JAI HIND COLLEGE
BASANTSING INSTITUTE OF SCIENCE
&
J.T.LALVANI COLLEGE OF COMMERCE
(AUTONOMOUS)
"A" Road, Churchgate, Mumbai - 400 020, India.

Affiliated to
University of Mumbai

Program: BSc

Proposed Course: Physics

Semester II

Credit Based Semester and Grading System (CBGS) with effect from the academic year 2020-21

F.Y.B.S.c Physics Syllabus

Academic year 2020-2021

Semester II			
Course Code	**Course Title**	**Credits**	**Lectures /Week**
SPHY201	Mathematical Physics, Waves and oscillations	2	3
SPHY202	Electricity and Electronics	2	3
SPHY2PR	Practical – II	2	6

Semester II – Theory

Course Code SPHY201	Mathematical Physics and Waves and Oscillations. (Credits: 02, Lectures/Week: 03)	
	Objectives: To study the basics of Mathematical Physics and Waves and Oscillations. **Outcomes:** 1. Understand the basic mathematical concepts and applications of them in physical situations. 2. Demonstrate quantitative problem solving skills in all the topics covered. 3. Understand concept of waves and oscillating systems.	
Unit I	**Differential Equations** Differential equations: Introduction, Ordinary differential equations, First order homogeneous and non-homogeneous equations with variable coefficients, Exact differentials, General first order Linear Differential Equation, Second-order homogeneous equations with constant coefficients. Problems depicting physical situations like LC and LR circuits, Simple Harmonic motion (spring mass system).	15 L
Unit II	**Waves and oscillations** 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 an 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.	15 L
Unit III	**Damped and Forced oscillations and Transient response of AC circuits** Damped vibrations: Damped harmonic oscillator,types of damping, Energy of a damped oscillator, Quality factor, Logarithmic decrement, relaxation time. Forced vibrations: Forced damped harmonic oscillator,special cases: low driving frequency , high driving frequency ,velocity resonance, quality factor of a driven oscillator, sharpness of resonance Transient response of circuits: Series LR, CR circuits, LCR circuits (only formula for LCR circuits), Growth and decay of currents/charge.	15 L
CA (Continuous Assessment)	Problem Solving/ Assignments/Presentations	

References:
1. H. K. Das, (2008), *Mathematical Physics*, S. Chand Publication
2. CR: D. Chattopadhyay, P C Rakshit, (7th Ed, 2007), *Electricity and Magnetism*. New Central Book agency.
3. N.K. Bajaj, (1998), *The Physics of Waves and Oscillations,* Tata McGraw Hill Publication

Additional References:
1. B.D.Gupta, (4th Ed., 2004) *Mathematical Physics*, Vikas Publishing house Private Limited.
2. Francis Crawford, (2007), *Berkeley Physics Course,* Vol. 3, Tata McGraw-Hill.

Course Code: SPHY202	Electricity and Electronics. (Credits: 02, Lectures/Week: 03)	
	Objectives: To study the fundamentals of Electricity and Electronics. **Outcomes:** 1. Understand electrical network theorems. 2.Analyze and simplify electrical networks by applying principles of mathematics and physical science.	
Unit I	**Alternating current theory & AC bridges** AC circuit containing pure resistance R, Pure inductor L and Pure capacitor C. Representation of sinusoids by complex numbers. Series LR, CR and LCR circuits, Resonance in LCR circuit (both series and parallel), power in ac circuit, Q factor. General AC bridge, Maxwell, de-Sauty, Wien Bridge.	**15 L**
Unit II	**Circuit Theorems, DC power supply& Digital Electronics** (Review Ohm's law, Kirchoff's laws) Superposition theorem, Thevenin's theorem, Ideal current sources, Norton's theorem, Reciprocity theorem, Maximum power transfer theorem. Numericals related to circuit analysis using above theorems. Half wave rectifier, Full wave rectifier, bridge wave rectifier, PIV and Ripple factor of full wave rectifier, capacitor filter, Zener diode as voltage stabilizer. **READING ASSIGNMENT:** Logic gates, NAND and NOR as universal building blocks, EXOR gate: logic expression, logic symbol, truth table, implementation using basic gates and its applications, Boolean Algebra, Boolean theorems, De-Morgan theorems.	**15 L**
Unit III	**Transistor characteristics & General amplifier characteristics** CB, CE, CC modes. Definition of gain α, β (dc and ac) and relation between them. Concept of amplification, amplifier notations, current gain, voltage gain, power gain, input resistance, output resistance, frequency response. CE amplifier-operation, load line analysis, operating point, cut off and saturation points.	**15 L**
CA (Continuous Assessment)	Class test, Seminars, Assignments, Class performance, Projects	

References:
1. D. Chattopadhyay , P. C .Rakshit,(9th Ed., 2011*), Electricity and Magnetism*:. New Central Bookagency.
2. B.L. Theraja and A.K. Theraja , (Vol. I., 2014) *A Textbook of Electrical Technology :* S.Chand Publication.
3. Boylestad and Nashelsky, (9th Ed., 2008), *Electronic devices and Circuit Theory*: Prentice Hall of India.
4. V. K. Mehta and R. Mehta, (11th Ed., 2010.) *Electronics Principals*: S. Chand Publication.
5. A.P. Malvino, (7th Ed., 2009) *Digital Principles and Applications*: Tata McGraw Hill.
6. Tokhiem, (6th Ed., 2012) *Digital electronics*: McGraw Hill International Edition.
7. A. P. Malvino and D.J.Bates, (7th Ed., 2009) *Electronic principles*: Tata McGraw Hill.
8.Mottershead, A.(Reprint– 2013) *Electronic devices and circuits.* PHI Pvt. Ltd.
9. Millman and Halkias, *Integrated Electronics*:Mc Graw Hill International.
10.Salivahanan, N. Suresh Kumar and A. Vallavaraj. (2nd Ed.),*Electronic Devices and Circuits*: (Tata McGraw Hill)

SPHY2PR	Practical-II (Credits-02, Lectures/Week-6)
	Skills 1.Use of DMM 2.Graph plotting using Excel 3.Component testing 4. Use of breadboard 5. Soldering Techniques **Experiments (Any 8)** 1. Zener diode as voltage regulator 2. LR circuit 3. Frequency of ac mains 4. LCR series resonance 5. LDR characteristics 6. Bridge rectifier 7. Transistor CE characteristics 8. Thevenin's theorem 9. NAND and NOR gate as universal building blocks 10. Study of Demorgan's theorems 11. Transistor as an amplifier: Frequency response **Demonstrations** 1.Laser beam divergence, Intensity profile 2.Use of CRO 3.Charge and discharge of capacitor 4. Light dependent switch

Students will come for 2 turns of two and a half hours per week for the laboratory session (Performing practicals).

i) Skills: All 3 skills mentioned are compulsory. Students are required to acquire these skills and enter details in their journal.

ii) Regular Physics Experiments: A minimum of **08** experiments from the practical course are to be performed and reported in the journal.

iii) Demonstrations: The demonstrations are to be performed by the teacher in the laboratory and students should be encouraged to participate and take observations wherever possible.

Demonstrations are designed to bring about interest and excitement in Physics. Students are required to enter details of these 'demonstration' experiments in their journal.

The certified journal must contain all skills, a minimum of **08** regular experiments, and**04**demonstration experiments.

Evaluation Scheme

[A] Evaluation scheme for Theory courses

- **Continuous Assessment (C.A.) - 40 Marks**

    - **C.A.-I: Test – 20 Marks of 40 mins. duration**

    - **C.A.-II : Assignment on Numericals for Paper I, Seminars, Assignments, Class performance, Poster/Projects for Paper II. (20 Marks)**

- **Semester End Examination (SEE)- 60 Marks**

[B] Evaluation scheme for Practical courses

Expt I	Expt II	Journal	Viva	Continuous assessment of rough journal	Total
30	30	10	10	20	100

Practical examination will be of 4 hours. Students will perform 2 experiments of 2 hours each.