DEPARTMENT OF PHYSICS				*CLASS: I B.Sc. Mathematics/IIChemistry*				
Sem.	**Course type**	**Course code**	**Course title**	**Credits**	**Contact hours/week**	**CIA**	**Ext**	**Total**
II/IV	Allied– II	20U2PAC2/ 20U4PAC2	ALLIED PHYSICS - II	4	4	25	75	100

Course Objectives:

1. The students will be able to
2. Understand the concepts of resistance of materials and capacity of conductors.
3. Illustrate the effect of magnetic field and the process of alternating current.
4. Explain the idea of the atom models and to analyse the basic properties of nucleus.
5. Learn the basic ideas of semiconductor diodes, transistor and logic gates.

Unit-I: Current Electricity

Capacitance – Definition – Unit - Principle of a capacitor – Capacitors in series and parallel – Ohms law – Resistance and Resistivity – Resistors in series and parallel – Kirchhoff's law – Wheatstone's network – Condition for balance – Carey–Foster's bridge – Measurement of resistance – Measurement of specific resistance – Potentiometer – Calibration of low range Voltmeter.

Self Study: Determination of temperature coefficient of resistance.

Audit: Calibration of High range voltmeter.

Unit-II: Electromagnetism

Electromagnetic Induction – Faraday's law – Lenz's law – Self inductance- Self inductance of a long solenoid - Mutual inductance –.Mutual inductance of two solenoids - A.C. Circuits – Mean value – RMS value – Peak value. LCR in series circuit – Impedance – Resonant frequency – Q factor.

Self Study: Applications of inductors.

Audit: Coefficient of coupling

Unit-III: Atomic and Nuclear Physics

Bohr atom model – Ionisation Potential – Atomic excitation – Frank – Hertz experiment – X–rays – Production – Derivation of Bragg's law – Properties of nuclei – Isotopes – Radio isotopes , Uses of radio isotopes - Nuclear binding energy – Nuclear fusion and Nuclear fission(Definition).

Self Study: X ray uses in industrial and medical fields.

Audit: Properties of X-rays

Unit-IV: Analog Electronics

Semiconductor – Intrinsic Semicondutor - Extrinsic semiconductor – Mobile Charge carriers and immobile ions – P N junction diode – Zener diode –Forward bias – Reverse bias - Bridge rectifier - Transistor – transistor biasing – CE configuration – Transistor characteristics (CE configuration only) – CE amplifier.

Self Study: Current gain relationship between α and β.

Audit:, Majority and minority carriers.

Unit-V: Digital Electronics

Number system – Decimal, binary, octal and hexadecimal system – Binary addition, subtraction and multiplication – Conversion of one number system to another number system. Logic gates – OR, AND, NOT, Ex–OR, NAND gates – Truth tables – Law and theorems of Boolean's algebra – De –Morgan's theorem.

Self Study: NOR Gate.

Audit: Half adder.

Books for Study

1. BrijLal& Subramanyam, Electricity and Magnetism,(2005),Ratan Prakashan Mandir Publishers.
   Unit I :7.1(i) ,7.2, 7.6 , 13.1 , 13.3 , 13.6 ,13.7 , 13.21 , 13.22 , 13.32 , 13.35 , 13.41(2).
   Unit II: 18.1 , 18.2 , 18.6 , 18.7 , 18.9 , 18.13 , 18.14 , 20.1 , 20.10 , 20.23(iii)
2. R Murugeshan and KiruthigaSivaprasath, Modern Physics, 2014,S.Chand&Co.Ltd.
   Unit III – 6.4 , 6.8 , 6.9 , 6.10(1) , 7.1 , 7.2 , 7.6 , 27.1 – 27.4 , 34.11, 35.2 , 35.7.
3. B. L. Theraja , Basic Electronics Solid State , 2012 , S.Chand&Co.Ltd.
   Unit IV: 12.22 – 12.27 , 13.1 – 13.3 , 13.5 – 13.7 , 13.9 , 15.1, 17.8 , 18.1 , 18.2 , 18.8 , 19.4 , 19.5 , 22.5 – 22.7 ,
   Unit V: 32.1 – 32.7 , 32.9 – 32.11 , 32.15, 32.19 – 32.23 , 32.25 – 32.28 , 33.1 , 33.3 , 33.5 , 33.7 , 33.9 , 33.10 , 33.12 , 33.14 , 33.15 , 33.16 , 33.17 , 33.21 , 33.22 , 34.1 – 34.3 , 34.5.
4. Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman , 14 th edition ,2017, Pearson India Education Services Pvt.Ltd.
   Applications :
   Unit I: Examples 24.5 , 24.6 , 25.2(c) , 25.3 , 26.1 – 26.7. (Pages 810, 814–817, 844–850, 872–882).
   Unit II: Examples 29.1 , 29.2 , 30.4 (Pages 979–984, 989, 990, 1018–1021).
   Unit III:Examples 36.5 , 38.4 , 39.5 , 43.1 , 43.3. (Pages 1225–1228, 1284 – 1286 , 1316 , 1464–1466, 1470–1471).

Books for References

1. R Murugeshan , Electricity and Magnetism , 2011 , S.Chand&Co.Ltd.
2. M.Narayanamurthy&N.Nagarathnam, Electricity & Magnetism, NPC pub., Revised edition.
3. R Murugeshan , Allied Physics, 2018 , S.Chand&Co.Ltd.
4. D.C.Tayal , Electricity and Magnetism , 1999 , Himalalaya Publishing Co.
5. D. Halliday, R.Rensick and J. Walker , Fundamentals of Physics, 6th edition, 2001,Wiley Eastern Limited.
6. V.K. Mehta, Rohit Mehta , Principles of Electronics , 2006 , S. Chand & Co.
7. D.L.Sehgal, K.L.Chopra and N.K.Sehgal , Modern Physics , 7th Edition, 1991 , Sultan Chand & Sons.
8. N. Subrahmanyam and BrijLal , Atomic and Nuclear Physics , 2000 , S. Chand & Co.
9. MalvinoLeach , Digital Principles and Application , 4thEdition , 1992 , Tata McGraw Hill.

Web Resources

Capacitors:

1. https://revisionworld.com/a2–level–level–revision/physics/fields–0/capacitors
2. https://www.birmingham.ac.uk/undergraduate/preparing–for–university/stem/Physics/stem–legacy–capacitors.aspx
3. https://isaacphysics.org/concepts/cp_capacitor
   https://www.arrow.com/en/research-and-events/articles/capacitor-basics-definition-uses-and-and-
   formulas-in-series-and-parallel

Carey Foster bridge:

5. https://electricalvoice.com/carey–foster–bridge–working–advantages–applications/

Electromagentic Induction:

6. https://www.toppr.com/guides/physics/magnetic–effects–of–electric–current/electromagnetic–induction–and–its–applications/
7. https://sciencing.com/what-electromagnets-used-everyday-life-4703546.html
8. https://www.electronicshub.org/applications-of-electromagnetism/

LCR Series Resonance Circuit:

9. http://vlab.amrita.edu/?sub=3&brch=75&sim=330&cnt=1

Bohr Atom Model:

10. https://www.toppr.com/guides/chemistry/structure–of–atom/bohrs–model–of–atom/

Frank Hertz Experiment:

11. https://vlab.amrita.edu/?sub=1&brch=195&sim=355&cnt=1
12. https://www.britannica.com/science/Franck–Hertz–experiment
13. https://ocw.mit.edu/courses/physics/8–13–14–experimental–physics–i–ii–junior–lab–fall–2016–spring–2017/experiments/the–franck–hertz–experiment/MIT8_13–14F16–S17exp7.pdf

Application of X rays:

14. https://science.jrank.org/pages/7433/X–Rays–Applications–x–rays.html

Radio Isotopes

15. https://www.britannica.com/science/radioactive–isotope

Nuclear Energy

16. http://www.energy.gov.za/files/media/Pub/NuclearEnergyInEverydayLife_Booklet.pdf

Semiconductors:

17. http://www.learnabout–electronics.org/Semiconductors/semiconductors_01.php

Applications of NAND Gates:

18. http://www.schoolphysics.co.uk/age16-19/Electronics/Logic%20gates/text/Logic_gates_applications/index.html

Course Designer(s):

1. Prof. V.Meenakshi Sundaram
2. Prof. M.Venkateshan
3. Dr. P. Pandi

Lecture Schedule

Unit	Topics	Hours	Mode
Unit I	Capacitance , Definition , Unit , Principle of a capacitor Capacitors in series and parallel	**2**	**Chalk and talk, Quiz and assignment**
	Ohms law , Resistance and Resistivity , Resistors in series and parallel	**2**	
	Kirchhoff's law , Wheatstone's network , Condition for balance	**3**	
	Carey–Foster's bridge ,Measurement of resistance, Measurement of specific resistance	**3**	
	Potentiometer ,Calibration of low range Voltmeter.	**2**	
Unit II	Electromagnetic Induction, Faraday's law, Lenz's law	**3**	**PPT Chalk and talk, quiz, Group discussion**
	Self inductance, Self inductance of a long solenoid, Mutual inductance , Mutual inductance of two solenoids	**3**	
	A.C. Circuits , Mean value , RMS value , Peak value	**3**	
	LCR in series circuit , Impedance , Resonant frequency, Q factor.	**3**	
Unit III	Bohr atom model	**2**	**Chalk and talk, Quiz and assignment**
	IonisationPotential , Atomic excitation	**2**	
	Frank – Hertz experiment	**2**	
	X–rays ,Production , Derivation of Bragg's law ,	**2**	
	Properties of nuclei , Isotopes, Radio isotopes , Uses of radio isotopes Nuclear binding energy	**2**	
	Nuclear fusion and Nuclear fission	**2**	
Unit IV	Semiconductor , Intrinsic Semicondutor , Extrinsic semiconductor, Majority and minority carriers, Mobile Charge carriers and immobile ions	**2**	**Chalk and talk, Quiz and assignment**
	P N junction diode ,	**2**	
	Zener diode, Forward bias , Reverse bias	**2**	
	Bridge rectifier	**1**	
	Transistor ,Working of a transistor , CE configuration	**2**	
	Transistor characteristics (CE configuration only)	**2**	
	CE amplifier	**1**	
Unit V	Number system , Decimal, binary, octal ,hexadecimal system and Conversion of one number system to another number system	**3**	**Chalk and talk, Quiz and assignment seminar**
	Binary addition, subtraction and multiplication	**2**	
	Logic gates , OR, AND, NOT, Ex–OR, truth tables	**2**	
	NAND gates , Truth tables	**2**	
	Law and theorems of Boolean's algebra	**2**	
	De–Morgan's theorem.	**1**	

Pedagogy

Chalk and talk , materials, PPT, Quiz , Assignment , Seminar , Problem solving , Group discussion , intraction and field visit.

Course Learning Outcomes

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

CLOs	Course Learning Outcome	Knowledge level
CLO –1	Apply Kirchhoff's laws to analyze circuits involving resistance, capacitance and voltage source including ac and dc Wheatstone's bridges	Upto K3
CLO –2	Use Laws of electromagnetic induction to day to day life appliances like induction stove, transformer, choke etc.,	Upto K3
CLO –3	Analyse the Physics of particles at the atomic and nuclear scale and appreciate the implications of the Bohr model of the atom, X–ray diffraction, nuclear stability and radioactivity	Upto K4
CLO –4	Understand the principle working and operation of rectifiers, regulators, oscillators and amplifiers along with characteristic parameters of operation and their construction from basic active semiconductor devices like diodes and transistors.	Upto K3
CLO –5	Apply principle of Boolean algebra for simplification and realization of digital circuits using logic gates.	Upto K3

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3						
CLO2	3						
CLO3	3						
CLO4	3						
CLO5	3						
CLO6	3						

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2		2	
CLO2	3	2		2	
CLO3	3		2	2	2
CLO4	3	2	2	2	2
CLO5	3	2	2	2	2

Advance application –3; Intermediate level –2; Basic level–1