of Amino Acids/protein.
4. Understanding uv visible spectra of protein/Nucleic Acids.
5. Project on a topic (equivalent to 2 practical sessions)
6. Visit to research institutes (equivalent to 2 practical sessions)
7. Assignment & literature survey (equivalent to 2 practical sessions).
8. Plotting and analysis of detector data (from University /research institutions)

Demonstration experiments

1. Error analysis of a given experiment
2. Wave form generator using Op-amp
3. PC simulations: graph, curve fitting etc.
4. Straight edge Fresnel diffraction
5. CE amplifier frequency response
6. Lissajous Figures using CRO

References:

1. Advanced course in Practical Physics D. Chattopadhya, PC Rakshit& B Saha. (6th Edition) Book and Allied Pvt.Ltd.
2. B.Sc.Practical Physics – Harnam Singh S.Chand& Co. Ld. 2001
3. A test book of Advanced Practical Physics _ SAMIR Kumar Ghosh, New Central Book Agency (3rd edition)
4. B.Sc. Practical Physics – CL Arora (1st Edition) -2001 S.Chand and Co Ltd.
5. Practical Physics CL Squires (3rd Edition) Cambridge University
6. University Practical Physics – DC Tayal. Himalaya Publication
7. Advanced Practical Physics – Worsnop&Flint.