



**JAI HIND COLLEGE
BASANTSING INSTITUTE OF SCIENCE
&
J.T.LALVANICOLLEGE OF COMMERCE
(AUTONOMOUS)**

"A" Road, Churchgate, Mumbai - 400 020, India.

**Affiliated to
University of Mumbai**

Program: B.Sc. Physics

Course: Mathematical Physics, Waves and Oscillations

Semester II

**Credit Based Semester and Grading System (CBSGS) with effect
from the academic year 2021-22**

F.Y. B.Sc Physics Syllabus

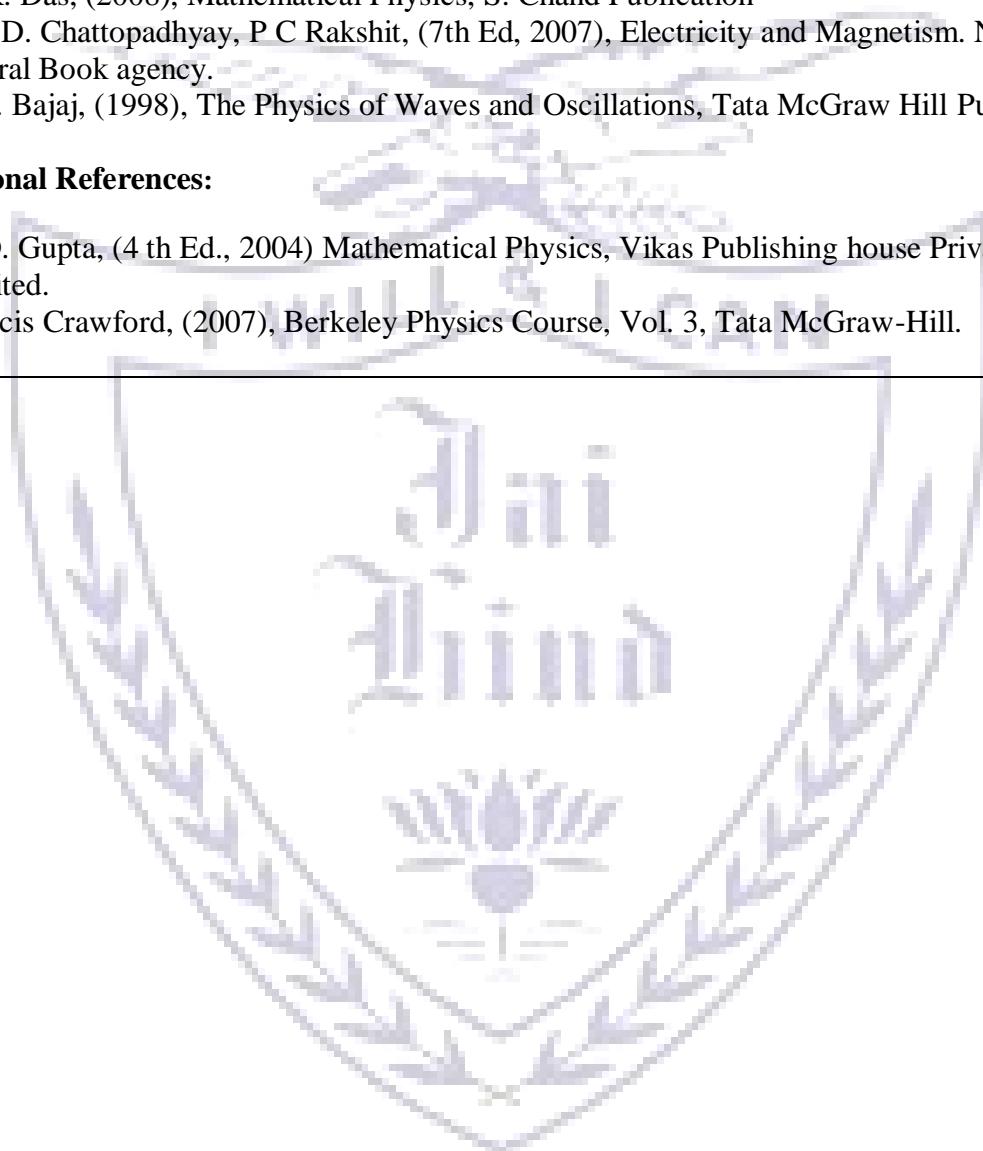
Semester II			
Course Code	Course Title	Credits	Lectures /Week
SPHY201	Mathematical Physics, Waves and Oscillations	2	3



Semester II – Theory

Course Code: SPHY201	Mathematical Physics and Waves and Oscillations. (Credits: 02, Lectures/Week:03)	
	Objectives: <ul style="list-style-type: none"> • To study the basics of Mathematical Physics and Waves and Oscillations. Outcomes: <ul style="list-style-type: none"> • To state the basic mathematical concepts and applications of them in physical situations. • Demonstrate quantitative problem-solving skills in all the topics covered. • Explain the concept of waves and oscillating systems. 	
Unit I	Differential Equations: <ol style="list-style-type: none"> 1. Differential equations: Introduction, Ordinary differential equations, 2. First order homogeneous and non-homogeneous equations with variable coefficients 3. Exact differentials 4. General first order Linear Differential Equation 5. Second-order homogeneous equations with n constant coefficients. 6. Problems depicting physical situations like LC and LR circuits, Simple Harmonic motion (spring mass system). 	15L
Unit II	Waves and Oscillations: <ol style="list-style-type: none"> 1. Superposition of Collinear Harmonic oscillations: Linearity and Super position Principle. 2. Superposition of two collinear oscillation shaving (1) equal frequencies and (2) different frequencies (Beats). 3. Superposition of two perpendicular Harmonic Oscillations: Graphical and Analytical Methods. 4. Lissajous Figures with equal and unequal frequency and their uses 5. Wave Motion: Transverse waves on a string, Travelling and standing waves on a string. Normal modes of a string, Group velocity, Phase velocity, Plane waves. 	15L
Unit III	Damped and Forced oscillations and Transient response of AC circuits <ol style="list-style-type: none"> 1. Damped vibrations: Damped harmonic oscillator, types of damping, Energy of a damped scillator, Quality factor, Logarithmic decrement, relaxation time. 2. Forced vibrations: Forced damped harmonic oscillator, special cases: low driving frequency, high driving frequency, velocity resonance, the quality factor of a driven oscillator, sharpness of resonance 3. Transient response of circuits: Series LR, CR circuits, LCR 	15L

	circuits (only formula for LCR circuits), Growth and decay of currents/charge.	
ICA (Internal Continuous Assessment)	Class test, Seminars, Assignments, Class performance	
<p>References:</p> <ol style="list-style-type: none"> 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 <p>Additional References:</p> <ol style="list-style-type: none"> 1. B. D. Gupta, (4 th Ed., 2004) Mathematical Physics, Vikas Publishing house Private Limited. 2. Francis Crawford, (2007), Berkeley Physics Course, Vol. 3, Tata McGraw-Hill. 		





**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: B.Sc. Physics

Course: Electricity and Electronics

Semester II

**Credit Based Semester and Grading System (CBSGS) with effect
from the academic year 2021-22**

F.Y. B.Sc Physics Syllabus

Semester II			
Course Code	Course Title	Credits	Lectures /Week
SPHY202	Electricity and Electronics	2	3



Course Code: SPHY202	Electricity and Electronics. (Credits: 02, Lectures/Week: 03)	
	Objectives: <ul style="list-style-type: none"> • To study the fundamentals of Electricity and Electronics Outcomes: <ul style="list-style-type: none"> • To solve electrical network theorems • Analyze and simplify electrical networks by applying principles of mathematics and physical science. 	
Unit I	Alternating current theory & AC bridges <ol style="list-style-type: none"> 1. AC circuit containing pure resistance R, Pure inductor L and Pure capacitor C. 2. Representation of sinusoids by complex numbers. 3. Series LR, CR, and LCR circuits, Resonance in LCR circuit (both series and parallel), power in ac circuit, Q factor. 4. General AC bridge, Maxwell, de-Sauty, Wien Bridge. 	15L
Unit II	Circuit Theorems, DC power supply & Digital Electronics <ol style="list-style-type: none"> 1. (Review Ohm's law, Kirchoff's laws) 2. Superposition theorem, Thevenin's theorem, Ideal current sources, Norton's theorem, Reciprocity theorem, Maximum power transfer theorem. 3. Numericals related to circuit analysis using above the theorems. 4. Half wave rectifier, Full wave rectifier, bridge wave rectifier, PIV and Ripple factor of full wave rectifier, capacitor filter, 5. Zenerdiodeas voltage stabilizer. Reading Assignment: <ol style="list-style-type: none"> 1. Logic gates, NAND, and NOR as universal building blocks ' 2. EXOR gate: logic expression, logic symbol, truth table, implementation using basic gates and its applications, Boolean Algebra, Boolean theorems, De-Morgan theorems. 	15L

<p align="center">Unit III</p>	<p>Transistor characteristics & General amplifier characteristics</p> <ol style="list-style-type: none"> 1. CB, CE, CC modes. 2. Definition of gain α, β (dc and ac) and relation between them. 3. Concept of amplification, amplifier notations, current gain, voltage gain, power gain, input resistance, output resistance, frequency response. 4. CE amplifier-operation, load line analysis, operating point, cut off and saturation points. 	<p align="center">15L</p>
<p align="center">ICA (Internal Continuous Assessment)</p>	<p align="center">Class test, Seminars, Assignments, Class performance</p>	
<p>References:</p> <ol style="list-style-type: none"> 1. D. Chattopadhyay , P. C. Rakshit,(9th Ed., 2011), Electricity and Magnetism:. New Central Book agency. 2. B.L. Theraja and A.K. Theraja , (Vol. I., 2014) A Textbook of Electrical Technology : S.Chand Publication. 3. Boylestad and Nashelsky, (9 th Ed., 2008), Electronic devices and Circuit Theory: PrenticeHall of India. 4. V. K. Mehta and R. Mehta, (11 th Ed., 2010.) Electronics Principals: S. Chand Publication. 5. A.P. Malvino, (7 th Ed., 2009) Digital Principles and Applications: Tata McGraw Hill. 6. Tokhiem, (6 th Ed., 2012) Digital electronics: McGraw Hill International Edition. 7. A. P. Malvino and D.J.Bates, (7 th 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) 		



**JAI HIND COLLEGE
BASANTSING INSTITUTE OF SCIENCE
&
J.T.LALVANICOLLEGE OF COMMERCE
(AUTONOMOUS)**

"A" Road, Churchgate, Mumbai - 400 020, India.

**Affiliated to
University of Mumbai**

Program: B.Sc. Physics

Course: Practical-II

Semester II

**Credit Based Semester and Grading System (CBSGS) with effect
from the academic year 2021-22**

F.Y. B.Sc Physics Syllabus

Semester II			
Course Code	Course Title	Credits	Lectures /Week
SPHY2PR	Practical-II	2	6



Course Code: SPHY2PR	Practical-II (Credits:02 Lectures/Week: 06)	
	Objectives: <ul style="list-style-type: none"> • To correlate theory concepts Outcomes: <ul style="list-style-type: none"> • To apply basic experimental skills through conduct of experiments. 	
	Skills: <ol style="list-style-type: none"> 1. Use of DMM 2. Graph plotting using Excel 3. Component testing 4. Use of breadboard 5. Soldering Techniques 	
	Experiments (Any 8): <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 1. Laser beam divergence, Intensity profile 2. Use of CRO 3. Charge and discharge of capacitor 4. Light dependent switch 	

Students will come for two turns of two and half hours each per week for the laboratory session (Performing practical).

i) Skill experiments: All 4 skill experiments 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.

The certified journal must contain all 4 skills and a minimum of **08** regular experiments,

Evaluation Scheme

Theory

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

C.A.-I: Test (MCQ) – 20 Marks of 30 minutes duration

C.A.-II: Assignment of Problems/Seminars/Class Performance

II. Semester End Examination (SEE) - 60 Marks

Practical

Total marks: 100						
Continuous Internal Assessment (CIA)			Semester End Examination (SEE)			Total
40%(40 Marks)			60% (60 Marks)			
Rough Journal	Journal	Viva-Voice	Expt -I	Expt- II	Total	
20	10	10	30	30	100	

Practical examination will be for a total duration of 4 hours. Students will perform 2 experiments of 2 hours each. Note: Certified journal is a must for the student to appear for practical examination.