1.2.1

List of New Courses Introduced with Course Contents

Colour Codes		
Employability Contents	**Green**	
Entrepreneurship Contents	**Light Blue**	
Skill Development Contents	**Pink**	
Name of the Subjects/Related to all three Components (Employability/ Entrepreneurship/ Skill Development)	**Yellow**	

List of New Courses

Department : *Pure and Applied Physics*

Program Name : *B.Sc. (Electronics)*

Academic Year : 2021-22

List of New Courses

Sr. No.	Course Code	Name of the Course
01.	AECPL01	Electronics in daily life
02.	PLUBTT1	Semiconductor Devices
03.	SECPL02	Simulation and Design of Digital Circuit Components

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2021-22

School : *School of Physical Sciences*

Department : *Pure and Applied Physics*

Date and Time : *March 10, 2022 – 02:00 PM*

Venue : *Smart Class Room*

The scheduled meeting of member of Board of Studies (BoS) of Department of Pure and Applied Physics, School of Studies of Physical Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, was held to design and discuss the B. Sc. (Electronics), scheme and syllabi.

The following members were present in the meeting:

1. Dr. M. N. Tripathi
2. Prof. P. K. Bajpai
3. Prof. D. C. Gupta, External Member (Professor & Head, School of Studies in Physics, Jiwaji University, Gwalior)
4. Dr. A. K. Singh
5. Mr. P. Rambabu
6. Dr. R. P. Patel
7. Dr. M. P. Sharma

The committee discussed and approved the scheme and syllabi. The following courses were revised in the B. Sc. (Electronics):

- Basic Circuit Theory and Network Analysis
- Basic Circuit Theory and Network Analysis Lab
- Applied Physics Lab

The following new courses were introduced in the B. Sc. (Electronics):

- Electronics in daily life (AECPL01)
- Semiconductor Devices (PLUBTT1)
- Simulation and Design of Digital Circuit Components (SECPL02)

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Signature & Seal of HoD

Scheme and Syllabus

Course Structure
B.Sc. Electronics Syllabus 2021-22

Sem	Course	Course Code	Course Name	Credits	Credits (T+L+P)	Internal Marks	ESE Max. Marks	Total Marks
I	Core 1	PLUATT1	Mathematical Foundation for Electronics	5	4+1+0	30	70	100
	Core 2	PLUATT2	Basic Circuit Theory and Network Analysis	3	3+0+0	30	70	100
		PLUALT2	Basic Circuit Theory and Network Analysis Lab	2	0+0+2	30	70	100
	GE-1		Opted from the pool course and offered by sister Departments	5		30	70	100
	AEC-1		Opted from the pool course and offered by University	2		30	70	100
	SEC-1		Opted from the pool course and offered by University	2		30	70	100
	Total			**19**				**600**
II	Core 3	PLUBTT1	Semiconductor Devices	3	3+0+0	30	70	100
		PLUBLT1	Semiconductor Devices Lab	2	0+0+2	30	70	100
	Core 4	PLUBTT2	Applied Physics	3	3+0+0	30	70	100
		PLUBLT2	Applied Physics Lab	2	0+0+2	30	70	100
	GE-2		Opted from the pool course and offered by sister Departments	5		30	70	100
	AEC-2		Opted from the pool course and offered by University	2		30	70	100
	SEC 2		Opted from the pool course and offered by University	2		30	70	100
	Total			**19**				**700**

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AEC - 1: Electronics in daily life
Course Code: AECPL01 **Credits = 2 (2+0+0)**

Unit – I: History of Electronics: The vacuum tube era, The semiconductor revolution, Integrated circuits, Compound Semiconductor, Digital electronics Materials, Optoelectronics, Superconducting electronics, Flat-panel displays

Unit – II: Different Electronic Components / Semiconductor Components, Passive Components- Resistors: specifications and colour coding. Capacitors: Principle, specifications and colour coding. Inductors: Principle, specifications and classification, Battery, Battery holders and connectors ,Fuses ,Transistors, Oscillation, thyristors ,Light-emitting diodes (LEDs) AC fundamentals: Generation of alternating voltages, Basic electronic functions Rectification, Amplification Using n-p-n transistor, Multimeters, MOSFETs.

Unit – III: Application of Electronics: Consumer Electronics Office Gadgets like calculators, Personal computers, Digital Camera, FAX machines, Printers, Scanners, Front Projector, etc. Home appliances Robot Vacuum Cleaner, Electric Deep Fryer Refrigerator, AC, Coffee Maker Machine, Hair dryer Water Purifier/Dispenser, Storage Devices
Advanced Consumer Electronic Devices: Smart Phones, iPod and Tablets, Wi-Fi and the Internet, barcode scanners, ATM, Dishwasher and POS terminals.

Medical Electronics: Stethoscope, Respiration Monitors Glucose meter, The Pacemaker, MRI, CT scan
Unit – IV: Industrial and Automotive Electronics: Power Windows, Electronic Control Unit (ECU),Airbag control , all vehicles etc. Meteorological and Oceanographic Electronics: Barometer: .Anemometer: Anemometer Hygrometer ,Data logger Smart Grid Systems Image Processing, Entertainment and Communication Electronics:Smart TVs, Set Top Boxes, Speakers , receivers etc.
Defence Application: RADAR technology, Electronic Warfare Systems, Military electronic equipments etc.

Reference Books:

1. Getting Started in Electronics by Forrest, M.Mims, Master Publishing, Inc
2. Make Electronics – Learning by Discovery by Charles Platt ,Maker Media Publishers
3. Practical Electronics for Inventors , Paul Scherz, McGraw-Hill Education
4. Everyday Electronics and You: A Guide to Maintaining and Getting the Best Out of Your Everyday Electronics Devon A. Smith Kindle Edition ,
5. Complete Guide to Home Appliance Repair – Evan Powel, Better Homes & Garden Books Publication.
6. A Text book of Electrical Technology Vol. 1 and 2,.B.L.Thereja S. Chand & Company
7. Domestic appliances servicing, K.P.Anwer,Scholar Institute Publications.
8. Basic Electrical Engineering, M.L. Anwani,DhanpatRai Publication.

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SEC - 1: Simulation and Design of Digital Circuit Components
Course Code: SECPL02 **Credits = 1 (1+0+0)**

Course Objectives

- To acquaint students with various basic digital gates used in digital system and develop logical circuits using Boolean gates, construction of various logic circuits using basic gates.
- To impart practical working knowledge of Simulation and Analysis of digital circuits using MATLAB and/or SCILAB.

Learning Outcomes:

On successful Completion of the course, students will be able to:

- Understand the main features and importance of the MATLAB/SCI LAB mathematical programming environment.
- Apply working knowledge of MATLAB/SCI LAB package to simulate and solve Digital Electronics circuits and Applications.

Basics of the circuit components

Basics of Voltage, Current, Resistance and Power, Ohm's law, Series and parallel combinations of electrical components.Basics of electrical instruments such as multimeter, voltmeter and ammeter.

Basics and Applications of the MATLAB

Fundamentals of the MATLAB software. Logic Circuits,Equivalent circuits of an NOT Gate, Exclusive OR Gate, , NOR Gate as Universal Gate, NAND Gate, NAND Gate as Universal Gate, XNOR Gate,Half Adder, Full Adder, Half Adder using NAND Gate, Full Adder using NAND Gate, Comparator.

Reference Books:

1. Electrical Circuits, K.A. Smith and R.E. Alley
2. Modern Digital Electronics by R.P. Jain
3. Digital Electronics by Malvino and Leech
4. Digital Signal Processing with Examples in MATLAB by Samuel D. Strearns and Don R. Hush
5. Digital Signal Processing using MATLAB by Vinay K. Ingle and Johan G. Proakis

SEC - 1: Simulation and Design of Digital Circuits Components Lab
Course Code: SECPL02 **Credits = 1 (0+0+1)**
Name of Experiments

1. Design the OR, AND &NOT Gate circuits using software and Verify with experiments
2. Design the NANDGate circuits using software and Verify with experiments.
3. Design the NOR Gate circuits using software and Verify with experiments.
4. Design the Half Adderusing NAND Gate using software and Verify with experiments.
5. Design the Full Adderusing NAND Gate using software and Verify with experiments.
6. Design the Comparator circuit using software and Verify with experiments.

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Semester - II

Core 3: Semiconductor Devices **Credit: 3 (3+0+0)**
Course Code: PLUBTT1
Course Objective:

- This module introduces to the students some of the important semiconductor devices along with the underlying semiconductor physics. The module makes the students familiar with the working principles of major semiconductor diode, bipolar transistor, field-effect transistor devices, negative-resistance and power devices and photonic devices.
- Understand the fundamental principles and applications of modern electronic and optoelectronic semiconductor device.
- Understanding the connection between theory and practical as well as to make familiar with Experiments.

Course Outcomes: After completion of this course, students will be able to

- Get an understanding about the working principles and characteristics of different types of semiconductor devices — p-n junction diodes, bi-polar transistors, MOSFETs, MESFETs, tunnel diodes, photo-detectors, LEDs and solar cells

Unit – I: Semiconductor Basics: Carrier Concentration at Normal Equilibrium in Intrinsic Semiconductors, Fermi Level for Intrinsic & Extrinsic Semiconductors, Donors, Acceptors, Dependence of Fermi Level on Temperature and Doping Concentration, Carrier Transport Phenomena: Carrier Drift, Mobility, Resistivity, Hall Effect, Diffusion Process, Einstein Relation, Current Density Equation, Continuity Equation.

Unit – II: P-N Junction Diode: Formation of Depletion Layer, Space Charge at a Junction, Derivation of Electrostatic Potential Difference at Thermal Equilibrium, Concept of Linearly Graded and an abrupt Junction, Depletion Width and Depletion Capacitance of an Abrupt Junction. Derivation of Diode Equation and I-V characteristics, Zener and Avalanche Junction Breakdown Mechanism. Tunnel diode, varactor diode, solar cell: circuit symbol, characteristics, applications.

Unit – III: Bipolar Junction Transistors (BJT): PNP and NPN Transistors, Basic Transistor Action, Emitter Efficiency, Current Gain, Energy Band Diagram of Transistor in Thermal Equilibrium, Quantitative Modes of operation, Input and Output Characteristics of CB, CE and CC Configurations. Metal Semiconductor Junctions:

Unit – IV: Field Effect Transistors: JFET, Construction, Idea of Channel Formation, Pinch-Off and Saturation Voltage, Current-Voltage Output Characteristics. MOSFET, types of MOSFETs, Circuit symbols, Working and Characteristic curves of Depletion type MOSFET (both N-channel and P-Channel) and Enhancement type MOSFET (both N channel and P channel). Power Devices: UJT, Basic construction and working, Equivalent circuit, Characteristics and relaxation oscillator-expression. SCR, Construction, Working and Characteristics, MESFET, Circuit symbols, Basic constructional features, Operation and Applications.

Reference Books:

1) S. M. Sze, Semiconductor Devices: Physics and Technology, 2nd Edition, Wiley India edition (2002).
2) Ben G Streetman and S. Banerjee, Solid State Electronic Devices, Pearson Education (2006)
3) Dennis Le Croissette, Transistors, Pearson Education (1989)
4) Jasprit Singh, Semiconductor Devices: Basic Principles, John Wiley and Sons (2001)
5) Kanaan Kano, Semiconductor Devices, Pearson Education (2004)
6) Robert F. Pierret, Semiconductor Device Fundamentals, Pearson Education (2006)

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