UNIVERSITY OF MUMBAI
No. UG/88 of 2015-16

CIRCULAR:-

A reference is invited to the Syllabi relating to the B.Sc. degree course , **vide** this office Circular No. UG/31 of 2009, dated 17th January, 2009 and the Principals of affiliated Colleges in Science are hereby informed that the recommendation made by the Faculty of Science at its meeting held on 22nd June, 2015 has been accepted by the Academic Council at its meeting held on 26th June, 2015 **vide** item No. 4.26 and that in accordance therewith, the syllabus as per Credit Based Semester and Grading System for the Second Year of B.Sc. programme in Physics is revised, which is available on the University's web site (www.mu.ac.in) and that the same has been brought into force with effect from the academic year 2016-17.

REGISTRAR

MUMBAI – 400 032
30th September, 2015

To,

The Principals of affiliated Colleges in Science and the Heads of the recognized Science Institution concerned.

A.C/4.26/26/06/2015

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No. UG/88-A of 2015-16 MUMBAI-400 032 30th September, 2015

Copy forwarded with compliments for information to :-

2) The Dean, Faculty of Science.
2) The Director, Board of Colleges and University Development,
3) The Professor-cum-Director, Institute of Distance and Open Learning (IDOL),
4) The Controller of Examinations,
5) The Co-Ordinator, University Computerization Centre.

REGISTRAR

..PTO

Academic Council

Item No.

UNIVERSITY OF MUMBAI

Syllabus for the S.Y.B.Sc.

Program:B.Sc.

Course: Physics

(Credit Based Semester and Grading System with effect from the academic year 2016–2017)

Revised Syllabus in Physics (Theory and Practical)

Asper credit based system
Second Year B.Sc.2016–2017.

The revised syllabus in Physics as per credit based system for the Second Year B.Sc. course will be implemented from the academic year 2016–2017.

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
I	**USPHP-301**	Mathematical Methods, Mechanics And Properties Of Matter	2
III	**USPHP-302**	Electricity and Magnetism	2
III	**USPHP-303**	Thermodynamics	2
III	**USPHP-3P**	Practical course-3 (Group A,B,C and Skill)	3
		Total	9
IV	**USPHP-401**	Optics	2
IV	**USPHP-402**	Electronics	2
IV	**USPHP-403**	Cosmology and Quantum Mechanics	2
IV	**USPHP-4P**	Practical course-4 (Group A,B,C and Demo)	3
		Total	9

USPH301: Mathematical Methods, Mechanics and Properties of Matter

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. Understand the concepts of mechanics, acoustics and the properties of matter and be able to perform calculations using them.
3. Demonstrate quantitative problem solving skills in all the topics covered.

UNIT-I i) Waves and Oscillations- i) Linear S.H.M., composition of two collinear S.H.M., superposition of two mutually perpendicular S.H.Ms, Lissajous's figures

SPP: 2.4.3 and 2.4.4

ii) Compound pendulum: Expression for period, maximum and minimum time periods, Centres of suspension and oscillations, Reversible compound pendulum, Kater's reversible pendulum. Advantages of a compound pendulum over a simple pendulum.

HP: (pages 279 to 284)

ii) Fourier series and applications.

Introduction, Fourier cosine and sine series, change of intervals, Complex form of Fourier series, Generalized Fourier series. (Note: - Good number of examples of all types is expected to be covered.)

CH: 7.1, 7.11, 7.12, 7.13, 7.14

UNIT-II Partial Differential equations and its applications.

Introduction, Formation of partial differential equation by eliminating arbitrary constants, by eliminating arbitrary functions, Modeling of vibrating stretched string or membrane one dimensional wave equation D'Alembert's solution to be obtained. By analogy of wave equation, obtain Schrodinger time dependent and time independent equation in one dimension, Modeling of two dimensional heat flow equation, Laplace's equation in two dimensions, Solutions by method of separation of variables, Use of Fourier series.

HKD: 9.3, 9.15, 9.16, 9.17, 9.18, 9.19, 9.20

UNIT-III Mechanics, Acoustics And Properties of Matter

i) Dynamics of system of particle and concept of rigid bodies, CM coordinates, Motion of a centre of mass and linear momentum, angular momentum and torque, angular momentumof a system of CM. Conservation of angular momentum.

BSJ: 6.1, 6.2, 6.4, 6.5, 6.6, 6.7, 6.11, 6.12

ii) Acoustics of Buildings

Reverberation, Sabine's formula (without derivation) Absorption coefficient, Acoustics of Buildings, factors affecting Acoustics of Buildings, Sound distribution in an auditorium.

Ref.:MS:5.9, 5.10, 5.12, 5.13, 5.14, 5.15.

iii) Bending of beams: bending moment, Basic assumptions for theory of bending, cantilever, beam supported at its ends and loaded in the middle, I-section girders, determination of Y by bending, Determination of elastic constants by Searle's method.

BSJ: 10.16, 10.17, 10.18, 10.19, 10.20, 10.22, 10.23, 10.26.

Note: - Good number of problems on all types is expected to be solved in each unit.

References:

SPP : Fundamentals of vibration and waves – S P Puri (Tata McGraw Hill)

HP : Mechanics – H. S. Hans and S. P. Puri, Tata McGraw Hill (2nd Ed.)

CH: Introduction to Mathematical Physics by Charlie Harper

HKD: Advanced Engineering Mathematics by H K Das

MS: Properties of matter and acoustics, S Chand Publications

BSJ: Mechanics and Electrodynamics Rev Edn. 2005 by Brijlal and Subramanayan and Jeevan Seshan.

Additional reference: KRS: Mechanics by Symon.

USPH-302: ELECTRICITY AND MAGNETISM

Learning Outcomes:

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

1. Understand the basic mathematical physics concepts and applications of them in physical situations
2. Understand the basic laws of electrostatics and magneto statics and applications of them and be able to perform calculations using them.
3. Demonstrate quantitative problem solving skills in all the topics covered.

UNIT I. i) Mathematical Background

Review of vector algebra and calculus. Product rules, Second derivative,

ii) Integral Calculus: Line, Surface and Volume Integrals, The Fundamental Theorem for Gradients (statement of theorem without proof; do problems), The Fundamental Theorem for Curls (statement of theorem without proof; do problems) The Fundamental Theorem for Divergences (statement of theorem without proof; do problems)

iii) Curvilinear Coordinates: Cylindrical Coordinates, Spherical Coordinates

DJG: 1.2.6 to 1.2.7, 1.3.1 to 1.3.4, 1.4.1 to 1.4.2, Problems 1.3 to 1.35

UNIT II. Electrostatics and Magnetostatics

The Electric Field: Introduction, Coulomb's Law, The Electric Field, Continuous Charge Distribution, Electric Potential, Introduction to Potential, 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: Magnetic Fields

The Biot Savart Law: Steady Currents,The Magnetic Field of a Steady Current Helmholtz coil and solenoid.

DJG: 2.1.1 to 2.1.4, 2.3.1, 2.3.2, 2.3.4, 2.4.1, 2.4.2, 5.1.1, 5.2.1, 5.2.2
BS: 16.10, 16.11

UNIT III: Motion of Charged Particles in Uniform electric and Magnetic Fields: Kinetic Energy of a Charged Particle in an Electric Field, Motion of a Charged Particle in a Constant Electric Field, Cathode Ray Oscilloscope, Charged Particle in an Alternating Electric Field, Force on a Charge in a Magnetic Field, Charged Particle in a Uniform and Constant Magnetic Field, The Cyclotron, Motion of Charged Particles in Combined Electric and Magnetic Fields, Velocity Selector

HP: 13.1, 13.2, 13.2.1, 13.3, 13.4, 13.5, 13.5.1, 13.6, 13.6.1

References:

DJG: Introduction to Electrodynamics 3rd Edn by D. Griffith

BS: Mechanics and Electrodynamics Rev Edn. 2005, by Brijlal and Subramanayan and Jeevan Seshan.

HP: Hans and Puri, Mechanics, TMH, 2nd Edition

USPH303: Thermodynamics

Learning Outcomes:

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

1. Understand the basic concepts of thermodynamics and its applications in physical situations.
2. Understand and learn low temperature physics
3. Demonstrate quantitative problem solving skills in all the topics covered.

UNIT-I

Conversion of heat into work, Heat engine, Carnot's cycle: its efficiency, Refrigerator

Steam engine, Rankine cycle

ABG : 7.1, 7.2, 7.3,7.3.1, 11.2, 11.3,

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

ABG : 7.5, 7.5.1, 7.6, 7.7, 7.8

Otto engine, Efficiency of Otto cycle, Diesel cycle, Efficiency of Diesel cycle, Otto and diesel comparison,

Refrigerator and air-conditioning, General Principle of Refrigerator, Theorem of refrigerator.

ABG : 11.4,11.4.1, 11.5,11.5.1 11.6, 11.7, 11.8, 11.8.1

UNIT-II

Clausius theorem, Entropy, Entropy of cyclic process, Reversible process; Entropy change, Carnot cycle, Reversible heat transfer, Principal 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.

ABG :-7.9, 7.10, 7.11, 7.12, 7.12.1, 7.12.2, 7.13, 7.14, 7.14.1, 7.14.3, 7.15, 7.16, 7.17

Third law of thermodynamics, Nernst heat theorem, Consequences of the third law, Maxwell's thermodynamic relations, Clausius – Claperyron equation,

ABG : 10.12,10.12.1, 10.12.2, 8.3, 8.3.2

UNIT III

Low temp physics: Different method of liquefaction of gases, method of freezing, Cooling by evaporation, cooling by adiabatic expansion**.**

BS : 7.1, 7.2, 7.3, 7.4

Joule – Thomson effect, Theory of the experiment, JT effect of van der Waals gas, Regenerative cooling, Liquefaction of air, Liquefaction of hydrogen, Liquefaction of helium, Properties and uses of liquid Helium, Feature of He II, He -III Cryostat,

ABG: 10.2, 10.2.1, 10.2.2, 10.3, 10.4, 10.5, 10.6, 10.6.1, 10.7, 10.10

References:

ABG: Thermal Physics, AB Gupta and H. Roy, Book and Allied (P) Ltd, Reprint 2008, 2009.

BS: Heat Thermodynamics and Statistical Physics, Brijlal, N.Subramanyam, P.S. Hemne, S. Chand, edition 2007.

Additional References:

1. Basic Thermodynamics : Evelyn Guha (Narosa Publications)
2. Thermal Physics : Philip M. Morse (W.A. Benjamin Inc. New York)
3. Heat & Thermodynamics : Robert and Miller (ELBS)
4. A treatise of Heat : Saha and Srivastava.

USPHP3P: Revised Practical course

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, weightage should be given to circuit/ray diagram, observations, tabular representation, experimental skill 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.

Leaning Outcome:

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

i) To demonstrate their practical skills more effectively.
ii) To understand and practice the skills while doing physics practical.
iii) To understand the use of apparatus and their use without fear.
iv) To correlate their physics theory concepts through practical.
v) Understand the concepts of errors and their estimation.

Group A

1 Surface tension by Jaeger's Method.
2 Bar pendulum: determination of g (Graph Lvs T and L vs LT^2)
3 Y by bending.
4 Searle's experiment: determination of Y and η.
5 Determination of thermal conductivity of bad conductor by Lee's Method.
6 Young's modulus by Koenig's method.
7 Helmholtz resonator- determination of unknown frequency.
8 Moment of Inertia of compound pendulum by method of coincidence.

Group B

9 Verification of Stefan's law (electrical method)
10 Determination of absolute capacitance using BG
11 High resistance by mirror galvanometer

12 Series Capacitance Bridge.
13 LCR parallel resonance.
14 e/m by Thomson's method
15 Temperature coefficient of resistance of conducting material,
16 Measurement of resistance of galvanometer-G by shunting.

Group C

17 Bridge rectifier: Ripple, Load regulation. (with C/ pi filter)
18 Figure of merit of a mirror galvanometer.
19 C1/C2 by de- Sauty's method.
20 Passive low pass filter.
21 Passive high pass filter.
22 High resistance by leakage using BG.
23 Charging and discharging of capacitor.
24 Lissajous figures using CRO.

D) Skill experiments:

1. Wiring of a simple circuit using bread board
2. Use of oscilloscope
3. Travelling microscope (radius of capillary)
4. Spectrometer: mean μ of yellow doublet of mercury source.
5. Component testing, colour code of resistors, capacitors etc.
6. Drawing of graph on semi logarithmic / logarithmic scale.

E) Exemption of two experiments from section A and/or B and/or C may be given if student carry out any one of the following activity.

1. Students should collect the information of at least five Physicistswith their work or any three events on physics. Report that in journal.
2. Students should carry out mini-project up to the satisfaction of professor In-charge of practical.
3. Study tour. Students participated in study tour must submit a study tour report.

For practical examination the learner will be examined in **three experiments** (one from each group). Each experiment will be of two hour duration. Minimum **3** from each group and in all minimum **12** experiments and 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 end practical examination only if the candidate 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.

REFERENCES

1. Advanced course in Practical Physics D. Chattopadhya, PC. Rakshit & B. Saha. (6^{th} Edition) Book & Allied Pvt. Ltd.
2. BSc Practical Physics – Harnam Singh S. Chand & Co. Ltd. – 2001
3. A Text book of advanced Practical Physics – Samir Kumar Ghosh, New Central Book Agency – (3^{rd} edition)
4. B Sc. Practical Physics – CL Arora (1^{st}Edition) – 2001 S. Chand & Co. Ltd.
5. Practical Physics – CL Squires – (3^{rd} Edition) Cambridge University Press.
6. University Practical Physics – D C Tayal. Himalaya Publication.
7. Advanced Practical Physics – Worsnop& Flint.

USPH401: Optics

Learning Outcomes:

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

1. Understand the diffraction and polarization processes and applications of them in physical situations.
2. Understand the applications of interference in design and working of interferometers.
3. Understand the resolving power of different optical instruments.
4. Demonstrate quantitative problem solving skills in all the topics covered.

UNIT I: (15 Lectures)

Diffraction:

Fresnel's diffraction: Introduction, Huygen's-Fresnel's theory, Fresnel's assumptions, Distinctionbetween interference and diffraction, Fresnel and Fraunhoffer types of diffraction, diffraction due tosingle edge, position of maximum and minimum intensity, intensity at a point inside a geometricalshadow, diffraction due to a narrow slit, diffraction due to narrow wire.

Fraunhoffer diffraction: introduction, Fraunhoffer diffraction at a single slit, intensity distribution indiffraction pattern due to single slit, Frounhoffer diffraction due to double slit, distinction betweensingle slit and double slit diffraction patterns, plane diffraction grating, theory of plane transmissiongrating, width of principal maxima, prism and grating spectra.

SBA: 17.1, 17.2, 17.3, 17.6, 17.7, 17.10, 17.10.1, 17.10.2, 17.11, 17.12, 18.1, 18.2, 18.2.1, 18.4, 18.4.2, 18.7, 18.7.1, 18.7.2, 18.7.8(i to vi)

Unit II: (15 lectures)

Michelson Interferometer: principle, construction, working, circular fringes, localized fringes, Visibility of fringes. Applications of Michelson interferometer, a) measurement of wavelength b) Determination of the difference in wavelengths of two waves c) Thickness of thin transparent sheet.d) Standardization of meter.

Fabry-Perot interferometer and etalon: Formation of fringes, determination of wavelength, Measurement of difference in wavelength.

SBA: 15.7, 15.7.1 to 15.7.7, 15.8, 15.8.1 o 15.8.3, 15.8.5, 15.12, 15.12. to 15.12.3

Resolving Power: introduction, Raleigh's criterion, resolving power of optical instruments, criterionfor resolution according to Lord Rayleigh's;Resolving power of telescope, resolving power of aprism, resolving power of a plane transmission grating.

SBA:19.1, 19.2, 19.5, 19.6, 19.7, 19.11, 19.12.

UNIT III: **(15 Lectures)**

Polarization: Introduction, The wire grid polarizer and a Polaroid, polarization by reflection, polarization by double refraction, Malus' law, Superposition of two disturbances, the mathematical analysis, the phenomenon of double refraction, quarter wave plates and half wave plates.

AG: 19.1, 19.2.1, 19.2.2, 19.2.3, 19.3, 19.4, 19.4.1, 19.5, 19.6.

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

REFRENCES

1. SBA.: A text book of Optics – Subramanyam, Brij Lal, Avadhanulu – S. Chand & Co. Multicoloured Ed. 2007.
2. AG. : Optics – Ajoy Ghatak (3rd Ed) Mc. Graw Hill Co.

USPH402: Electronics

Learning Outcomes:

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

1. Understand the basics of transistor biasing, operational amplifiers, their applications.
2. Understand the basic concepts of oscillators and be able to perform calculations using them.
3. Understand the working of digital circuits.
4. Use IC 555 timer for various timing applications.
3. Demonstrate quantitative problem solving skills in all the topics covered.

UNIT I (15 Lectures)

1. Transistor Biasing: Essentials of transistor biasing circuit, stability factor, methods of transistor biasing, Emitter bias, Voltage divider bias method.

MM: 9.5, 9.6, 9.7, 9.9, 9.10, 9.12

2. Uni- Junction Transistor: Symbol, construction, I-V characteristics, equivalent circuit

AM: 28.5

3. 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.

AM: 7.1 to 7.7, 17.1, 17.2, 17.3.

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

MM: 10.4, 10.5, 11.3

UNIT II **(15 Lectures)**

1. Oscillators: Introduction, effect of positive feedback. Requirements for oscillations, phase shift oscillator, Colpitt's oscillator, Use of UJT as a relaxation oscillator

AM: 18.0 to 18.3, 18.6, 28.5

2. Operational Amplifiers: Introduction, Differential and Common-Mode Operation,Op-Amp Basics, Virtual Ground , Practical Op-Amp Circuits : Inverting amplifier, Non inverting amplifier, Unity Follower, summing amplifier, integrator, differentiator, Frequency Parameters : Gain bandwidth and Slew rate

BN: 14.1 to 14.4 and 14.6 (7^{th} Edition)

BN : 13.1 to 13.4 and 13.6 (8^{th} Ed.)

UNIT III **(15 Lectures)**

1. Number system: Decimal, binary, hexadecimal number system and their mutual conversions.

ML: 5.2 to 5.5, 5.7

2. Binary addition, binary subtraction, unsigned Binary numbers, Sign-magnitude Numbers, 2's compliment representation and 2's compliment arithmetic: addition and subtraction.

ML: 6.1 to 6.6

3. Flip-flops and counters: R-S flip flops, Clocked R-S , D Flip flop, edge triggered J K flip flop, Master slave flip flop, Asynchronous counters: 3 bit ripple up counter and 3 bit ripple down counter

ML: 8.1, 8.2,8.5, 8.8 , 10.1

4. 555 Timer : Block diagram , Monostable and Astable Operation

MB: 23.7, 23.8, 23.9

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

References:

1. MM : Principles of Electronics – V. K. Mehta and Rohit Mehta. (S. Chand – Multicoloured illustrative edition)
2. AM : Electronic devices and circuits – An introduction Allan Mottershead (PHI Pvt. Ltd. – EEE – Reprint – 2013)
3. BN : Electronic Devices And Circuit Theory: Robert Boylestad and Louis Nashelsky (7^{th}/8th Edition Prentice Hall)
4. ML : Digital Principles and Applications: Donald Leach, A Malvino , Goutam Saha (13^{th} Edition) (McGraw Hill Publication)
5. MB : Electronic Principles : A. P. Malvino and D.J. Bates (7th Ed.) – (TMH).

Additional references:

UNIT – I: Electronics Fundamental and applications (8^{th} Ed.) D. Chattopadhyay & P. C. Rakshit (New Age International)

Unit-II and UNIT–III : A textbook of electronics – Santanu Chattopadhyay New Central Book Agency. 2006 Ed.

Basic Electronics – Ravish Aradhya H V, Mc Graw Hill Education 2013 Ed.

USPH 403 Cosmology and Quantum Mechanics

Learning Outcomes:

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

1. Understand the basic terms like Cosmology, galaxy, quasars.
2. Understand the postulates of quantum mechanics and to understand need of quantum mechanics.
3. Demonstrate quantitative problem solving skills in all the topics covered.

UNIT I:

Cosmology : Units in cosmology : length, mass, time scale , Magnitude,(solve problems) structural hierarchy (large scale structure of the universe) Hubble's law and expansion of the universe (problems)

JVN E - 1.1 , 1.2, 1.3

Types of galaxy, Radio Sources, Quasars, Radiation background

JVNI - 1.3, 1.4 , 1.5 ,1.6 , 1.9

Quantum mechanics : (Review : failure of classical mechanics to explain black body radiation and how quantum theory was successful , De-Broglie waves) Photo electric effect , waves of what ? Describing a wave, phase velocity and group velocity, Applying the uncertainty principle (problems on all the topics), Applications of quantum mechanics

AB - 2.3, 3.2, 3.3, 3.4, 3.9 Concepts of modern physics (6^{th} Edition) – Arthur Beiser

UNIT II:

Postulates of Quantum mechanics, Quantum mechanics, Wave equation, Schrodinger's equation –time dependent form, Linearity and superposition, Expectation values, Operators, Schrodinger's equation –steady state form Worked out examples and problems

SPS : 4.9

AB - 5.1 to 5.7

UNIT III:

Free states , The free particle , potential step, The rectangular potential barrier, The tunnel effect, The emission of alpha particle for a radioactive element, Square well potential , free states, bound states , particle in a box, Particle in a rectangular three dimensional box, Worked out examples and problems

SPS - 5.1 to 5.6 , 6.1 to 6.3

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

References :

JVNE: Elements of Cosmology – by Jayant V Narlikar 1996 University press

JVNI: Introduction to Cosmology(3^{rd} edition 2002) – Jayant Narlikar Cambridge University Press

AB: Concepts of modern physics - Arthur Beiser (6^{th} Editionn) Tata Mc Graw Hill

SPS: Quantum Mechanics : SP Singh , M.K Bagade , Kamal Singh Chand 2004 Edition

Additional references:

Astrophysics for Physicists- Chapter 9 - (Cambridge university press): Arnab Rai Chaudhary

Quantum Physics (2^{nd} edition) Wiley student edition, Eisberg and Resnick

Modern Physics : A B Gupta

Solid state Physics by S O Pillai for Unit 3.

USPHP4P: Revised Practical course

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, weightage should be given to circuit/ray diagram, observations, tabular representation, experimental skill 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.

Leaning Outcome:

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

i) To demonstrate their practical skills.
ii) To understand and practice the skills while doing physics practical.
iii) To understand the use of apparatus and their use without fear.
iv) To correlate their physics theory concepts through practical.
v) Understand the concepts of errors and their estimation.

List of experiments:

Group A

1. Optical lever: determination of μ
2. Determination of Couchy's constants.
3. Cylindrical obstacle: determination of λ
4. Fresnel's bi-prism: determination of λ
5. Resolving power of telescope.
6. R.P. of grating
7. Brewster's law: determination of μ
8. Single slit diffraction

Group B

9. Opamp: Inverting amplifier with different gains
10. Opamp: Noninverting amplifier with different gains and voltage follower
11. Opamp: Integrator
12. Opamp: Differentiator.
13. Passive band pass filter.
14. UJT characteristics
15. UJT relaxation oscillator
16. Colpitt's oscillator.

Group C

17. CE amplifier: determination of bandwidth
18. CE amplifier: variation of gain with load
19. Square wave oscillator using gates.
20. Half adder and full adder (7486, 7408)
21. Study of MS-JK flip flop and divide by 2 and 4 counter.
22. 555 timer as Astable multivibrator
23. 555 timer as Monostable multivibrator
24. Use of 555 as timer in seconds and minutes

Demonstration experiments:

1. Laser experiments: straight edge, single slit, ruler grating
2. Optical fibre: transmission of signal
3. Concept of beats
4. Coupled oscillations and resonance
5. Error analysis of a given experiment
6. Wave form generator using Op-amp
7. PC simulations: graph, curve fitting etc.
8. Straight edge Fresnel diffraction
9. Double refraction
10. First order active filter.
11. Hysteresis expt.

E) Exemption of two experiments from section A and/or B and/or C may be given if student

carry out any one of the following activity.

1. Students should collect the information of at least five Physicists with their work or write a report on any major physics events and report that in journal.
2. Students should carry out mini-project up to the satisfaction of professor In-charge of practical.
3. Study tour; Students participated in study tour must submit a study tour report.

REFRENCES

1. Advanced course in Practical Physics D. Chattopadhya, PC. Rakshit & B. Saha. (6^{th} Edition) Book & Allied Pvt. Ltd.
2. BSc Practical Physics – Harnam Singh S. Chand & Co. Ltd. – 2001
3. A Text book of advanced Practical Physics – Samir Kumar Ghosh, New Central Book Agency – (3^{rd} edition)
4. B Sc. Practical Physics – CL Arora (1^{st} Edition) – 2001 S. Chand & Co. Ltd.
5. Practical Physics – CL Squires – (3^{rd} Edition) Cambridge University Press.
6. University Practical Physics – D C Tayal. Himalaya Publication.
7. Advanced Practical Physics – Worsnop & Flint.

For practical examination the learner will be examined in **three experiments** (one from each group). Each experiment will be of two **hour** duration. **Minimum 3** from each group and in all minimum **12** experiments and minimum of 4 demonstration experiments are required to be completed and reported in journal compulsorily. The learner be evaluated at the time of viva voce on the basis of regular experiments and the demonstration experiments.

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

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