Semester VI

Course Code 23	**BSCPHY0613**	
Credits=3	**L=2 , T=1 , P=0**	
Name of the course	**Digital Electronics**	
Type of the course	**Major Core Course XIII**	
Number of hrs required for this course	**45 hrs.**	
Total Max Marks	**100**	
Semester Term End Examination	**Max Marks: 50**	**Maximum Time: 3 hrs.**
Continuous Comprehensive Assessment: Based on Minor Tests (2), class tests, Tutorials/ Assignments, Quiz, Seminar and Attendance. **Marks Attendance:** 5 marks to be given as per the regulations		**Max Marks: 50**

Instructions:

1 **For Paper Setters and candidates:** Question paper will consist of five sections: Sections A(Compulsory, Covering all the units), B(Unit-I), C (Unit-II), D (Unit-III) , E (Unit IV). Nine questions will be set in all. Section A will be Compulsory, consisting of a single question with 9 subparts of objective short answer/ multiple choice type, which will cover whole of the syllabus of the course and consist of the 36% of the maximum marks of the end term examination for the course. Sections B, C, D, and E will have two questions each from respective sub units and each question will carry 16% of maximum marks of the end term examination for the course. 20-30% questions should be problem based numericals.

2 **For Candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections: B,C,D and E of the end term question paper and all the subparts in section A. Use of nonprogrammble calculator is allowed.

Course of Study

Unit-I (12 hrs.)

1.1 Digital Fundamentals: Binary, Octal and Hexadecimal number systems and their inter conversion, Binary arithmetic (addition, subtraction, multiplication and division 1's and 2's complements,

1.2 Basic logic gates: OR, AND, NOT, NAND, NOR, XOR, XNOR, positive and negative logic, Boolean algebra theorems, De Morgan's Theorem examples of IC gates. code (straight Binary code, BCD code, Gray code) Error detection, correction and Hamming codes.

Unit-II (12 hrs.)

2.1 Basic Idea about fundamental Products and derivation of through sum of product methods, sum of product equation. Minterms and Maxterms, Karnaugh mapping, k-map representation of logical functions for 2-4 variable.

2.2 Simplification of Boolean Equation with the help of k-map, Various minmiztion techniques, Quinne's Methods and quinnel Mc- Cluskey method, Difference between combinational & sequential ckts, Half adder, Full adder, Half subtractor, Full subtractor, Serial and parallel Binary adder

Unit-III (10 hrs.)

3.1 Flip Flop circuits: Various kind of Flip Flops, clocked RS flip, Flop, Edge Triggered, D Flip Flop, Flip Flop, twitching time, JK Flip Flop, JK Master slave. Flip Flop,

3.2 Counters: Clock waveforms, 555 timer as astable multivibrator, shift registers: Serial out, parallel in, parallel out; synchronous counters, Alynchronous counters, Ring counters.

Unit IV (11 hrs)

4.1 Converter Circuits: D/A converters, A/D Counters, clipping and Clamping, astable, Monostable and bistable multivibrators using transistors.

4.2 Logic Families: Introduction and performance criteria for logic families, Various logic families: DCTL, RTL, DTL, TTL & ECL, working and characteristics in priew, Saturated and non-saturated , fan in and fan out, MOS gates and CMOS gate, comparison of various logic families.

Books Suggested:

1. Malvino and Leach, Digital Principle and application
2. Taub and Schilling, Digital Integrated Electronics
3. Samuel C Lee, Digital Circuits and Logic Design
4. Pulse, Digital and Switching Waveforms, Millman and Taub.
5. Lionel Warnes, Macmillan Press Limited Analogue and Digital Electronics, London, 1998.
6. Digital fundamentals by Floyd & Jain, Pearson Education.

Course Code 25	**BSCPHY0613(P)**	
Credits=1	**L=0 , T=0 , P=1**	
Name of the course	**Physics Lab VIII (Digital Electronics, Solid State Physics, Nuclear Physics)**	
Type of the course	**Major Core Lab Course XIII**	
Number of hrs required for this course	**30 hrs.**	
Total Max Marks	**50**	
Semester Term End Examination	**50 % of total marks**	**Maximum Time: 3 hrs**
Continuous Comprehensive Assessment: Based on performance in the laboratory, lab record, lab seminar and Attendance. **Marks Attendance:** 5% marks to be given as per the regulations		**Max Marks: 50% of the total marks**

Instructions for Paper Setters and candidates: Laboratory examination will consist of two parts: (i) Performing a practical exercise assigned by the examiner from Unit II or Unit III (50% of the total marks) (ii) Viva Voce Examination (50 % of the total marks) Viva Voce Examination will be related to the practical performed, seminar assignment done by the candidate related to the paper and lab skills (Unit I) learnt during the course of the semester.

Course of Study

Unit I

The test of lab skills will be of the following test items:

i. Use of an oscilloscope.
ii. CRO as a versatile measuring device.
iii. Soldering.
iv. Circuit tracing of Laboratory electronic equipment,
v. Use of Digital multimeter/ VTVM for measuring voltages
vi. Color codes for resistor and capacitors.
vii. Testing a diode BJT and FET.
viii. Circuit tracing of Laboratory electronic equipment,
ix. Winding a coil / transformer.
x. To test a microphone/ speaker.
xi. To test a radio-receiver.
xii. Study the layout of receiver circuit.
xiii. Interfacing of a computer with the measuring instruments
xiv. Trouble shooting a circuit

Unit II

Laboratory Exercises:

1. Verify the truth tables of (a) AND (b) OR, (c) NOT, (d) NAND (e) NOR (f) XOR (g) EXTOR gates)
2. Implementation of half adder using AND- OR gates.
3. Implementation of full adder using AND –OR-gates.
4. Implementation of half subtraction using AND-OR & NOT gates
5. Implementation of full Subtractor using AND- OR and NOT gates
6. Verify truth tables of RS& JK flip flops
7. Using 555 timer as astable multivibrator.

8. **Magnetic materials**

Objectives:

Knowledge of (i) hysteresis loop, (ii) coercively and retentively.

Activity: Tracing of hysteresis loop of a number of magnetic materials and qualitatively discussing their distinguishing features

9. Ionization Potential of Hg:

Objective:

1. Concept of ionization potential.

Activity:

1. To measure ionization potential of mercury.

10. Photoelectric effect:

Objective:

1. Study of Photoelectric effect.

Activity:

1. Measure of stopping potential
2. Calculation of Planck's constant.

11. Work Function:

Objective: Idea of work functions; methods for determination of work function.

Activity: Work function of material of filament of a directly heated diode.

12. Energy gap:

Objective: Intrinsic and extrinsic semi-conductors, band model, energy gap, diode equation.

Activity: Measurement of reverse saturation current to a PN-junction diode at various temperatures and to find the approximate value of energy gap.

13. **Thermal Conductivity**

Objectives:

i) Attainment of steady state.

ii) Application of radiation correction.

iii) Magnitude of thermal conductivity of bad conductors.

Activity: To determine the coefficient of thermal conductivity of a disc of bad conductor using method of lees.

14. GM Counter:

Objective: Principles, construction, working and use of a GM-counter.

Activities:

1. Plateau and dead time of a GM counter.
2. Absorption of beta particles in aluminum.

15. **Millikan's** Experiment **(Through Remotely Controlled Lab) http://rd-munich.informatk.unbw-muenchen.de/**

16. **Photoelectric** Effect **(Through Remotely Controlled Lab) http://rd-munich.informatk.unbw-muenchen.de/**

17. Radioactivity **(Through Remotely Controlled Lab) http://rd-munich.informatk.unbw-muenchen.de/**

Unit III

Suggested Open ended Exercises:

1. **Design and Fabrication**:

i) Fabrication and design of simple electronic gadget or a toy involving principles of physics.

(ii) Design an LED display screen

Books Suggested

1. A Laboratory Manual of Physics for Undergraduate Classes, Vani Publication House, New Delhi.
2. Art of Electronics, Paul Horowitz, Cambridge University Press, New Delhi
3. Practical Physics, CL Arora (S.Chand)