DEPARTMENT OF ELECTRONICS

Proceedings of Academic Advisory Committee meeting held on 06-04-2024

A meeting of the Academic Advisory Committee was held on 0-04-2024 at 10.30 am in the Electronics Staff room X708. Following Agenda was considered.

1. **Proposing the syllabus for the BSc UG Electronics Course -Semester I and II under Two Major Scheme of Deemed to be University curriculum**
2. **Proposing Syllabus of Certificate course**
3. **Any other matter with the permission of chair**

Decisions:

(i) Resolved to design curriculum according to the structure proposed by the Office of the Registrar

(ii) Decided to offer the existing syllabus under NEP in the Autonomous system for the academic year 2024-25 under Deemed to be university.

(iii) Accepted the Proposed list of Practicals.

(iv) Accepted the proposed Question paper pattern

(v) Accepted the Open Elective (OE) syllabus.

(vi) Accepted the curriculum of certificate course

List of Members Present:

- **Dr Narayana Moolya. B , Associate Professor and Head , Dept of Electronics, St Aloysius Deemed to be University-Chairman.**
- **Dr Jayaprakash Gowda , Associate Professor of Electronics, St Aloysius Deemed to be University- Internal Member.**
- **Dr Ishwara Bhat. S, Associate Professor and Head , Dept of Physics, St Aloysius Deemed to be University- Invited member**
- **Dr Ananthakrishna T, Associate Professor of ECE, Manipal Institute of Technology, MAHE, Manipal.**
- **Dr Aruna Kalcura. T, Associate Professor and Head , Dept of Statistics, St Aloysius Deemed to be University-Dean , School of Physical Sciences.**

COURSE Structure:

Sl. No.	Semester	Title of thePaper	Teaching Hours	Hours /week		Examination Pattern Max. Marks /Paper				Duration of Exam (hours)	
						Theory		Practical			
				Theory	Practical	Exam	I A	Exam	I A	Theory	Practical
1	I	1. THEORY: G 504 DC1.1 Electronic Devices and Circuits. 2. Practicals :504 DC 2.1P Practical I	56	4	4	60	40	25	25	2.5	4
		G504 OE 1.1 PCB design and IC fabrication	42	2	1	40	10	-	-	2	-
2	II	1.THEORY:G 504 DC1.2 Analog and Digital Circuits 3. Practicals :G504 DC 2.2P Practical II	56	4	4	60	40	25	25	2.5	4
		ELE-G504 OE 2.1 : Fundamentals of Digital Electronics.	45	2	1	40	10	-	-	2*	-

Semester	Code	Paper Title
I	G 504DC1.1 G 504DC 2.1P G 504OE1.1	Electronic Devices and Circuits. Practicals - I PCB design and IC fabrication
II	G 504DC1.2 G 504DC2.2P G 504OE2.1	Analog and Digital Circuits Practicals - II Fundamentals of Digital Electronics.

SEMESTER – I

G 504 DC1.1 **Electronic Devices and Circuits.**

(Credits: Theory – 04, Practical – 02) **Total Teaching hours: 56**

Programme outcomes:

PO1	Understand, appreciate and apply the concepts of Electronics in various fields science, environment and contribute to improve the quality of life.
PO2	Acquire and Enhance basic skills of reasoning, application and hands on experience to use basic tools and methods of Electronics.
PO3	Develop broad knowledge and understanding of key concepts of electronic science and equip with advanced scientific/technological capabilities for analyzing and tackling the issues and problems in the field of Electronics.
PO4	Create an awareness of the impact of Electronics on the society, and Development outside the scientific community.
PO5	Inculcate scientific temper in fellow students and also among the larger scientific community, and society in general.
PO6	Use modern techniques and recent methods to imbibe and propagate the concepts of Electronics.
PO7	Think, acquire knowledge and skills through logical reasoning and inculcate the culture of self-learning.
PO8	Exercise critical thinking and the scientific knowledge to design, carry out, record, analyze and co-relate the results of Electronics practical.

Course Objectives

Upon completing this course, the student will be able to

1. Understand fundamentals of network analysis.
2. Be familiar with the basic operation of Electronic devices and circuits which are the building blocks of all Electronic circuits and gadgets.
3. Principles of operation of transistors and their applications
4. Learn the number systems and basics of Digital
5. Boolean algebra, Boolean postulates and simplification of Boolean functions
6. understand Logic gates and their applications

Course Outcomes:

At the end of this Course students will be able to

CO1: Study and analyze basic networks using network theorems in systematic manner.

CO2: Build simple electronic circuits used in various applications.

CO3: Describe the behaviour of basic semiconductor devices

CO4: Reproduce the I-V characteristics of diode/BJT devices

CO5: Explain the behaviour, characteristics and applications of Varactor diode,LED, Zener diodes.

CO6: apply standard device models to explain/calculate critical internal parameters of semiconductor devices.

CO7: Understand and represent numbers in powers of base and converting one

fromthe other, carry out simple arithmetic operations.
CO8: Understand the basic knowledge of Digital system building blocks, effectively can construct simple digital designs with the knowledge of Boolean algebra.

UNIT-I

Chapter1: Electronic Components: Classification: Passive and active, linear and nonlinear, unilateral and bilateral elements, Concept of Voltage and Current Sources, Source transformation principle, electric energy and power.
Resistors: Fixed and variable resistors, Constructional features of carbon composition, metal film and wire wound resistors. Variable resistors: Potentiometer, rheostat and preset - use of potentiometer as a variable resistor and potential divider.
Capacitors: Fixed- various types of fixed capacitors, polar and non polar capacitors-constructional features-electrolytic and non-electrolytic capacitors. Variable capacitors-trimmers and ganged capacitors.
Inductors- Fixed inductors, classification based on the frequency operation.
Transformers-Principles of operation, types, mention of applications. **5hrs**

Chapter2: Network Theorems: Kirchhoff's laws, Mesh analysis, superposition theorem, maximum power transfer theorem, The venin's theorem, Norton's Theorem – (2 mesh problems involving maximum of two voltage sources). H-parameters of a two port network. (Illustrative problems to be worked out wherever required.

5hrs

Chapter3: DC and AC Circuits: Transient response of RC, RL and LCR circuits.
AC Circuits: Phasors, AC response of R, L, C, RC, RL, and RLC circuits. Series resonant circuit - Bandwidth, quality factor. Parallel resonant circuit, RC integrator and RC differentiator. RC Filters-Low pass, High pass and Band pass filters. (All ac response should be studied using 'j' operator) **4hrs**

UNIT-II

Chapter1:PN junction diode: Ideal and practical diodes, Formation of Depletion Layer, Diode Equation and I-V characteristics-cut-in voltage, static and dynamic resistance, Reverse saturation current, reverse breakdown voltage. Reverse breakdown- Zener and avalanche breakdown. **5hrs**
Chapter2: Special semiconductor diodes: Zener diode**,** Varactor diode , Light emitting diode and photo diode- construction, circuit symbol, characteristics, working and applications of each diode. **5hrs**
Chapter3: Rectifiers-Half wave and Full wave (center tap and bridge) rectifiers, expressions for output voltage, output current ,frequency ,PIV, ripple factor and efficiency (mention only), Shunt capacitor and series inductor filter. **4hrs**

UNIT-III

Chapter1: Bipolar junction Transistors: Introduction, structure and working, unbiased transistor-formation of depletion regions, basic biasing schemes. Transistor configurations, Transistor action and its importance, current gains, relationship between current gains, Characteristics of a transistor, Operating point, transistor as a switch. **7hrs**

Chapter2:Field Effect Transistors (FET): JFET –Construction, Operation. FET Characteristics-drain and transfer. FET parameters, Relationship between FET parameters, Small signal ac model of FET. Comparison between JFET and BJT.**MOSFETs**- Depletion and Enhancement type-basic structure, working, drain and transfer characteristics, Advantages of N-channel MOSFETs over p-channel, handling precautions of MOSFETs. **7hrs**

UNIT IV

Chapter1: Number System: Introduction to Digital , digital signals, need for representing information in digital form**.** Decimal, Binary, Octal and Hexadecimal number systems. Conversions of numbers from one base to the other. Representation of signed and unsigned numbers. Binary arithmetics. Representation of negative numbers in binary number system. Subtraction of binary numbers by 1's and 2's complement method. **Binary codes:** BCD codes- weighted and non weighted codes. Self complementing codes-8421, 2421, Excess-3, Gray code, cyclic codes. Alphanumeric codes- ASCII and EBCDIC . **5hrs**

Chapter2: Boolean algebra: Postulates and Theorems of Boolean algebra. Duality principle in Boolean algebra. De Morgan's theorems-statement and proof. Boolean functions-simplification of Boolean functions using postulates. Logic gates. Universal gates - NOR and NAND gates. Realisation of other gates using only NAND gates. **5hrs**

Chapter3: Standard Forms Of Boolean Functions – Standard SOP and POS, realization of Boolean functions using NAND and NOR gates only. Karnaugh map- Simplification of Boolean functions using K-map (up to 4 variables), don't Care conditions. **4hrs**

Reference Books:

1	A.P. Malvino, "Principles of ", 7th edition .TMH, 2011.
2	Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
3	Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
4	David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni. Press, 2015
5	Electronic devices and circuit theory by Boylestad, Robert Nashelsky
6	Robert L Boylestad, "Introductory circuit analysis", 5th edition., UniversalBook
7	R.S.Sedha, "A Text book of Applied ", 7th edition., S. Chand and Company Ltd. 2011
8	Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)

Pattern of Question Paper:

Time: 2.5hrs. Max. Marks 60

Section-A: Short answer Type Questions

1. Multiple choice questions	6/6	1x6 =6
2. Very short answer questions.	6/8	1x6 =6
3. Short answer questions	6/8	2x6=12
Section B: Analytical/Problem solving/Application type questions	4/6	4x4=16

Section C: Descriptive/Analytical/Problem solving questions 4/6 5x4=20

Note i) All the sections should cover equal questions from each unit

ii) Maximum of 30% problems can be asked

G 504 DC2.1P: PRACTICALS – I

SECTION A. Demonstration Experiments. (ANY SIX EXPERIMENTS TO BE CONDUCTED.) 2 sessions

1. Understanding of Colour coding of resistors and identification of various types of resistors.
2. Understanding of coding various types of capacitors and identification of various types of capacitors.
3. Understanding and using multimeter for device testing.
4. Familiarisation and testing of different types of transistors.
5. Understanding soldering technique and hands on experience on soldering.
6. Understanding CRO and function generator and measurement of voltage and frequency of the signals using CRO
7. Verification of truth tables of NOT, AND and OR gates using TTL ICs.
8. Verification of truth tables of NAND and NOR gates using TTL ICs.

SECTION B: List of Experiments. Any Eight Experiments to be conducted - 8 sessions

1. Semi-conductor (RECTIFIER) Diode Characteristics.
2. Zener Diode Characteristics
3. Characteristics of LED-Comparison of cut-in voltages for different colours (3 diff colours).
4. Transistor Characteristics.
5. JFET Characteristics.
6. Study of Bridge rectifier using diodes.
7. Investigation of capacitance and Inductance in ac circuits.
8. Realisation of AND, OR, NOT, NOR, XOR, XNOR using only NAND gates
9. DC load line of transistor switch.
10. DTL AND, OR gates and NOT gate using transistor.
11. Charging and discharging of a capacitor.

Scheme of valuation:

Part A: Identification of circuit Elements and testing Exercise		06 (split up shown)
Part B : One Experiment of Three Hrs Duration		13(split up shown)
Record		06
Internal Assessment		25
	Total	50

Scheme of valuation

Part A: Based on SECTION-A

1. Writing observations and diagrams required for answering the given question -2 Mark

2. Conducting and demonstrating the meaurement/testing and facing viva - 4marks

Total **06marks**

Part B:

Formula/Truth table/specimen graph ------	2
Labelled Circuit diagram/base diagram of key device/ labelled pin diagram	2
Tabular column/Design calculations/selection of components	2
Circuit layout and connections-	1
Obtaining response, recording readings and number of trials-	4
Graph and calculations-	1
Result/accuracy-	1
	Total: 13

OPEN ELECTIVE1: G 504 OE1.1
PCB DESIGN AND IC FABRICATION

COURSE OUTCOMES:

At the end of the course the student should be able to:

CO1	Know the need for PCB Design, steps involved in PCB Design and Fabrication Process.
CO2	Design a schematic/layout PCB for analog circuits, digital circuits and mixed circuits.
CO3	Design an integral part of electronic products by understanding the PCB design.
CO4	To Understand various types of integrated circuits.
CO5	To understand the various steps involved in the fabrication of IC

Total Teaching hours: 42

Unit-1 **14Hours**

14 Hours

PCB Design: Types of PCB, Single sided board – double sided – Multilayer boards – Plated through holes technology – Benefits of Surface Mount Technology (SMT) – Limitation of SMT – Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's.

LAYOUT AND ARTWORK: Layout Planning – General rules of Layout – Resistance, Capacitance and Inductance – Conductor Spacing – Supply and Ground Conductors – Component Placing and mounting–Cooling requirement and package density–Layout check. Basic artwork approaches– Artwork taping guideline–General artwork rules– artwork check and Inspection.

Unit-2 **14 Hours**

Laminates and photo printing: Manufacture of copper clad laminates – Properties of laminates – Types of Laminates – Manual cleaning process – Basic printing process for

double sided PCB's – Photo resists – wet film resists – Coating process for wet film resists – Exposure and further process for wet film resists – Dry film resists.

ETCHING AND SOLDERING: Introduction – Etching machine – Etchant system. Soldering: Principles of Solder connection – Solder joints – Solder alloys – Soldering fluxes. Soldering Tools: Soldering, De-soldering tools and Techniques – Manual Soldering – Solder mask – Safety, health and medical aspects in Soldering practice.

Unit-3 **14 Hours**

IC fabrication techniques: IC Fabrication Techniques: Monolithic and hybrid Ics, scales of integration. Advantages of ICs. Crystalline and epitaxial growth. Crystalline growth from melted material. Floating Zone Technique. Epitaxial Growth. Metallic films deposition. Basic Principles of Diffusion and ions implantation. Diffusion related processes. Implantation related processes. Lithography techniques. Optical Lithography. Electron and ion beams and X-ray lithography. Chemical etching. Passive components integration-resistor, capacitor and inductor. Integration of active devices-diode, transistor, NMOS and CMOS.

Demonstration Experiments:

1	Understanding voltage, current, frequency etc and use of basic devices and meters used for testing purpose.
2	Types of motors and transformers used in household appliances
3	SMPS: Block diagram and working
4	Inverter-Block diagram, understanding various stages and measurement of voltages at various points
5	PCB design and fabrication
6	PCB testing, soldering and de-soldering

Pattern of Question Paper:

Time: 2.5hrs. Max. Marks 60

Section-A:1. Short answer Type Questions **2marks each** **5/7** **5X2=10**

Section B: long answer type questions **4marks each** **5/6** **5X4=20**

Section C: Descriptive/Analytical/Problem solving questions **10marks each** **3/4** **3x10=30**
(Maximum of two sub questions)

- **Reference books:**

1 Silicon Integrated Circuits: Advances in Materials and Device Research" by Dawon Kahng

2 Integrated circuit fabrication / Kumar Shubham, Ankaj Gupta.By:Shubham, Kumar [author.]CRC Press, 2021

3 Basic electrical engineering - V K Mehta and Rohit Mehta, S Chand and Company.

4 Clyde F.Coombs "Printed circuits Handbook" IIIEdition McGrawhill
KraigMitzner, "Complete PCB Design Using OrCAD Capture and Layout," Elsevier, Amsterdam,

5 Electrical Circuits, K.A. Smith and R.E. Alley, Cambridge University Press.

6 Performance and design of AC machines - M G Say ELBSEdtion.

7 Walter C.Bosshart "PCB Design and Technology" Tata McGraw Hill, Publications, Delhi. 1983.

8 Walter C Bosshart, "Printed Circuit Board Design and Technology",1st ed.,McGraw Hill Education

II SEMESTER

G 504 DC1.2

ANALOG AND DIGITAL CIRCUITS

(Credits: Theory – 04, Practical – 02) Total Teaching hours: 56

Course Objectives

Upon completing this course, the student will become familiar with various working principles of widely used electronic devices, linear and digital ICs which help the students to build small projects and also be able to answer some basic questions that appear in competitive examinations.

Course Outcomes:

At the end of this course, students will be able to

CO1: design suitable biasing circuit to a transistor for specific application.
CO2: explain performance parameters of any amplifier
CO3: understand and appreciate the Fabrication of ICs
CO4: understand the Fundamentals of Operational Amplifiers.
CO5: interpret the experimental data for better understanding the ICs.
CO6: understand linear and nonlinear applications of operational amplifiers.
CO7: Analyze combinatorial and sequential circuits
CO8: understands and interprets parameters of various Logic families

UNIT-I

Chapter1: Transistor biasing circuits: Stability of Q –point, stability factor, factors affecting Q-point, Thermal runaway. Transistor biasing circuits-Fixed bias, fixed bias with emitter resistor, collector feedback bias, emitter bias and Universal bias. Equation for dc load line, stability of Q-point & design of each biasing circuits to be discussed. **5hrs**

Chapter2: Small Signal Amplifiers: Transistor models: h-parameter model, Ebers' Moll model.

Ac load line, coupling and bypass capacitors, CE amplifier-working, Graphical explanation, ac analysis using h parameter model, Expressions for gain, input and output impedance, ac model, frequency response of CE amplifier, Design of CE amplifier, CC and CB amplifiers (qualitative). Application of cc amplifiers in impedance matching , Relative merits of CE, CB and CC amplifiers, Mention of applications CB, CC and CE amplifiers. FET amplifiers - CS amplifier – expression for gain, input and output impedances, frequency response, CD and CG amplifiers (qualitative) **7hrs**

Chapter3: Multistage Amplifiers: Need for cascading of amplifiers, coupling schemes,

Comparison of different coupling schemes. Two stage CE amplifiers- direct, RC and transformer coupling, Darlington pair, comparison of Darlington pair and cc amplifier.

2HRS

UNIT-II

Chapter1: Feedback: Feedback in amplifiers: Concept of feedback, positive feedback and negative feedback, general theory of feedback –expression for the gain of an amplifier with feedback, effects of negative feedback (qualitative). Four types of feedback connection-characteristics of each case (block diagram only) **3hrs**

Chapter2: IC fabrication techniques: IC Fabrication Techniques: Monolithic and hybrid Ics, scales of integration. Advantages of ICs. Crystalline and epitaxial growth. Crystalline growth from melted material. Floating Zone Technique. Epitaxial Growth. Metallic films deposition. Basic Principles of Diffusion and ions implantation. Diffusion related processes. Implantation related processes. Lithography techniques. Optical Lithography. Electron and ion beams and X-ray lithography. Chemical etching. Passive components integration-resistor, capacitor and inductor. Integration of active devices-diode, transistor, NMOS and CMOS. **3hrs**

Chapter2: Operational Amplifiers: Transistor differential amplifiers**-** Four configurations of differential amplifier using transistors, Dual input balanced output BJT differential amplifier (qualitative). Concept of common mode gain, differential gain and CMRR. Block diagram of OPAMP, characteristics of an ideal opamp Characteristics of practical OPAMP(IC 741)- Input Offset Voltage , Input Offset Current, Bias current, Input and Output resistance, Slew Rate, CMRR, PSRR and frequency response. Amplifiers in open loop configuration-inverting, non inverting and differerntial amplifiers, limitations of using op-amp in open loop configuration. **8hrs**

UNIT-III

Chapter1: Amplifiers using op-amp: Voltage series feedback amplifier - Derivation of expression for Closed Loop Voltage gain, input and Output Resistance, Voltage follower. Voltage Shunt Feed-back Amplifier - Derivation of expression for closed loop voltage gain, expression for Input and Output Resistance. Current to voltage converter, OPAMP inverter. Differential Amplifier - Derivation of expression for gain. **4hrs**

Chapter2: General linear applications of Op-amp: Summing amplifier – using inverting and non-inverting configurations-derivation of expression for output voltage, summing amplifier as adder and averager, Op-amp substractor, inverter, Integrator and Differentiator**-** Derivation of expression for output voltage, frequency response, practical circuits. Comparators: Characteristics, OPAMP as comparator, Applications- voltage level detector, zero crossing detector, Inverting and non inverting Schmitt triggers- expression for UTP , LTP and hysteresis voltage **6hrs**

Chapter3: Filters using op-amp**:** Types, advantages over passive filters. Mention of commonly used active filters- Butter worth, Chebyshev and Cauer filters. First order low pass and high pass Butter worth filters- derivation of expression for gain, operation and design. **4hrs**

UNIT-IV

Chapter1: Combinational Logic Circuit: Design procedure with examples –Half Adder, Full Adder, Half substractor, Four bit parallel binary adder, Parity Bit Generator, 2 bit magnitude comparator, multiplexers – realization of Boolean functions using 4 to 1 MUX, De-multiplexers -1 to 4 DEMUX, Code converters, decoders - 2 to 4 line decoders, encoders. **5hrs**

Chapter2: Sequential circuits: Flip Flops – RS Flip Flop – basic type (using NAND gates), pulse and Edge Triggering, clocked RS Flip Flops with timing diagram. D Flip Flop – truth table, timing diagram. JK Flip Flop – truth table, timing diagram, racing in flip-flops, Master slave JK flip flop, T Flip Flops. **6hrs**

Chapter3: Logic Families: Pulse characteristics, Logic Families-classification of digital ICs. Characteristics of logic families, circuit description of TTL NAND gate with totem pole and open collector. TTL IC terminology. CMOS NAND, comparison of TTL and CMOS families **3hrs**

Reference Books:

1. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7thEd., 2011, Tata McGraw
2. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
3. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer,2001, PHI Learning.
4. David A. Bell “Electronic Devices and Circuits”, 5th Edition, Oxford Uni.Press, 2015
5. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
6. Electronic Devices Conventional Current Version by Thomas L. Floyd
7. Silicon Integrated Circuits: Advances in Materials and Device Research" by Dawon Kahng
8. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn, 2000, Prentice Hall
9. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011,Oxford University Press.
10. R. L. Tokheim, Digital Principles, Schaum’s Outline Series, TataMcGraw- Hill (1994)
11. R.S.Sedha, “A Text book of Applied electronics”, 7th edition.,S.Chand and Company Ltd. 2011
12. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
13. Integrated circuit fabrication / Kumar Shubham, Ankaj Gupta.By:Shubham, Kumar [author.]CRC Press, 2021

Pattern of Question Paper:

Time: 2.5hrs. Max. Marks 60

Section-A: Short answer Type Questions

1. Multiple choice questions	6/6	1x6 =6
2. Very short answer questions.	6/8	1x6 =6
3. Short answer questions	6/8	2x6=12
Section B: Analytical/Problem solving/Application type questions	4/6	4x4=16
Section C: Descriptive/Analytical/Problem solving questions	4/6	5x4=20

Note i) All the sections should cover equal questions from each unit

ii) Maximum of 30% problems can be asked

G 504 DC2.2P

PART A (Any 8) - 8 sessions

1. Transistor Biasing circuits -fixed bias, emitter feedback bias and universal bias.
2. Study of CE amplifier.
3. Study of CC amplifier.
4. Characteristics operational amplifier.
5. Study of inverting, non-inverting and differential amplifiers using Op amp.
6. Low pass filters and high pass filters using op-amp.
7. Study of differentiator and integrator using op-amp.
8. Study of Comparator and Schmitt trigger using op-amp
9. Arithmetic circuits- (i) half adder (ii) half substractor and (iii) full adder.
10. Realization of Boolean functions using multiplexers.

Part B: Guided Mini project: - 2 sessions

Project Title "Design, fabrication and testing of a Regulated power supply (RPS)". The PCB required for the given project should be fabricated in the lab. Once the RPS is fabricated, its performance should be analysed by studying load regulation and source regulation. A project report duly signed by the Batch in charge staff and Head of the Depart is required to be produced during the End semester Practical Examination for Evaluation.

Scheme of valuation

Practical II – G 504.2P

Part A:	One Experiment of Three Hrs Duration	13(split up shown)
Part B:	Presentation of Mini project	06(split up shown)
	Record	06
	Internal Assessment	25
	Total	50

Part A: Based on SECTION-A

Formula/Truth table/specimen graph ------	2
Labelled Circuit diagram/base diagram of key device/ labelled pin diagram	2
Tabular column/Design calculations/selection of components	2
Circuit layout and connections-	1
Obtaining response, recording readings and number of trials-	4
Graph and calculations-	1
Result/accuracy-	1
	Total: 13

Part B: Valuation of mini Project

Presentation -2marks

Viva	-2marks
Project Report(Dissertation)	-2marks
	Total: 06

ELE-G504 OE 2.1: Fundamentals of Digital Electronics.

CO 1	Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
CO 2	To understand and examine the structure of various number systems and its application in digital design.
CO 3	The ability to understand, analyze and design various combinational and sequential circuits.
CO 4	Ability to identify basic requirements for a design application and propose a cost effective solution.
CO 5	The ability to identify and prevent various hazards and timing problems in a digital design
CO 6	To develop skill to build, and troubleshoot digital circuits.

UNIT I

Number systems: Binary, Octal and Hexadecimal number systems. Conversion from one system to the other. Addition, multiplication and division in binary systems. Negative numbers. Subtraction in binary systems – one's and two's complement methods.
Parity codes: Parity checking codes.
Weighted codes: 8421, 2421, with stress on 8421. Self complementary codes.
Non weighted codes: excess 3 code and gray code. Alphanumeric codes – ASCII, EBCDIC codes. **14hrs**

UNIT II

Boolean Algebra: Laws of Boolean algebra, Principle of duality,. De-Morgan's theorems. Simplification of Boolean expressions. Boolean expression for logic circuits and vice versa. Universal logic gates – NAND and NOR. Realization of basic gates from universal gates. EXOR gate. (SOP and POS notations. Canonical expressions). Realisation of SOP using NAND gates. Conversion from SOP to POS form and vice versa. Reduction of Boolean expressions (three/four variables with don't care conditions) using Karnaugh maps. Realization of simplified Karnaugh expressions with NAND and NOR gates. **14hrs**

UNIT III

Combinational logic circuits: Half Adder, Full Adder, Half subtractor, full subtractor, Four bit adder/subtractor circuit, parity checkers and generators using XOR gates.
Code generation: Multiplexer: 4 to 1-line multiplexer, De – multiplexer: 1 to 4 demux, Encoders – 8 to 3 line, Decimal to BCD encoders. Decoders – 2 to 4 lines, 3 to 8 lines, BCD to decimal and seven segment display decoders.
Gates and flip flops: Families of gates. TTL and CMOS gates, parameters, circuit diagram, working of NAND and NOR gates, compatibility. RS flip flops, clocked RS and D flip flops, JK and T flip flops, Race around condition. Master slave JK flip flops. **14hrs**

Reference Book

1. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
2. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer,2001, PHI Learning.
3. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7thEd., 2011, Tata McGraw
4. Digital Electronics , S.K. Mandal, 2010, 1st edition, McGraw Hill
5. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHILearning Pvt. Ltd.
6. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
7. R. L. Tokheim, Digital Principles, Schaum's Outline Series, TataMcGraw- Hill (1994)

Pattern of Question Paper:

Time: 2.5hrs. Max. Marks 60

Section-A:1. Short answer Type Questions	**2marks each**	**5/7**	**5X2=10**
Section B: long answer type questions	**4marks each**	**5/6**	**5X4=20**
Section C: Descriptive/Analytical/Problem solving questions (Maximum of two sub questions)	**10marks each**	**3/4**	**3x10=30**

Certificate Course

HYBRID MODE CERTIFICATE COURSE IN DIGITAL ELECTRONICS

TITTLE: FUNAMENTALS OF DIGITAL ELECTRONICS

Course Objectives: To introduce interested students to the concepts of Digital Electronics
Learning outcomes: After completing this course student will get to know

CO1: The two stable states of Electronics devices used to generate and process any information in Digital Electronics

CO2: Various number systems in general and binary number systems in particular and representation memory size in terms of byts

CO3: Various building blocks of Digital Electronics and their role in modern Digital instruments and communication systems

CO4: Basics of Semiconductor memory system 5. Hands on experience in handling Basic ICs used in Digital Electronics

Course Details

I. **Topics to be covered through online classes: 20 hrs**

Introduction: Definition of analog signal and Digital signals, representation of digital signal in the form of two complementary states-Concepts of binary variables.

Representation of digital signals in the form of timing diagrams. bits, bytes, Kilobytes, Giga bytes and terra bytes. **2hrs**

Number Systems –: Binary, octal, hexadecimal and decimal Number systems and their inter conversion. Binary arithmatics– addition, subtraction, multiplication, division, representation of negative numbers, subtraction using 1's and 2's complement methods. **4hrs**

Boolean Algebra: Postulates of Boolean Algebra, Boolean theorems, De Morgan's Theorems, truth table, logic gates – NOT, OR, AND, NAND, NOR, EXOR, EXNOR – truth table, symbol. Universal gates-NAND and NOR. Boolean functions-simplification of Boolean functions using Postulates of Boolean algebra. **4hrs**

Standard Forms Of Boolean Functions – Standard SOP and POS, realization of Boolean functions using NAND and NOR gates. Karnaugh map (K-map)- Basics of Karnaugh map, plotting two, three and four variable SOP in K-map. Groups in K-map-pair, quad and octet, redundant groups, overlapping groups, folding of K-map. Simplification of Boolean functions using K-map, don't Care conditions. **5hrs**

Combinational Logic Circuit: Design procedure with examples –Half Adder, Full Adder, Half subtractor, Four bit parallel binary adder.

Flip flops: Basic one bit memory cell using NAND Gates. SR filp flop, clocked SR flip-flop, J-K flip flop, T flip flop, and D flip-flop. Counters using T flip-flop and registers using D flip-flops **5hrs**

II. Topics to be covered on Contact programme: Hands on Training programme 10hrs

1. Verification of truth tables of AND, OR and NOT gates using TTL ICs
2. Verification of truth tables of NAND, NOR and EXOR gates using TTL ICs
3. Realization of De Morgan's Theorems
4. Realization half adder and half substractor
5. Realization full adder
6. Realization of Binary adder
7. Verification of truth table of D flip flop
8. Verification of truth table of JK flip flops
9. Realization two bit ripple counter using JK flip-flops
10. Realization two 2-bit serial register using D flip-flops

III. Reference Books:

1. Digital Principles and applications – A.P Malvino & D.P Leach
2. Digital Design – Thomas L Floyd – 8 th edition – Pearson Education.
3. Digital Logic and Computer design – Moris M Mano – PHI publishers