SILVER OAK UNIVERSITY

College of Technology
Bachelor of Technology
Information Technology
Course Name: Principles of Physics
Course Code: 1010253104
Semester: 2nd

Prerequisite:

Basic Physics Knowledge for Semiconductors

Course Objectives:

1. Physics in Digital electronics is essential to understanding the design and working of a wide range of applications, from consumer and industrial electronics to communications; from embedded systems, and computers to security and military equipment. As the devices used in these applications decrease in size and employ more complex technology, it is essential for engineers and students to fully understand both the fundamentals and also the implementation and application principles of digital electronics, devices and integrated circuits, thus enabling them to use the most appropriate and effective technique to suit their technical needs. To acquire fundamental knowledge about nature and its phenomena including quantitative expression and also to enhance intellectual, computational, experimental, communication and analytical skills of the students. Physics is necessary to satisfy the basic sciences requirement, as appropriate for particular Computer and Information Technology Engineering disciplines

Teaching Scheme:

Teaching Scheme				
L	T	P	Contact Hours	Credit
3	0	2	5	4

Contents:

Unit	Topics	Teaching Hours	Weightage %
1	**Semiconductors and Diodes**: Semiconductors- definition & energy band diagrams. Properties of semiconductors. Intrinsic and Extrinsic, N and P type semiconductors. Diode- formation, depletion region, VI Characteristics, types and applications. Zener diode- reverse bias characteristics, voltage regulation, shunt voltage regulator, **Lasers** Introduction, Characteristics of laser radiation Spontaneous and stimulated emission, Einstein's theory of matter radiation : A and B coefficients Working of LASER with basic idea about Population Inversion, Pumping mechanism, Optical Resonators Solid-state lasers (Ruby), HE-NE Laser Applications of LASER: Medical, Industrial, Communication and other	12	25

	Activity: How to read & write memory using Laser in Optical Disk Memory		
2	**Transistors and MOSFETs:** Transistors- definition, terminals**,** types, symbols, formation of NPN and PNP, Transistor biasing- definition, List configurations and applications. CE input and output characteristics- cut off, saturation, and active regions. FET- definition, types. MOSFET- definition, types, symbols. N type enhancement mode- construction, working, characteristics, switch. List applications Differentiate BJT and MOSFET. **Activity: Using Breadboard prepare a circuit for using MOSFET as Switch**	9	25
3	**Number System and Boolean Algebra** Review of number system; types and conversion, codes. Boolean algebra: De-Morgan's theorem, switching functions, Prime Implicants and Essential Prime Implicants, Universal Gates **Activity: Verification of De-Morgan's Theorem using Gates**	5	15
4	**Superconductivity** Superconductivity, General Properties of superconductors Types of Superconductors: Type I and Type II, Mechanism of Superconductivity BCS Theory Applications: Magnets, Josephson effect, SQUID, Maglev, other. **Activity: Presentation on Superconductor for Computer Engineering Application**	6	15
5	**Fiber Optics** Introduction of Optical Fiber, Advantages of Optical Fiber Total Internal Reflection Numerical Aperture and Acceptance angle Attenuation & dispersion mechanism in optical fibers (Qualitative only) Modes of Propagation Types of Optical Fiber, Applications of optical fiber **Communication System**: Communication systems: (Communication system components, Analog modulation- AM, FM, PM. Digital modulation- ASK, FSK, PSK. **Activity: Experiments using Arduino and Sensors**	8	20

Course Outcomes:

Sr. No.	CO Statement	Unit
CO-1	Use basic concepts to analyze and design a wide range of semiconductor devices	1
CO-2	Understanding the construction and characteristics of FET and MOSFETs and differentiate with BJT	2
CO-3	Understanding the different number systems used in computerized system and codes used to represent the digits and fundamental of arithmetic	3
CO-4	Operation using each number system and codes.	4
CO-5	Understanding the properties of Superconductor and its application	5

Teaching & Learning Methodology:

1. Chalk and Board
2. PPT on Projectors
3. Flip Classrooms

List of Experiments:

Sr. No.	Practical Name
1	To understand some basic aspects of error analysis and graph drawing.
2	Understanding Logic Gates and universal logic gates.
3	Transistor Characteristics.
4	Gray to binary and binary to Gray conversion.
5	Characteristics of FET.
6	To study the I-V Characteristics of Silicon diodes.
7	To study the I-V Characteristics of Zener diodes.
8	To study the I-V Characteristics of LEDs.
9	Understand half wave rectifiers and full wave rectifiers.
10	To measure the Resistivity & Band gap of Germanium Crystal (N-type) by Four Probe Method.
11	To measure the numerical aperture of optical fiber.
12	To Study of propagation & bending loss in optical fiber.
13	To determine the frequency of given laser source.
14	To understand some basic aspects of error analysis and graph drawing.
15	Understanding Logic Gates and universal logic gates.
16	Transistor Characteristics.
17	Gray to binary and binary to Gray conversion.
18	Characteristics of FET.
19	To study the I-V Characteristics of Silicon diodes.
20	To study the I-V Characteristics of Zener diodes.

Major Equipment:

Sr No	Name	Specification

1	Universal training kit – electronics	
2	Rectifier Kit (Half wave, full wave, bridge)	Consisting of 0-30 V variable power supply, Diodes (IN 4007), Module of 10k resistors, Included Filter Circuit.
3	Diode Characteristics	0-30 V regulated tunable power supply, milliammeter (0-50mA), Microammeter (0-100μA), Digital multimeter, Resistances module 10K, Facility of Silicon Diode (IN4001), Germanium Diode (DR 25) and Zener Diode with reverse bias voltage Max. up to 8-9 V
4	Semiconductor energy gap set up	
5	Young's Modulus set up	Stand, weight box (up to 1kg), Samples (iron, Al, Cu etc), DC adapter, Spherometer stand with buzzer, weight holder
6	solar energy trainer	Fundamental of photovoltaic cell should be studied, application and Characteristics features should be measured by a kit
7	Ultrasonic measurement kit	
8	Fiber Optic Kit	LED source 950 nm/660 nm compatible APV or Photo diode Detector with Numerical Aperture Measurement Facility
9	Laser Source	He- Ne Laser and 1350 nm I-R Laser
10	CRO (20MHz)-(5MHz) dual channel	Dual channel,0-200 V, four probe, with power probe
11	Digital Multimeters	
12	Wires	
13	Capacitors, Resistors	
14	Diodes	
15	LEDs, LDRs	
16	Function Generator (5MHz)	Generation of sine, Square, Saw tooth waves required, +/- pulses frequency range up to 20 MHz, Peak to peak voltage around 20 V

Books Recommended:

1. Jacob. Millman, Christos C.Halkias, “Electronic Devices and Circuits”,Tata McGraw Hill Publishing Limited, New Delhi, 2008, ISBN 0070634556, 9780070634558.
2. Jacob Millman and C. Halkias, “Integrated Electronics – Analog and Digital Circuits and Systems”, Tata McGraw Hill, 2001, ISBN 0074622455, 9780074622452.
3. Semiconductor Devices, Physics and Technology, 3ed, ISVby Simon Sze.
4. Dr. Rakesh Dogra,,“Engineering Physics” S. K. Kataria & Sons Publication, India.
5. Resnick, Halliday and Krane, Physics part I and II, 5th Edition John Wiely (2002). Jewett &Serwey, “Physics for scientists and engineers with modern physics” ,Cengage publications.
6. The Feynman Lectures on Physics Vol 2, Pearson Education India.

List of Open-Source Software/learning website:

1. The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India.
2. Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
3. How things works by Louis A Bloomfeild, Wiley Publications.
4. Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education.
5. NPTEL Video Lectures.

CO-PO-PSO Matrix:

Co. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO2	PSO1	PSO2
CO-1	2	2	1	1					1			1	2	1
CO-2	2	2	1	1					1			1	2	1
CO-3	2	2	1	1					1			1	1	
CO-4	2	2	1	1					1			1	1	
CO-5	2	2	1	1					1			1	1	1