R. J. COLLEGE

[Arts, Science & Commerce]
NAAC Re-Accreditation "A" Grade
"BEST COLLEGE" University of Mumbai

Autonomous

(Affiliated to Mumbai University)

Program Code: **RJSUPHY**

Syllabus for F Y. B.Sc. Physics (Theory & Practical)

(Choice Based Credit System with effect from 2018-19)

Ramniranjan Jhunjhunwala College

Autonomous

(Affiliated to University of Mumbai)

Department of Physics

F.Y.B.Sc.

Sem I and Sem II

Academic Year (2018-19)

Syllabus for B.Sc. Physics (Theory & Practical)
CBCS (Choice Based Credit System)
First Year B.Sc.
2018–2019

The revised syllabus in Physics as per Choice Based Credit System for the First Year B.Sc. Course will be implemented from the academic year 2018-2019.

Preamble:
The systematic and planned curricula from these courses shall motivate and encourage learners to understand basic concepts of Physics.

Objectives:
• Develop analytical abilities towards real world problems.
• Familiarize with current and recent scientific and technological developments.
• Enrich knowledge through problem solving, hands-on activities, study visits, projects etc.

Course Code	Title	Credits
	Semester I	
RJSUPHY101	Classical Physics	2.0
RJSUPHY102	Modern Physics	2.0
RJSUPHY10P1	Practical I	2.0
Course Code		Total 6.0
	Semester II	
RJSUPHY201	Mathematical Physics	2.0
RJSUPHY202	Electricity and Electronics	2.0
RJSUPHY20P1	Practical II	2.0
		Total 6.0

SEMESTER I

Name of the Course	Duration	Semester	Subject
B.Sc. in Physics	Six Semesters	I	Physics
Course Code	**Title**		
RJSUPHY101	Classical Physics		

Learning Outcomes:

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

1. Understand Newton's laws and apply them in calculations of the motion of simple systems.
2. Use the free body diagrams to analyze the forces on the object.
3. Understand the concepts of friction and the concepts of elasticity, fluid mechanics and be able to perform calculations using them.
4. Understand the concepts of lens system and interference.
5. Apply the laws of thermodynamics to formulate the relations necessary to analyze the thermodynamic process.
6. Demonstrate quantitative problem solving skills in all the topics covered.

SEMESTER I

Paper I (Classical Physics) – RJSUPHY101

Unit I

Newton's Laws: Newton's first, second and third laws of motion, interpretation and applications, pseudo forces, inertial and non-inertial frames of reference. Worked out examples(with friction present).

Elasticity: Review of Elastic constants Y, K, η and σ; Equivalence of shear strain to compression and extension strains. Relations between elastic constants, Couple for twist in cylinder and application.

Fluid Dynamics: Equation of continuity, Bernoulli's equation, applications of Bernoulli's equation, streamline and turbulent flow, lines of flow in airfoil, Poiseuille's equation, Reynolds Number.

Unit II

Lens Maker's Formula (Review), Newton's lens equation, magnification-lateral, longitudinal and angular.

Equivalent focal length of two thin lenses, thick lens, Ramsden and Huygens eyepiece.

Aberration: Spherical Aberration, Reduction of Spherical Aberration, Chromatic aberration and condition for achromatic aberration. Interference: Interference in thin films, Fringes in Wedge shaped films, Newton's Rings (Reflective).

Unit III

Behavior of real gases and real gas equation, Van der Waal equation.

Thermodynamic Systems, Zeroth law of thermodynamics, Concept of Heat, the first law, Non Adiabatic process and Heat as a path function, Internal energy, Heat capacity and specific heat, Application of first law to simple processes, general relations from the first law, Indicator diagram, Work done during isothermal and adiabatic processes, Worked examples, Problems.

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

References:

Unit I

1. Halliday, Resnick and Walker, Fundamental of Physics (extended) – (6th Ed.), John Wiley & Sons.
2. H. C. Verma, Concepts of Physics – Part I, (2002 Ed.)Bharati Bhavan Publishers.

Unit II

1. Brij Lal, Subramanyam and Avadhanulu, A Textbook of Optics, (25th revised ed.2012) S. Chand.
2. Jenkins and White, Fundamentals of Optics by (4th Ed.), McGraw Hill International.

Unit III

1. M W Zemansky and R H Dittman, Heat and Thermodynamics, McGraw Hill.
2. Brij Lal, Subramanyam and Hemne, Heat Thermodynamics and Statistical Physics, S. Chand, Revised, Multi-coloured, (2007 Ed.)

Additional References:

1. Thornton and Marion, Classical Dynamics (5th Ed.)
2. D S Mathur, Element of Properties of Matter, S. Chand & Co.
3. R Murugeshan and K Shivprasath, Properties of Matter and Acoustics, S. Chand.
4. D K Chakrabarti, Theory and Experiments on Thermal Physics,(2006 Ed.), Central books.
5. C L Arora, Optics, S. Chand.
6. Hans and Puri, Mechanics, (2nd Ed.) Tata McGraw Hill.

SEMESTER I

Name of the Course	Duration	Semester	Subject
B.Sc. in Physics	Six semesters	I	Physics
Course Code	**Title**		
RJSUPHY102	Modern Physics		

Learning Outcomes:

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

1. Understand nuclear properties and nuclear behavior.
2. Understand the isotopes and their applications.
3. Demonstrate and understand the quantum mechanical concepts.
4. Demonstrate quantitative problem solving skills in all the topics covered.

Paper II (Modern Physics) – RJSUPHY102

Unit I

Structure of Nuclei: Basic properties of nuclei, Composition, Charge, Size, Density of nucleus, Mass defect and Binding energy, Packing fraction, BE/A vs A plot, stability of nuclei (N vs Z plot) and problems.

Radioactivity: Radioactive disintegration concept of natural and artificial, radioactivity properties of α, β, γ-rays, laws of radioactive decay, half-life, mean life (derivation not required), units of radioactivity, successive disintegration and equilibrium, radioisotopes, Numerical Problems.

Carbon dating and other applications of radioactive isotopes (Agricultural, Medical, Industrial, Archaeological -information from net).

Unit II

Interaction between particles and matter, Ionization chamber, Proportional counter, and Geiger-Mueller counter, Problems.

Nuclear Reactions: Types of Reactions and Conservation Laws, Concept of Compound and Direct Nuclear Reactions, Q value equation and solution of the Q equation, Problems.

Fusion and Fission definitions and qualitative discussion with examples.

Unit III

Origin of Quantum theory, Black body (definition), Black body spectrum, Wien's displacement law, Matter waves, Wave particle duality, Heisenberg's Uncertainty Principle, Davisson-Germer experiment, G. P. Thompson experiment.

X-Rays production and properties, Continuous and characteristic X-Ray spectra, X-Ray Diffraction, Bragg's Law, Applications of X-Rays.

(Review of Photoelectric effect), Compton effect, Pair production and Annihilation, Photons and Gravity, Gravitational Red Shift.

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

References:

Unit I

1. Arthur Beiser, Perspectives of Modern Physics, Tata McGraw Hill.
2. Dr. S. B. Patel, Nuclear Physics,(Reprint 2009), New Age International.

Unit II

1. Dr. S. B. Patel, Nuclear Physics,(Reprint 2009), New Age International.
2. Nuclear Physics, Irving Kaplan, (2nd Ed.) Narosa Publishing House.
3. Arthur Beiser, Perspectives of Modern Physics, Tata McGraw Hill.

Unit III

1. Arthur Beiser, Perspectives of Modern Physics, Tata McGraw Hill.

Additional References:

1. S N Ghosal, Nuclear Physics,(2nd ed.), S. Chand.
2. N Subrahmanyam, Brij Lal and Seshan, Atomic and Nuclear Physics,(Revised Ed. Reprint 2012), S. Chand.

SEMESTER I

Name of the Course	Duration	Semester	Subject
B.Sc. in Physics	Six semesters	I	Physics
Course Code	**Title**		
RJSUPHY10P1	Practical		

Learning Outcomes:

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

i) Demonstrate their practical skills.
ii) Understand and practice the skills while doing physics practical.
iii) Understand the use of apparatus and their use without fear.
iv) Correlate their physics theory concepts through practical.

Physics Practical Course – RJSUPHY10P1

A. Regular Experiment:

1) J by Electrical Method: To determine mechanical equivalent of heat. (Radiation correction by graph method)
2) Torsional Oscillation: To determine Modulus of rigidity η of a material of wire by Torsional oscillations.
3) Bifilar Pendulum.
4) Spectrometer: To determine the angle of Prism.
5) Flat spiral spring: To determine Young's Modulus Y of a material of wire by method of vibrations.
6) To determine Coefficient of Viscosity (η) of a given liquid by Poisseuli's Method.
7) Surface Tension/Angle of contact.
8) Combination of Lenses: To determine the equivalent focal length of a lens system by magnification method.
9) Spectrometer: To determine the refractive index μ of the material of Prism.
10) To study Thermistor characteristic (Resistance vs Temperature).
11) Constant Volume/Constant Pressure.
12) Wedge Shaped Film.
13) R.I. of liquid using LASER.
14) Y by bending.
15) Verification of Stokes theorem.
16) Flywheel.
17) Frequency of AC Mains: To determine frequency of AC mains.
18) LDR Characteristics: To study the dependence of LDR resistance on intensity of light.
19) RL Circuit: To determine the value of given inductance and phase angle.
20) RLC Series Resonance: To determine resonance frequency of RLC series circuit.

B. Skill Experiments:

1) Use of Vernier calipers, Micrometer Screw Gauge, Travelling Microscope.
2) Graph Plotting: Straight Line with intercept, Resonance Curve etc.
3) Spectrometer: Schuster's Method.
4) Use of DMM and Scientific calculator.

Note:

Minimum **8** experiments from the list of the Regular experiments and Minimum **4** Skill experiments should be completed and reported in the journal, in the first semester. **Certified Journal is a must,** to be eligible to appear for the semester end practical examination.

Scheme of Examination:

A candidate will be allowed to appear for the semester end practical examination, only if the candidate submits a Certified Journal, at the time of practical examination of the semester or a certificate from the Head of the Department /Institute, to the effect that the candidate has completed the practical course of that semester of F.Y.B.Sc. Physics, as per the minimum requirement. The duration of the practical examination will be of two hours per experiment. There will be two experiments through which the candidate will be examined in the practical examination. The questions on the slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for its skill and understanding of Physics.

SEMESTER II

Name of the Course	Duration	Semester	Subject
B.Sc. in Physics	Six Semesters	II	Physics
Course Code	**Title**		
RJSUPHY201	Mathematical Physics		

Learning Outcomes:

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

1. Understand the basic mathematical concepts and applications of them in physical situations.

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

SEMESTER II

Paper I (Mathematical Physics) – RJSUPHY201

Unit I

Vector Algebra:

Vectors, Scalars, Vector algebra, Laws of Vector algebra, Unit vector, Rectangular unit vectors, components of a vector, Scalar fields, Vector fields, Problems based on Vector algebra. Dot or Scalar product, Cross or Vector product, Commutative and Distributive Laws, Scalar Triple product, Vector Triple product (Omit proofs). Problems and applications based on Dot, Cross and Triple products.

Gradient, Divergence and Curl:

The ∇ operator, Definitions and physical significance of Gradient, Divergence and Curl; Distributive Laws for Gradient, Divergence and Curl (Omit proofs); Problems based on Gradient, Divergence and Curl, Visualization of functions (plotting).

Unit II

Differential Equations:

Introduction, Ordinary differential equations: first order homogeneous and non- homogeneous differential equations with variable coefficients, Variable separable method, exact differentials equation, General first order Linear Differential equation, Second-order homogeneous differential equations with constant coefficients. Problems depicting physical situations like LC and RL circuits. Transient response of circuits: Series RL, RC, RLC circuits. Growth and decay of currents/charge.

Unit III

Superposition of Collinear Harmonic Oscillations: Linearity and Superposition Principle. Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats).

Superposition of two perpendicular Harmonic Oscillations: Graphical and Analytical methods. Lissajous Figures with equal and unequal frequency and their uses.

Wave Motion: Transverse waves on string, Travelling and standing waves on a string, Normal modes of a string, Group velocity, Phase velocity, Plane waves, Spherical waves, Wave intensity, Visualization of functions (plotting).

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

References:

Unit I

1.Murray R Spiegel, Schaum's outline of Theory and Problems of Vector Analysis, Asian students Edition.

Unit II

1.Charlie Harper, Introduction to Mathematical Physics, 2009 (EEE) PHI Learning Pvt. Ltd.

Unit III

1. The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.

2. The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.

Additional References:

1. Brij Lal,N. Subrahmanyam ,Jivan Seshan, Mechanics and Electrodynamics, S. Chand

2. A K Ghatak, Chua, Mathematical Physics, 1995, Macmillan India Ltd.

3. Ken Riley, Michael Hobson and Stephen Bence, Mathematical Methods for Physics and Engineering, Cambridge (Indian edition).

4. H. K. Dass, Mathematical Physics, S. Chand & Co.

5. Jon Mathews & R. L. Walker, Mathematical Methods of Physics: W A Benjamin Inc.

6. Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hil

SEMESTER II

Name of the Course	Duration	Semester	Subject
B.Sc. in Physics	Six Semesters	II	Physics
Course Code	**Title**		
RJSUPHY202	Electricity and Electronics		

Paper II (Electricity and Electronics) – RJSUPHY202

Unit I

Alternating Current Theory:

(Concept of R, L, and C: Review)AC circuit containing pure R, pure L and pure C (Review), representation of sinusoids by complex numbers, series R-C, R-L and RLC circuits. Resonance in RLC circuit (both series and parallel), Power in AC circuit, Q-factor.

AC bridges: General AC bridge, Maxwell, de-Sauty's, Wien Bridge.

Unit II

Circuit theorems: (Review: ohm's law, Kirchhoff's laws), Superposition Theorem, Thevenin's Theorem, Ideal Current Sources, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem, Numerical related to circuit analysis using the above theorems.

DC power supply: (Review of Half wave rectifier and Full wave rectifier), Bridge rectifier, PIV and Ripple factor of full wave rectifier, Capacitor Filter. Zener diode as voltage stabilizer.

Digital electronics: Logic gates (Review), NAND and NOR as universal building blocks, EX-OR gate: logic expression, logic symbol, truth table, Implementation using basic gates and its application, Boolean algebra, Boolean theorems. De-Morgan theorems, Half adder and Full adder.

Transistor as amplifier: CB, CE, CC Modes, Definition of gains α, β(DC and AC) and relation between them.

Unit III

Electrostatics and Magnetostatics:

Electrostatics: Introduction, Coulomb's Law, the Electric Field, Continuous Charge Distribution, Electric Potential: Introduction, Comments on Potential, the Potential of a Localized Charge Distribution.

Work and Energy in Electrostatics: The Work done to move a Charge, the Energy of a Point Charge Distribution.

Magnetostatics: Introduction, Steady Currents, the Magnetic Field of a Steady Current, the Biot-Savart Law, Applications of Biot-Savart Law: Straight wire, Circular coil, Helmholtz coils and Solenoid.

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

References:

Unit I

1) D. Chattopadhyay, P C Rakshit, Electricity and Magnetism (7th Ed.), New Central Book Agency.
2) V K Mehta and R Mehta Electronics Principals, (Multi coloured Revised 11th Ed. reprint in 2012),S. Chand.
3) A P Malvino, Digital Principles and Applications: Tata McGraw Hill

Unit II

1) D. Chattopadhyay, P C Rakshit, Electricity and Magnetism (7th Ed.), New Central Book Agency.
2) Boylestad and Nashelsky, Electronic Devices and Circuit Theory,(7th edition), Prentice Hall of India.
3) A P Malvino, Digital Principles and Applications, Tata McGraw Hill.

Unit III

1) David J. Griffiths, Introduction to Electrodynamics, Prentice Hall India (EEE 3rd Ed.).
2) D. Chattopadhyay, P C Rakshit, Electricity and Magnetism,(7th Ed.), New Central Book Agency.

Additional References:

1) B.L. Theraja and A.K. Theraja, A Textbook of Electrical Technology Vol. I, S. Chand Publication.
2) V K Mehta and R Mehta Electronics Principals, (Multi coloured Revised 11th Ed. reprint in 2012),S. Chand.
3) A B Bhattacharya, Electronics Principles and Applications, Central Publisher.
4) Tokhiem, Digital Electronics, (4thEd.), McGraw Hill International Edition.
5) Robert L. Boylestad, Introductory Circuit Analysis.

SEMESTER II

Name of the Course	Duration	Semester	Subject
B.Sc. in Physics	Six Semesters	II	Physics
Course Code	**Title**		
RJSUPHY20P1	Practical II		

Learning Outcomes:

On successful completion of this course students will be able to:
i) Demonstrate their practical skills.
ii) Understand and practice the skills while doing physics practicals.
iii) Understand the use of apparatus and their use without fear.
iv) Correlate their physics theory concepts through practicals.

Physics Practical Course – RJSUPHY20P1

A) Regular Experiment:

1) CE amplifier characteristics.
2) Half Adder and Full Adder.
3) De-Sauty's bridge.
4) To study Zener Diode as Voltage Regulator.
5) To study load regulation of a Bridge Rectifier.
6) RL Circuit: To determine the value of given inductance and phase angle.
7) RC Circuit: To determine value of given capacitor and phase angle.
8) Frequency of AC Mains: To determine frequency of AC mains.
9) RLC Series Resonance: To determine resonance frequency of RLC series circuit.
10) To study NAND and NOR gates as Universal Building Blocks.
11) To study EX-OR Gate, Half Adder.
12) To verify De Morgan's Theorems.
13) Thevenin's Theorem: To verify Thevenin's theorem for DC circuits.
14) Norton's Theorem: To verify Norton's theorem for DC circuits.
15) LDR Characteristics: To study the dependence of LDR resistance on intensity of light.
16) R.I. of liquid using LASER.
17) Torsional Oscillation: To determine modulus of rigidity η of a material of wire by Torsional oscillations.
18) Surface Tension / Angle of contact.

B) Demo Experiments:

1) Newton's Ring.
2) Light dependent switch.
3) Laser beam divergence, Intensity.
4) Use of Oscilloscope.
5) Charging and discharging of a capacitor.
6) Single slit diffraction.
7) Show ripple, with and without filter (Using CRO), in a bridge rectifier.
8) Magnetization Exp. (Mapping and Magnetic lines).
9) Faraday's laws.
10) Use of PC for graph plotting.

Note:

Minimum **8** experiments from the list of the Regular experiments and Minimum **4** Demo experiments should be completed and reported in the journal, in the second semester.

Certified Journal is a must, to be eligible to appear for the semester end practical examination.

Scheme of Examination:

A candidate will be allowed to appear for the semester end practical examination, only if the candidate submits a Certified Journal, at the time of practical examination of the semester or a certificate from the Head of the Department / Institute, to the effect that the candidate has completed the practical course of that semester of F.Y.B.Sc. Physics, as per the minimum requirement. The duration of the practical examination will be of two hours per experiment. There will be two experiments through which the candidate will be examined in the practical examination. The questions on the slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for its skill and understanding of Physics.

Program Code: **RJSUPHY**

F. Y. B.Sc. Course in Physics (Choice Based Credit System w. e. f. academic year 2018-19)

Course outcomes:

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

1	Understand Newton's laws and apply them in calculations of the motion of simple systems.
2	Use the free body diagrams to analyse the forces on the object.
3	Understand the concepts of friction and the concepts of elasticity, fluid mechanics and be able to perform calculations using them.
4	Understand the concepts of lens system and interference.
5	Apply the laws of thermodynamics to formulate the relations necessary to analyse a thermodynamic process.
6	Demonstrate quantitative problem solving skills in all the topics covered.
7	Understand nuclear properties and nuclear behaviour.
8	Understand the types of isotopes and their applications.
9	Demonstrate and understand the quantum mechanical concepts.
10	Understand the basic mathematical concepts and applications of them in physical situations.
11	Demonstrate quantitative problem solving skills in all the topics covered.
12	To demonstrate their practical skills, the use of apparatus, the concepts of errors and their estimation.
13	To correlate their physics theory concepts through practicals.

Learning Outcomes:

On successful completion of the course, students will be able to

1	State and analyse Newton’s three laws of motion. Apply Newton’s laws of motion to solve the numericals.
2	Write applications of Newton’s laws of motion.
3	State differences between inertial and non-inertial frame of reference.
4	Establish relation between elastic constants Y, K, η and σ.
5	State applications of Bernoulli’s equation in aerodynamics and aviation field.
6	Derive Newton’s lens equation. How is it helpful to opticians?
7	Explain the structure of Ramsden and Huygens eyepiece. Write their application in everyday life.
8	Write differences in spherical, chromatic and achromatic aberration. How these lens defects can be avoided?
9	Explain the phenomenon of interference in thin films. Write its application in wedge shaped films and Newton’s rings.

10	Explain the Zeroth and First law of thermodynamics. Describe application of first law to simple processes like
11	Differentiate between adiabatic and isothermal processes.
12	Explain the concepts of binding energy, packing fraction and mass defect. Solve numericals to calculate binding energy of various nuclei.
13	Explain the law of radioactive disintegration, properties of α, β and γ rays.
14	Explain law of successive disintegration and various equilibrium observed in radioactive isotopes.
15	Explain the application of radioactive isotopes in agricultural, medical, industrial, archaeological field.
16	Explain the interaction of high energy particles and matter in ionization chamber, proportional counter and Geiger Muller counter.
17	Derive Q value equation and solve problem based on Q value.
18	Explain various types of nuclear reactions and conservation laws.
19	Write applications of X- rays in everyday life. Explain Bragg's law in X- ray production.
20	Explain the concepts of Compton effect, pair production and gravitational red shift.
21	Explain Davisson-Germer experiment and G. P. Thompson experiment. How are they useful in the study of modern physics?
22	Calculate mechanical equivalent heat (J) by Electrical method, Young's modulus (Y) by vibration method of flat spiral spring, Surface tension of a liquid, determine refractive index of material of prism, calculate equivalent focal length of a lens system, determine radius of curvature of a given plano-convex lens using newton's rings by using laboratory set up.
23	State and explain laws of vector algebra and solve problems based on vector algebra. Solve problems based on dot, cross and triple products.
24	Solve problems based on del operator, gradient, divergence and curl.
25	Apply first and second order linear homogeneous equations to series LC, LR circuits and simple harmonic motion.
26	Study transient response of circuits in series LR, CR, LCR circuits and derive the necessary equations for current flowing in the circuits.
27	Explain the concept of superposition of two collinear harmonic oscillation shaving equal frequencies and different frequencies. Explain the phenomenon of beats. How is it useful in communication systems?
28	Explain how the Lissajous figures can be drawn by using concept of superposition of two perpendicular simple harmonic motions with equal and unequal frequencies and using analytical and graphical method.
29	Learn the concepts of transverse waves on string, travelling and standing waves on string, group and phase velocity, spherical and plane waves.
30	Understand the concepts of simple electrical AC circuits like L-R, C-R, and LCR circuits and resonance in LCR circuits.
31	Study balance conditions in the A-C bridges like Maxwell, De-sauty, Wein and Hay bridge and solve numericals on these bridge theory.
32	Learn the various electronic circuit theorems like Superposition, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem and their analysis through numerial problems.

33	Study the concepts of rectification in DC power supply, the types of rectifiers and their efficiencies, construction of diode circuits like clipper and clampers, application of Zener diode as voltage regulator.
34	Learn various concepts of digital electronics like NAND and NOR gates as universal building blocks, Verification of Demorgan's laws and its applications through truth tables and logic diagrams, construction of half adder and full adder circuits using basic gates and their applications in digital systems.
35	Understand the concepts of electric field and laws associated with it, to understand the relation between work and energy in electrostatics by studying the case of work done to move a charge in electric field.
36	Understand the concept of Magnetostatics and Biot Savart law, the magnetic field of a steady current. Solve numericals based on these laws.
37	Perform the actual experiments based on the theory to understand the concepts through hands on experience in the laboratory like study of Zener diode as regulator, determine unknown capacitance value of a capacitor in series C-R circuit, determine frequency of ac mains, to determine resonance frequency of LCR series resonance circuit, study NAND and NOR gates as universal building blocks, to verify Thevenin's theorem, study the dependence of LDR resistance on intensity of light etc.
39	Perform the skill experiments based on graph plotting skills, learn how to use measuring instruments like Vernier callipers, micrometer screw guage, travelling microscope, spectrometer and digital multimeter.
40	Learn how the cathode ray oscilloscope (CRO) works, how to use personal computer for graph plotting etc through demonstration experiments.