St Aloysius College (Autonomous)

Mangaluru

Re-accredited by NAAC "A++" Grade

Course structure and syllabus of

B.Sc.

ELECTRONICS

Under NEP Regulations, 2021

(2021-22 Batch Onwards)

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ESTD : 1880

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Re-accredited by NAAC with '**A++**' Grade with CGPA 3.67/4 (Cycle 4)
Recognised as Centre for Research Capacity Building under UGC-STRIDE Scheme
Recognised under DBT – BUILDER Scheme, Government of India
College with "STAR STATUS" Conferred by DBT, Government of India
Recognised by UGC as "College with Potential for Excellence"

Date: 17-08-2022

NOTIFICATION

Sub: Syllabus of **B.Sc. ELECTRONICS** under NEP Regulations, 2021.
(As per Mangalore University guidelines)

Ref: 1. Decision of the Academic Council meeting held on 09-07-2022 vide Agenda No: 14
2. Decision of the Academic Council meeting held on 02-09-2023 vide Agenda No: 3
3. Office Notification dated 17-08-2022
4. Office Notification dated 26-09-2023

Pursuant to the above, the Syllabus of **B.Sc. ELECTRONICS** under NEP Regulations, 2021 which was approved by the Academic Council at its meeting held on 09-07-2022 & 02-09-2023 is hereby notified for implementation with effect from the academic year **2022-23**.

PRINCIPAL

ST ALOYSIUS COLLEGE MANGALORE 575 003 AUTONOMOUS

REGISTRAR

To:

1. The Chairman/Dean/HOD.
2. The Registrar Office

Sl. No.	Semester	Title of thePaper	Teaching Hours	Hours /week		Examination Pattern Max. Marks /Paper				Duration of Exam (hours)		Total Marks / paper	Theory Credits	Practical Credits
						Theory		Practical						
				Theory	Practical	Exam	I A	Exam	I A	Theory	Practical			
1	I	ELE-CT1: G 504 DC1.1 Electronic Devices and Circuits.	56	4	4	60	40	25	25	2.5	4	100+50	4	2
		ELE-G504 OE 1.1 PCB Design and Fabrication. ELE-G504 OE 1.2:Domestic Equipment maintenance	45	2	1	40	10	-	-	2	-	50	2	1
2	II	ELE-CT2: G 504 DC1.2 Analog and Digital Circuits	56	4	4	60	40	25	25	2.5	4	100+50	4	2
		ELE-G504 OE 2.1 : Fundamentals of Digital Electronics. ELE-G504 OE 2.2:Electronics for everyone	45	2	1	40	10	-	-	2*	-	50	2	1
3	III	ELE-CT3: G 504 DC1.3 Power control, Oscillators, wave shaping circuits, Principles of Radio Communication and Digital circuits	56	4	4	60	40	25	25	2.5	4	100+50	4	2
		ELE-G504 OE3.1: principles Of Electronic Communications. ELE-G504 OE 3.2: Medical Electronics	45	2	1	40	10	--		2	---	50	2	1
4	IV	ELE-CT4: G 504 DC1.4 Electronic Communications, Microprocessors and Digital Design using Verilog	56	4	4	60	40	25	25	2.5	4	100+50	4	2
5	V	ELE-CT5A: G 504 DC1.5 ELECTRONIC COMMUNICATION SYSTEMS ELE-CT5B: G 504 DC2.5 Embedded SYSTEMS	56	4	4	60	40	25	25	2.5	4	100+50	4	2
6.	VI	ELE-CT6A: G 504 DC1.6 Transducers, Sensor networks , principles of IOT and 5G communications ELE-CT6B: G 504 DC2.6 C Language & signals and systems	56	4	4	60	40	25	25	2.5	4	100+50	4	2

3. Library

Semester	Code	Paper Title
I	G 504DC1.1	Electronic Devices and Circuits.
	G 504DC 2.1P	Practicals - I
	G 504OE1.1	Basics of Electronic circuits and PCB design
	G504 OE 1.2	Domestic Equipment maintenance
II	G 504DC1.2	Analog and Digital Circuits
	G 504DC2.2P	Practicals - II
	G 504OE2.1	Fundamentals of Digital Electronics.
	G504 OE 2.2	Electronics for everyone
III	G 504DC1.3	Power control , Oscillators, waves shaping circuits, Principles of Radio Communication and Digital circuits
	G 504DC2.3P	Practicals - III
	G 504OE3.1	Elements of Electronic Communication systems.
	G504 OE 3.2	Medical Electronics
IV	G 504DC1.4	Electronic Communications, Microprocessors and Digital Design using Verilog
	G 504DC2.4P	Practicals - IV
V	G 504DC1.5	ELECTRONIC COMMUNICATION SYSTEMS
	G 504DC2.5P	Practicals - V
	G 504DC3.5	Embedded SYSTEMS
	G 504DC4.5P	Practicals - VI
VI	G 504DC1.6	Transducers, Sensor networks , principles of IOT and 5G communications
	G 504DC2.6P	Practicals - VII
	G 504DC3.6	C Language & signals and systems
	G 504DC4.6P	Practicals - VIII

Preamble

This model curriculum content for B.Sc (Honours) as per NEP-2020, is intended to enable the graduates to respond to the current needs of the industry and equip them with skills relevant for national and global standards. The framework encourages innovation in teaching-learning process and appropriate assessment of student learning levels.

Introduction

B.Sc. (Honours) is a program which needs to develop a specialized skill set among the graduates to meet the needs of industries.

The curriculum is designed to help learners to analyze, appreciate, understand and critically engage with learning of the subject and also to provide better learning experience. Apart from imparting disciplinary knowledge, the curriculum is aimed to equip the graduates with competencies like problem solving, Applying the concepts and analytical reasoning which provide them high professional competence.

The Department encourages its concerned faculty to make suitable pedagogical innovations, in addition to teaching/learning processes suggested in the model curriculum, so that the Course/Programme learning outcomes are achieved.

Significance

In recent years, has made unprecedented growth in terms of new technologies, new ideas and principles. The research organizations and industries that work in this frontier area are in need of highly skilled and scientifically oriented manpower. This manpower can be available only with flexible, adaptive and progressive training programs and a cohesive interaction among the institutions, universities, and industries. The key areas of study within subject area of comprise: Semiconductor Devices, analog and digital circuit design, microprocessors & Microcontroller systems, Electronic Communications, Medical and Equipment, computer coding/programming in high level languages etc. and also modern applied fields such as embedded systems, data communication, robotics, VLSI, control systems, etc.

Eligibility criteria

Students who have qualified PUC Science of Karnataka Pre University Education Board or equivalent 10+2, ITI or Diploma in any stream are eligible for opting to B.Sc. / B.Sc. (Hons.) UG program in.

Program Objectives

The overall Objectives of the B.Sc. (Honours) program are to:

- Provide students with learning experiences that develop broad knowledge and understanding of key concepts of and equip students with advanced scientific / technological capabilities for analyzing and tackling the issues and problems in the field of.
- Develop ability in students to apply knowledge and skills they have acquired to solve specific theoretical and applied problems in by providing hands on experience.
- Develop abilities in students to design and develop innovative solutions for benefits of society.
- Provide students with skills that enable them to get employment in industries or pursue Higher studies or research assignments or turn as entrepreneurs.

Program outcome

- Ability to apply knowledge of Logic thinking and basic science for solving related problems
- Ability to perform experiments, as well as to analyse and interpretdata.
- Ability to design and manage electronic systems or processes that conforms toa given specification within ethical and economic constraints.
- Ability to identify, formulate, solve and analyze the problems in various sub disciplines of Science.
- Ability to use Modern Tools / Techniques.

B.Sc. / B.Sc. (Hons.) as per NEP (2021-22 and onwards)

SUBJECT:

***Questions from practicals have to be included in theory examinations of Open Electives (Since is a practical oriented subject)**

Basis for Awarding Theory Internal Assessment Marks:

Sl No	Particulars	
1	Minimum of Two internal Tests	
2	Assignments/Seminar/Case Study /Project work / Reports on - visits to industries/exhibitions/science centres/active participation in competitions, etc.	
TOTAL Theory IA Marks		

Basis for Awarding Practical Internal Assessment Marks:

Sl No	Particulars	
1	PracticalTest	
2	Record writing	
3	Active participation in practical classes	
TOTAL Practical IA Marks		

SEMESTER – I

G 504 DC1.1 Electronic Devices and Circuits.

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

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

Chaptr2: 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

Chaptr3: i. 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) **5hrs**

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.

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**

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 **14hrs**

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. Robert L Boylestad, "Introductory circuit analysis", 5th edition., Universal Book 2003.
2. R.S.Sedha, "A Text book of Applied ", 7th edition., S. Chand andCompany Ltd. 2011
3. A.P. Malvino, "Principles of ", 7th edition .TMH, 2011.
4. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
5. David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni.Press, 2015
6. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
7. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
8. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHILearning.

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	4/6	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

PRACTICALS-I

Program Name	**BSc in Electronics**	Semester	**I**
Course Title	**PRACTICAL I**		
Course Code	G504 DC 2.2P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

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

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

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.

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 06

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

BASICS OF ELECTRONIC CIRCUITS AND PCB DESIGN

Total Teaching hours: 36

Unit-1 **12 Hours**

Generation of and distribution of electricity*:* Mention of hydro electric generator, diesel generator, thermal generator, wind power, solar, ocean waves. Generation of DC power – Mention of batteries. Single phase, Two phase and Three phase. Transformers. Power transmission and distribution. Domestic electrical wiring – connection from AC line to the meter, sockets, mention of phase neutral and the need of earthing. Mention of electric shock and safety. Mention of power type (ac or dc) and current ratings for home appliances. Mention of tester. Electric motor working principle.

Unit – 2 **12 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-3

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.

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 3/5 3x10=30

(Maximum of two sub questions)

- **Reference books:**

1. Electrical Circuits, K.A. Smith and R.E. Alley, Cambridge University Press.
2. A text book in Electrical Technology - B L Theraja - S Chand & Co.
3. A text book of Electrical Technology - A K Theraja.
4. Performance and design of AC machines - M G Say ELBSEdtion.
5. Basic electrical engineering - V K Mehta and Rohit Mehta, S Chand andCompany.
6. Walter C.Bosshart “PCB Design and Technology” Tata McGraw Hill,

Publications, Delhi. 1983.
7. Clyde F.Coombs “Printed circuits Handbook” IIIEdition McGrawhill Kraig Mitzner, “Complete PCB Design Using OrCAD Capture and Layout,” Elsevier, Amsterdam,
8. Walter C Bosshart, “Printed Circuit Board Design and Technology”,1st ed., McGraw Hill Education

G504 OE 1.2 Domestic Equipment maintenance

Course Outcomes(COs):

Atthe end ofthe coursethestudent should beableto:

1. Aptitude to apply Logic thinking and Basic Science knowledge for problem solving in various fields of electronics both in industries andresearch.
2. To acquire experimental skills, analyzing the results and interpret data.
3. Ability to design / develop / manage /operation and maintenance of sophisticated electronic gadgets /Systems / processes that conforms to a given specification within ethical and economic constraints.
4. Capacity to identify and implementation of the formula to solve the electronic related issues and analyze the problems in various sub disciplines of electronics.
5. Capability to use the Modern Tools / Techniques for the operation and maintenance of the domestic electrical / electronic gadgets
6. Capability to use the Modern Tools/ Techniques.

UNIT – 1 **15 Hrs**

Geyser: Construction and working, parts and manufacturing process, types. Common faults and their troubleshooting: Dripping geyser overflow, overheating, steam or hot water escaping from overflow, water leaking through the ceiling, no hot water, water not hot enough, poor hot water pressure. Induction cooker: Construction and working, parts and manufacturing process, types. Common faults and their troubleshooting: Cooker fuse blown, cooker buttons not working, cook top shuts off while cooking, food not get cooked or heated properly, over heating and uneven heating, display keep flashing, weird noises–crackling, fan noise, humming

sound, clicking.

UNIT– 2 **15 Hrs**

MicrowaveOven: Working, raw material and manufacturing process, types, Common faults and their troubleshooting: Microwave does not heat, runs then stops, buttons do not work, plate do not spin, bulb does not turn ON during operation, sparking inside, shuts OFF after few seconds.

Refrigerator: Working, raw material and manufacturing process, electrical wiring diagram, types of refrigerator. Common faults and their troubleshooting: fridge not cooling, fridge not defrosting, leaking water, freezing food light not working, freezer is cooled but fridge stays warm, dead refrigerator, not enough cooling, keeps running, leakage, makes noise. Replacement procedure for:seal(gasket), evaporator fan motor, PTC relay, thermostat, compressor,bulb.

Demonstration Experiments: 1.Working of Geyser.

2. Working of Microwave Oven.
3. Working of Induction Cooker.

UNIT– 3 **15 Hrs**

AirConditioner: Working, raw material and manufacturing process, electrical wiring diagram, types. Common Faults and their trouble shooting: Faults in following parts of AC: Filter, thermostat, refrigerant leaks, breakers, capacitors, compressor, evaporator coils, condenser coils, warm contactor. General faults: AC UNIT has an odour, shuts ON and OFF repeatedly, does not blow cold air, repeatedly tripping a circuit breaker, indoor UNIT is leaking water inside the room, outdoor UNIT is making an unusually loud sound, room is not getting cold enough, AC not turning ON.

Demonstration Experiments: 1.WorkingofAir Conditioner. 2. Working of Refrigerator.

References

1. Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting, R.G. Gupta TMH, 2001.
2. Modern Electronic Equipment: Troubleshooting, Repair and Maintenance, R S Khandpur, TMH, 1987.
3. Electronic fault diagnosis by G.C. Loveday, A.H. Longman , 4th Edition,1994.

II SEMESTER

G 504DC1.2

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. **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 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. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
2. Electronic Devices Conventional Current Version by Thomas L. Floyd
3. David A. Bell “Electronic Devices and Circuits”, 5th Edition, Oxford Uni.Press, 2015
4. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn, 2000, Prentice Hall
5. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011,Oxford University Press.
6. R.S.Sedha, “A Text book of Applied ”, 7th edition.,S.Chand andCompany Ltd. 2011
7. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
8. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7thEd., 2011, Tata McGraw
9. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHILearning Pvt. Ltd.
10. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
11. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer,2001, PHI Learning.
12. R. L. Tokheim, Digital Principles, Schaum’s Outline Series, TataMcGraw- Hill (1994)
13. Digital , S.K. Mandal, 2010, 1st edition, McGraw Hill

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	4/6	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

PRACTICALS-II

Program Name	**BSc in Electronics**	Semester	**II**
Course Title	**PRACTICAL II**		
Course Code	G504 DC 2.2P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

PART A (Any 8)

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:

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.

UNIT 1

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 2

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**

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**

Text Book: Albert Paul Malvino and Donald P Leach, Digital principles and applications, McGraw Hill – 4th edition).
Reference Book: Sudhakar Samuel, Logic design, Sanguine Technical Publishers.

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 3/5 3x10=30
(Maximum of two sub questions)

Reference Books:

ELE-G504 OE 2.2:Electronics For Everyone

(Credits: Theory – 02, Demonstration Lab– 01) Total Teaching hours: 42

CourseOutcomes(COs):

Atthe end ofthe coursethestudent should be ableto:

1. Aptitude to apply Logic thinking and Basic Science knowledge for problem solving invariousfields of electronics both in industriesand research.
2. Toacquireexperimentalskills, analyzing theresultsand interpret data.
3. Ability to design / develop/ manage/ operation and maintenance of sophisticated electronic gadgets / systems / processes that conforms to a given specification within ethical and economic constraints.
4. Capacity to identify and implementation of the formula to solve the electronic related issues and analyze the problems in various sub disciplines ofelectronics.
5. Capability to use the Modern Tools/ Techniques.

Unit-1

Timer and PLL: Functional block diagram of 555 timer, Monostable operation and its Application, Astable operation

and its Applications, **Phase Locked Loop**: Functional block diagram – Phase detector / Comparator, Voltage Controlled Oscillator, Low pass filter, Applications: Frequency multiplier/ Division, AM detection

Unit-2

Operational Amplifier: Inverting and non-inverting amplifier, Op-amp parameters, Summing Amplifier, Difference Amplifier, Integrator, Differentiator, Instrumentation Amplifier, Audio Amplifier(LM386), Voltage to current converter, Current to Voltage converter, Sample and Hold circuits.

First order active filters (Circuit diagram and formula only): low pass, high pass, band pass, band reject and all pass filters. Phase-shift and Wein bridge oscillator using op-amp.

Unit-3

Transducers (Basic Working): Displacement transducers - Resistive (Potentiometric, Strain Gauges – Types, Gauge Factor, bridge circuits, Semi-conductor strain gauge) Capacitive (diaphragm), Hall effect sensors, magneto-strictive transducers, Microphone, Touch Switch, Piezoelectric sensors, light(photo-conductive, photo emissive, photo voltaic, semiconductor, LDR), Temperature(electrical and non-electrical), Pressure sensor.

A-D and D-A Conversion: D-A conversion: 4 bit binary weighted resistor type, circuit and working. Circuit of R-2R ladder- Basic concept.A-D conversion characteristics, successive approximation ADC. (Mention the relevant ICs for all).

Unit-4

Data Acquisition using Arduino: Arduino: Birth, Open Source community, Functional Block Diagram, Functions of each Pin, Arduino Development Boards: IDE, I/O Functions, Looping Techniques, Decision Making Techniques, Designing of 1st sketch, Programming of an Arduino

(Arduino ISP) , Serial port Interfacing, Basic Interfacing and I/O Concept, Interfacing LED,Switch,7seg LED, different sensors.

Suggested Books:

1. B. C. Sarkar and S. Sarkar, Analog Electronics: Devices and Circuits (Revised edition), Damodar Group (Publishers),Burdwan, ISBN: 978-93-85775-15-4 (2019)
2. Measurement Systems, 4/e, Doeblin McGraw Hill, New York, 1992.
3. Electrical Measurements & Electronic Measurements by A.K. Sawhney

4. B. C. Sarkar and S. Sarkar, Digital Electronics: Circuits and Systems, S U T Prakashani
,Burdwan, ISBN:978-81-88391-57-8 (2018)
5. Instrumentation- Devices and Systems ByRangan, Sarma, and Mani, Tata-McGrawHill
6. Electronic Instrumentation by H.S Kalsi, McGraw Hill
7. Instrumentation measurements and analysis by Nakra&Choudhary
6. Measurement & Instrumentation- DVS Murthy
7. R. A. Gayakwad, Op-Amps and Linear IC's, Pearson Education (2003)
8. Electronic Sensor Circuits and Projects, III Volume, Forrest M Mims, Master Publishing Inc.
9. Timer, Op Amp, and Optoelectronic Circuits & Projects, Forrest M Mims, Master Publishing Inc.
10. Exploring Arduino, Jeremy Blum, Wiley
11. Beginning Arduino, Michael McRobetrs, Technology in Action
12. Beginning Arduino Programming, Brian Evans ,Technology in Action
13. Practical Arduino Engineering, Harold Timmis, Technology in Action
14. Practical Arduino : Cool Projects for open source hardware, Jonathan Oxer, Hugh Blemings, Technology in Action

Electronics For Everyone

Demonstration Lab (Hardware and Circuit Simulation Software) 15 hours

1. Study of basic monostable multivibrator
2. Study of basic Astable multivibrator
3. Light detection using 555 timer
4. Rain alarm using 555 timer
5. Motor control by PWM using 555 timer
6. LED flasher circuit using 555 timer
7. Analog light wave Transmitter/ Receiver using 555 timer
8. Study of basic inverting and non-inverting amplifier
9. Study of basic integrator circuit
10. Study of basic differentiator circuit
11. Design of first order LPF
12. Study of first order HPF
13. Designing of fiber optic based Transmitter /Receiver using LM386
14. Temperature to voltage converter using 741.
15. Shadow sensing using 741
16. Light based PWM using 741 and V-F converter
17. Test the different Arduino Boards, Open-Source and Arduino Shields.
18. Install Arduino IDE and its development tool.
19. Develop a program to Blink LED for 1second.
20. Develop a program to interface Input Switches and output LEDs with development board (arduino).
21. Interface 7 segment display with development board (arduino)
22. Interface LM35 temperature sensor with arduino and monitor temperature on serial monitor.

23. Interface DC motor using L293D Motor Driver.
24. Interfacing of various sensors with arduino development board

SEMESTER - III

POWER CONTROL, OSCILLATORS, WAVE SHAPING CIRCUITS,

PRINCIPLES OF RADIO COMMUNICATION AND DIGITAL CIRCUITS

Course Objectives:

1. To understand the structure of various power control devices and realize their applications
2. To understand the principles of oscillators and learn different Oscillators
3. To learn the clippers and clampers using diodes and op-amps.
4. To understand the communication system, Principle and working communication system, means and medium of communication.
5. To understand the Principle and working of different modulation techniques.
6. To understand characteristics of computer memory and learn the different types of memories.
7. To learn the circuits of various memory cells.

➢ **Course Outcomes (COs):**

After the successful completion of the course, the student will be able to:

CO1: Know the basic concept of breakdown devices.

CO2: Understand the principles Oscillators.

CO3: Analyse any wave shaping circuit.

C04: Unerstand the working of various types of Computer memories.

CO5. Analyse the working of various memory organization.

CO6. Understand the principles of Radio Communications.

CO7: Familiar with “AM” and “FM “techniques.

CO8: Understand Registers and Counters

UNIT-I

Chapter1:Breakdown devices:

Silicon Controlled Rectifier (SCR)-Construction, Biasing, Operation, Equivalent circuit, V-I characteristic, mention of applications, half wave rectifier using SCR.

Triac: Construction, equivalent circuit, operation, V-I characteristics, mention of applications, power control using triac, phase control circuit using triac- single and double time constant, comparison of SCR and Triac.

Diac: Construction, equivalent circuit, operation, V-I characteristics, mention of applications

5HRS

CHAPTER 2:

Power amplifiers: Classification on the basis of placement of Q point- Graphical representation, Single ended power amplifiers-class A resistive load and inductive load - efficiency. Class B push pull amplifier – efficiency. Mention of typical applications. Audio amplifier using IC.

5hrs

CHAPTER 3:

Voltage regulators: Block diagram of regulated power supply, Line and Load regulation, Zener diode as voltage regulator – circuit diagram, load and line regulation, disadvantages. Fixed and Variable IC Voltage Regulators (78xx, 79xx, LM317). **4hrs**

UNIT-II

Chapter1:

Oscillators: Classification, Principles of oscillators-Barkhaussen criterion.

RC oscillators-phase shift oscillator and Wein bridge oscillator using op-amp.

LC Oscillators: Principles of generation of oscillations in a tank circuit. Hartley and Colpitt' s oscillators using op-amp. Square wave, ramp and triangular waveform generators using op-amp. Crystals as source of oscillations and crystal oscillator

IC 555-*internal structure, working. Astable and Monostable multivibrators–working, waveforms mention of expression for frequency/pulse width* ***8HRS***

Chapter2: Instrumentation Amplifier: Expression for output voltage, application as temperature indicator, temperature controller. Signal converters-digital to analog and analog to digital converters **3hrs**

CHAPTER 3: Wave shaping circuits: Clippers and clampers using diodes and Voltage Multipli Voltage limiters- one side and two side limiting using op-amp. **3HRS**

UNIT III

CHAPTER 1: Amplitude Modulation: Need for modulation. Amplitude modulation − Expressions for AM wave, Modulation index, bandwidth, frequency spectrum, power relations, Schemes of AM, Modulation circuits –Collector modulation. Balanced modulator, AM transmitter (Block diagram). **5HRS**

CHAPTER 2: Frequency modulation: Expression for FM wave, reactance modulator-varactor diode and FET. Pre – emphasis and de – emphasis (circuits), FM transmitter (block diagram) with AFC. Comparison of AM and FM. phase modulation (Qualitative). **4HRS**

CHAPTER 3: Antennas: Introduction – basic action of a dipole antenna - Calculation of electric field intensity at a distance 'r' from a transmitting antenna, total power radiated, radiation resistance, Aperture of an antenna, Bandwidth, Beamwidth, Directivity, Directive

gain, efficiency. Resonant antenna, folded dipole, characteristic impedance, parasitic elements-directors and reflectors, Yagi-Uda antenna, parabolic reflector. **5HRS**

UNIT IV

CHAPTER 1: Registers: Serial load and Parallel load shift registers using D -FF. **2hrs**

CHAPTER 2: Counters: Synchronous and Asynchronous counters, mod-16 and mod10 (decade) asynchronous counter using T flip flops **,** mod-16 and mod10 (decade) synchronous counter using T flip flops**.** Design of synchronous counters using JK flip flops.

5Hrs

CHAPTER 3: Memory: Characteristics of memory. Semiconductor memories – RAM - a bipolar memory cell - Read/Write operation. Dynamic MOS storage Cell and Static MOS cell - Read/Write operation in a Dynamic MOS cell and static memory cell. Read only memory types – ROM, EPROM, and EEPROM. 4×4 bit diode ROM – Read operation. Bulk storage devices –Hard disk and optical disks. Flash memory. **7hrs**

Reference Books:

1. Electronic Communication - George Kennedy – 3rd edition – TMH edition
2. Satellite Communication – Dr D C Agarwal – Khanna Publishers
3. Electronic Communication – Dennis Roddy& John Coolen – 4th edition – PHI.
4. Electronic Communication – Miller, 6th edition – PHI.
5. Digital systems, principles and applications – Ronald J Tocci, Neal S Widmer, Printice Hall of India, New Delhi
6. An Introduction to Digital Computer Fundamentals – Rajaraman & Radhakrishnan – 3rd edition – PHI publications
7. Digital Design – Thomas L Floyd – 8th edition – Pearson Education.
8. Electronic Communication, Modulation and Transmission – Robert J Schoenbeck – Universal Book Stall
9. Wireless communication Technology – Roy Blake – Thomson & Blar

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	4/6	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

PRACTICALS-III

Program Name	**BSc in Electronics**	Semester	**III**
Course Title	**PRACTICAL III**		
Course Code	G504 DC 2.3P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

SECTION-A (Any 6)

1. Square wave generator
2. Triangular wave generator
3. Study of zener diode regulator
4. Verification of characteristics table of DFF
5. Verification of characteristics table of JKFF
6. Two bit serial shift register using DFF
7. Two bit serial shift register using DFF

SECTION-B (Any 8)

1. Series transistor Regulators.
2. Study of adjustable voltage regulator using IC.
3. Study of power amplifier using IC
4. Band pass and band stop filters using op-amp.
5. Differentiator and integrator
6. Waveform generators
7. Clippers and clampers.
8. Mod-16 ripple counter using JKFF.
9. 4-bit serial shift register using DFF
10. Study of Universal shift register.

Scheme of valuation:

Part A: One Experiment of one Hr Duration 06 (split up shown)

Part B : One Experiment of Three Hrs Duration 13split up shown)

Record	06
Internal Assessment	25
Total	50

Part A:

Formula/Truth table/specimen graph ------	1
Labelled Circuit diagram/base diagram of key device/ labelled pin diagram	1
Tabular column/Design calculations/selection of components /circuit connections	1
Obtaining response, recording readings and number of trials-	1
Graph and calculations-	1
Result/accuracy-	1
	Total: 06

Part B: Based on SECTION-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

ELE-OE3.1: Principles of Electronic Communication systems

(Credits: Theory – 03) **Total Teaching hours: 45**

Course outcomes	
CO1:	The history and development of Electronic communication system
CO2:	different channels of signal propagation in electronic communication systems
CO3:	working principles of common communication systems like Radio, television and cell phones
CO4:	principles of digital communication-mobile communication, internet and social media

Course Objectives

To introduce the applications of communication technology.

To understand the methods and techniques used in communication field.

Learning outcomes: After completion of this paper the student learns

- The history and development of Electronic communication system
- various types of Electronic communication system and their areas of application
- different channels of signal propagation in electronic communication systems
- various techniques of modulation
- the mechanism of signal transmission in different media
- the basics of analog transmission and digital transmission
- working principles of common communication systems like Radio, television and cell phones
- the elements of satellite communication systems
- elements of wireless communication and fibre optic communication systems
- principles of digital communication-mobile communication, internet and social media

Syllabus

UNIT I

Introduction: meaning of communication with special reference to electronic communication, development of electronic communication, channels of communication and application of each frequency band. 3 **hrs**

Modulation: need for modulation, defining modulation, different types of modulation-AM, FM and phase modulation, Characteristics and application each type.

3 hrs

Radio wave propagation: Electromagnetic waves –characteristics and frequency spectrum, Radio waves and frequency distribution spectrum- mention the areas of application.

3 hr

Radio wave transmission and reception: Antennas- Principles of radiation in an antenna, types of antenna, dipole antenna, resonant antennas and non resonant antenna, isotropic antenna and non isotropic antenna, characteristics of antenna, reciprocity theorem. Microwave antennas and modern antennas.

3 hrs

Modes of radio wave propagation-ground wave, space wave and sky waves. Structure of troposphere and ionosphere, role of ionosphere in radio wave propagation. **3 hrs**

UNIT II

Satellite communication: Features of communication satellites-types and Internal block diagram of a communication satellites-transponder-block diagram and functions of different stages, uplink and downlink frequencies, frequency bands used in satellite communication- application of various bands.

3 **hrs**

Radio receivers: Introduction, AM receivers-types, block diagram of superheterodyne radio receiver, functions of various stages with waveforms, characteristics of radio receivers, AGC and AVC, image frequency and its rejection.FM receivers- FM detectors.

3 hrs

Television: Scanning and CVS, camera tube, monochrome TV signal, block diagram of monochrome transmitter and receiver, principles of colour TV-Transmitter and receiver.

3 hrs

Transmission lines and Waveguides: Wires and cables, single ended and differential lines, basic transmission line-types structure, characteristics, applications, balanced and unbalanced lines, BALUNs, characteristic impedance of transmission line, factors which determine the characteristic impedance, incident wave, reflected wave and standing wave, reflection coefficient, standing wave ratio, open circuited and short circuited lines, standing waves in transmission lines, resonant and non resonant lines, mismatch and its effects, losses in transmission lines, types of waveguides, modes of propagation, Comparison of wave guides and transmission lines

6hrs

UNIT-III

Optical Fibers and optical communication systems: Introduction to optical fiber communication system – optical communication link. Principles of light transmission through fibers (qualitative), Advantages of fibers, Structure of optical fibers. Optical Fibber types -single mode, multi mode, step index, graded index fibers. Attenuation and losses in

fibers, pulse distortion in fibers. Fiber couplers, connectors and splices

3hrs

Optical sources and detectors - LED, Laser diode - construction, characteristics, optical amplifiers. Laser diode modulation, and Laser diode frequency modulation.
Optical detectors - Photo diodes, PIN and Avalanche, construction and characteristics.

3hrs

Digital Communication: Types, Sampling Theorem – Nyquist rate, Pulse Analog Modulation - PAM, PTM – PPM, PWM – Basic concepts and applications. Pulse Digital Modulation – PCM

3hrs

Multiplexing Schemes: Frequency division multiplexing and Time division multiplexing. Code Division Multiplexing**:** Basic schemes of access, key elements of CDMA, processing gain, pseudorandom noise codes (PN codes), PN spreading, types of spread spectrum communication,-DSSS, FHSSS and THSS (block diagram), applications of CDMA.

Mobile Communication System: Overview of wireless communication System-Block diagram, Cell Principles - cells, cell clusters, cell sites, frequency reuse, cell splitting, call handoff, frequency spectrum. Block diagram of a typical handset. Principles of Internet and social group communication systems.

3hrs

Books for Reference:

1. Kennedy G., *Electronic Communication Systems*, McGraw-Hill, New York, 2008.
2. Roody and Coolen, *Electronic Communication*, Prentice Hall of India LTD., New Delhi, 2007.

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 3/5 3x10=30
(Maximum of two sub questions)

References:

1. Electronic instruments and systems: Principles, maintenance andtroubleshooting by R. G. Gupta Tata McGraw Hill
2. Modern electronic equipment: Troubleshooting, repair and

maintenance byKhandpur, Tata McGraw Hill

3. Electronic fault diagnosis by G. C. Loveday, A. H. Wheeler publishing

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ELE-G504 OE 3.2: Medical Electronics

Unit–1:	10Hrs
Fundamental Electronics: Amplifiers, Frequency response, signal generation. Different types of transducers & their selection for biomedical applications. Electrode theory, selection criteria of electrodes & different types of electrodes Bio electric amplifiers	
Unit -2:	12 Hrs
Introduction to Bio-medical instruments: Origin of bio-electric signals, active & passive transducer for medical application –Electrocardiography-waveform-standard lead systems, typical ECG amplifier, EEG electrode, recording systems, EMG basic principle-block diagram of a recorder.	
Unit -3:	10 Hrs
Medical Imaging: Nature and production od X-rays, Improving X-ray images, Computerised axial tomography, Using ultrasound in medicine, Ultrasound scanning, Magnetic resonance imaging PET and SPECT Imaging	
Unit -4:	13Hrs
Biomedical Signal Processing: Fundamentals of signal processing, digital image, transforming image, image enhancement, image Segmentation, image compression, image restoration and reconstruction of medical images. Demonstration using MATLAB	

References	
1	L Cromwell, F J Weibell, Eapfeiffer, Biomedical Instrumentation and measurements, PHI Publications.

IV SEM

G 504 DC1.4

Electronic Communications, Microprocessors and Digital Design using Verilog

UNIT I **15 Hrs**

Ionosphere: Different modes of radio wave propagation, allotment of frequency in the electromagnetic spectrum. Ionosphere – Formation, composition and variation. Mention of expression for refractive index of ionosphere. Mechanism of reflection of radio wave, role of Ionospheric layers in radio communication. Critical frequency, MUF, skip distance, skip zone and Secant Law. Satellite communication–Basics of Satellite communications, Basic block diagram, Linkages, transponder (Block diagram), station keeping, frequency bands used in satellite communication **5 hrs**

Transmission lines and Waveguides: Wires and cables, single ended and differential lines, basic transmission line-types structure, characteristics, applications, balanced and unbalanced lines, BALUNs, characteristic impedance of transmission line, factors which determine the characteristic impedance, basic transmission line equations, incident wave, reflected wave and standing wave, reflection coefficient, standing wave ratio, open circuited and short circuited lines, standing waves in transmission lines, resonant and non resonant lines, mismatch and its effects, losses in transmission lines, types of waveguides, modes of propagation, Comparison of wave guides and transmission lines **6hrs**

Radio Receivers: super heterodyne receiver with block diagram, RF stage , mixer-self excited and separately excited mixers, IF amplifier, Demodulation - AM diode detector, practical diode detector (actual circuit diagram of each stage) receiver characteristics, AGC - types, characteristics of radio receiver, FM detectors – Slope detector, Balanced Slope detector, Foster – Seeley discriminator, ratio detector (Qualitative) . Noise in electronic circuits.

4hrs

UNIT II **15 Hrs**

Television transmission: principles of scanning, interlaced scanning, Camera tubes – Plumbicon & CCD Camera, Composite Video signal (CVS), VSB transmission, TV channel allocation (CCIR-B), positive and negative modulation, allotment of frequency, B/W TV transmitter (block diagram). **6hrs**

Principles of Color TV – compatibility, mixing of colors – additive & subtractive, luminance & Chrominance signals, Color camera tube, Color systems – NTSC & PAL, Modulation of color Signals in NTSC system**.**

5hrs

Television Receivers: Monochrome picture tube. Block diagram of monochrome TV receiver.

Colour Picture tube and Colour killer. Separation of chrominance and luminance signals. Principles of operation of LCD and LED TVS, Remote control. Control knobs and explanation of adjustments like -colour, brightness, sharpness and contrast. **4 hrs**

UNIT III

Digital Computers: Analog and Digital computers, Introduction, Block diagram of digital computer- characteristics and functions of various stages, Generations of digital computers, microcomputer system – input / store / output –operation.

3hrs

Micro processors: Introduction, Block diagram of a general microprocessor. Evolution of microprocessors.

8085 micro-processor: architecture of 8085 MP, Pins and signals of 8085, Serial input and serial output, interrupts.

6hrs

Instruction set – Data transfer, arithmetic and logic instructions. Addressing modes. Branch instructions. Stack and its operation. Subroutines and Interrupts –simple programs .

6hrs

UNIT IV

Overview of Verilog HDL: Evolution of CAD, emergence of HDLs, typical HDL flow, Trends in HDLs.

Hierarchical Modelling Concepts: Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block, Lexical conventions. Data types, system tasks, compiler directives.

Modules and Ports: Module definition, port declaration, connecting ports, hierarchical name referencing.

Gate-Level Modeling: Modelling using basic Verilog gate primitives, Description of and/or and buf/not type gates, Rise, fall and turn-off delays, min, max, and typical delays. Combinational logic circuit design using Gate level modeling

Dataflow Modeling: Continuous assignments, delay specification, expressions, operators, operands, operator types.

Behavioral Modeling: Structured procedures, initial and always, blocking and non-blocking statements. Delay control; generate statement, event control, conditional statements, Multiway branching, loops, sequential and parallel blocks.

Tasks and functions: Differences between tasks and functions, declaration, invocation, automatic tasks and functions. Combinational and sequential logic circuit design using all

three modelling.

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	4/6	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

PRACTICALS-IV

Program Name	**BSc in Electronics**	Semester	**Sixth Semester**
Course Title	**PRACTICAL IV**		
Course Code	G504 DC 2.4P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

PRACTICALS

SECTION-A: ANY 8 EXPERIMENTS TO BE DONE From PART-A.

SECTION-B: Any one from PART-B or PART- should be conducted.

PART-A

- Amplitude modulation and Demodulation
- Frequency modulation
- IF amplifier
- RF Amplifier
- Design and study of a binary adder
- Synchronous 4 bit counter
- Study of an ALU
- Assembling a desktop PC
- Digital to Analog Converter
- Construction and demonstration of standard FM broadcast Radio Receiver

Part B: Guided Mini project:

Project Title "Design, fabrication and testing of a monoshot pulse generator with amplitude control option using Timer IC". The PCB required for the given project should be fabricated in the lab. The performance fabricated instrument should be tested in the

ab. 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

Part – C: Verilog HDL Laboratory

Write and execute Verilog code to realize

1. Realization of logic gates.
2. Encoder without priority and with priority.
3. Multiplexer, De-multiplexer.
4. Comparator, Code converters – Binary to Gray and vice versa.
5. Adder/Subtractor (Half and Full) using different modelling styles.
6. 4-bit parallel adder and 4-bit ALU/8-bit ALU.
7. SR, D, JK, T-flip-flops.
8. To realize counters: Up/Down (BCD and Binary).
9. 4-bit Binary counter, BCD counters (Synchronous reset) and any arbitrary sequence counters.
10. 4-bit Binary counter, BCD counters (Asynchronous reset) and any arbitrary sequence counters.
11. Modelling of Universal shift registers.

Practical II – G 504.2P

SECTIONA: Based on Part A: Experiment of Three Hrs Duration 13(split up shown)

SECTION B: Based on Part B/ Part B (ANY ONE) 06 (splitup shown)

Record	06
Internal Assessment	25
Total	50

SECTION-B

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

PART-C: Verilog Problem: One Program from Part-C- 06 marks
Writing-2marks
Editing-2marks
Execution and result -2marks
Total: 06

V SEMESTER
G504.5A: ELECTRONIC COMMUNICATION SYSTEMS
COURSE OUTCOMES

CO1: The history and development of Electronic communication system,various types of Electronic communication system and their areas of application,different channels of signal propagation in electronic communication systems

CO2: Concept, theory and circuits of various techniques of modulation.

CO3: the mechanism of signal transmission in different media the basics of analog transmission and digital transmission

CO4: working principles of common communication systems like Radio, television and cell phones

CO5: the elements of satellite communication systems

CO6: Elements of wireless communication and fibre optic communication systems principles of digital communication-mobile communication, internet and social media.

UNIT I

Opto-Electronic Devices: Direct and indirect energy gap materials, Photo conduction, Solar cell, Optocouplers, LASCR, Solid State Relays, Photo Transistor**.** **4HRS**

Optical fibers: Introduction to optical fiber communication system – optical communication link. Principles of light transmission through fibers, Advantages of fibers, Structure of optical fibers. Fiber types -single mode, multi mode, step index, graded index fibers. Attenuation and losses in fibers, pulse distortion in fibers. Fiber couplers, connectors and splices.

6hrs

Optical sources - LED, Laser diode - construction, characteristics, optical amplifiers. LED modulation circuits, Laser diode modulation, and Laser diode frequency modulation.

Optical detectors - Photo diodes, PIN and Avalanche, construction and characteristics.**5hrs**

Digital communication: Block diagram of digital transmission and reception, Bit Rate, Baud Rate Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK).Advantage and disadvantages of digital transmission, characteristics of data transmission circuits – Shannon
limit for information capacity, bandwidth requirements, data transmission speed, noise, crosstalk, echo suppressors, distortion and equalizer, MODEM– modes, classification.

Digital Communication: Types, Sampling Theorem – Nyquist rate, Pulse Analog Modulation - PAM, PTM – PPM, PWM generation, detection and application. Pulse Digital Modulation – PCM – Generation, detection, Companding. **6hrs**

UNIT-III **14Hrs**

Cellular Communication System: Overview of wireless communication System-Block diagram, Cell Principles - cells, cell clusters, cell sites, frequency reuse, cell splitting, call handoff, frequency spectrum. Block diagram of a typical handset. **5hrs**

GSM System: GSM architecture-mobile station, base station subsystem and network subsystem. GSM interfaces, Mobile Identities-SIM, IMEI, MSI and LAI. Block diagram of outgoing and incoming calls in GSM. **4hrs**

INTERNET: Terms used in connection with internet, Internet Architecture, MODEMs, domains Internet services-email, www, search engine, news, FTP, internet telephony, internet protocols and internet banking.
6hrs

UNIT-IV

Microwave devices for Communication: GUNN diode, READ diode, IMPATT diode, BARITT diode, PIN diodes, Schottky barrier diodes, Multicavity Klystron, Magnetron, block diagram of Microwave communication and working, Applications. **6HRS**

RADAR Communication Systems: RADAR principles, frequencies and powers used in RADAR, maximum Unambiguous range, detailed block diagram of pulsed RADAR system, RADAR range equation-derivation, factors influencing maximum range, effect of ground on RADAR antenna characteristics, doppler effect, expression for Doppler frequency. MTI RADAR-block diagram, working, CW RADAR-block diagram, working, advantages,

applications and limitations, FM CW RADAR-block diagram, numerical examples wherever Applicable

9HRS

Reference Books:

1. Monochrome and Colour Television – R R Gulati – Willey Eastern Limited.
2. Television Engineering - Arvind M Dhake – Tata McGraw Hill.
3. Television Engineering – Bernard Grob
4. Electronic Communication - George Kennedy – 3rd edition – TMH edition
5. Fiber Optic Communication – Joseph C Palais – Pearson Education Asia
6. Optic Fiber Communication – Gerd Keiser– Mc GrawHill– 3rd edition
7. Computer Network- Tanabaum

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	4/6	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

Semester-V

PRACTICALS-V

Program Name	**BSc in Electronics**	Semester	**V**
Course Title	**PRACTICAL V**		
Course Code	G504 DC 2.5P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

COURSE OUTCOMES

CO1: Analyze and relate the working of Opto-electronic devices.

CO2: Understand and relate the characteristics of optical fibers and their simple applications,

CO3: Write programs in microcontrollers using the instruction set, code and execute the program.

PRACTICALS V

List of Experiments (Minimum of Eight experiments to be done FROM EACH Section. 4 hrs duration per week)

SECTION-A

1. Setting up of a fiber optic analog link
2. Setting up of a fiber optic digital link
3. Determination of attenuation factor
4. Study of bending losses
5. Determination of numerical aperture of plastic fibers
6. Study of frequency modulation and demodulation
7. Study of pulse width modulation and demodulation
8. Study of pulse position modulation and demodulation

SECTION-B

1. Characteristics of photo transistor
2. Charactristics of fiber optic sources
3. Charactristics of fiber optic detectors
4. Characterics of LASCR
5. Optical modulation using transistor
6. Characteristics of solar cells
7. Study of ASK generation and Detection
8. Study of FSK generation and Detection
9. Study of PSK generation and Detection
10. Study of Time Division Multiplexing and Demultiplexing
11. Study of Frequency Multiplier.
12. QPSK modulator and demodulator
13. Determination of V-I Characteristics curve of a Gunn Diode

Scheme of Examination

Section-A:One experiment -10 marks

Section-B:One experiment -9 marks

Records	6 marks
Internal Assessment-	25 marks

TOTAL:50 MARKS

Semester-V

G 504DC 3.5 Embedded SYSTEMS

COURSE OUTCOMES

CO1: understand the architecture of microcontrollers.

CO2: understand their instruction set and write simple programs in them

CO3: Know the application of microcontrollers in various fields

CO4: understand the architecture of any microcontroller,

CO5: Understand the architecture of PIC

CO6: Understand the connection of interfacing units

UNIT I

14 hrs

Embedded Systems: Examples of Embedded Systems, Design Parameters of Embedded Systems, Microcontrollers, Memory: Information Storage Device, Read Only Memory, Random Access Memory, Aligned and Unaligned Memory Accesses, The Microprocessor, Microprocessor Architecture Classification. Architecture, Memory Interface-Based Architecture Classification, Performance Comparison of Different Architectures, Software System and Development Tools, Software Sub-Systems, Software Development Tools, Debugging Tools and Techniques, Manual Methods, Software-Only Methods, Software-Hardware Debugging

Architecture of 8051: 8051 block diagram, 8051 programming model, oscillator and clock, program counter and data pointer, registers, Flags and PSW, Internal memory, Stack and stack pointer, SFRs, Pins and signals of 8051,input- output ports and circuits. Timers and Counters. Interrupts of 8051.

UNIT II

14hrs

Instructions of 8051: Data transfer instructions: Addressing modes: immediate, register, direct and indirect, external data moves, push and pop, data exchange-example programs. Logical nstructions: byte-level, bit level, rotate and swap- example programs. Arithmetic instructions: Flags, increment and decrement, addition-unsigned and signed, multiplication and division, subtraction programs-Example programs.

Jump and call instructions: The Jump and call program range, Jumps-bit jumps, byte jumps and unconditional jumps-example programs. Calls and subroutines: Subroutines, calls and stack, calls and returns, interrupt returns

UNIT III

8051 Microcontroller Hardware Programming:Data types and time delays, I/O Programming, Timer Programming, Serial Communication- Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, UASRT Serial port programming, Interrupt programming, Keyboard and LCD Interfacing, ADC, DAC interfacing, Using Flash and EEPROM memories for data storage, Stepper motor and DC motor interfacing.

14 hrs

UNIT IV

PIC18 Microcontrollers: Overview of the PIC18 Family, Architecture and features of 18F458, Status register, Data memory and Special Function Registers, Data memory map, Access RAM, Indirect addressing and accessing tables in data memory, Program memory, Program memory map, Program Counter , Configuration registers, Stacks, Automatic Stack operations, Programmer access to the Stack, Fast Register Stack, Interrupts, Context saving with interrupts, Power supply and reset, Power supply, Power-up and Reset, Oscillator sources. Clock source switching, Parallel Ports, Parallel Slave Port, Watchdog Timer, Capture/Compare/PWM (CCP) Modules, MSSP Serial Port, Low-Voltage Detect, Nano-watt technology, Enhanced Peripherals. .

14hrs

Reference Books

1. Muhammad Tahir and KashifJaved, "ARM Microprocessor Systems: Cortex-M Architecture,Programming, and Interfacing," 1st Edition, CRC Press, 2017.
2. Kenneth J. Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson/Cengage Learning,1997
3. Muhammad Ali Mazidi and Janice Gillespie and Rollin D, "The 8051 Microcontroller andEmbedded Systems using assembly and C,"1st Edition, Pearson, 2006.
4. Tim Wilmshurst, "Designing Embedded Systems with PIC Microcontrollers: Principles andapplications", First Edition, Elsevier, 2007.
5. Muhammad Ali Mazidi and Rolin D, Mckinlay, "PIC Microcontroller and Embedded Systemsusing assembly and C for PIC18," 1stEdition, Pearson, 2008.
6. John Pitman, "Design with PIC Microcontrollers," 1st Edition,Prentice Hall, 1997.

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	4/6	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

Semester-V

PRACTICALS-VI

Program Name	**BSc in Electronics**	Semester	**Sixth Semester**
Course Title	**PRACTICAL VI**		
Course Code	G504 DC 4.5P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

COURSE OUTCOMES

CO1: Write programs in microcontrollers using the instruction set, code and execute the program.
CO2: To write and execute programs by writing assembly/C programs using KeilµVision IDE for 8051/8051-kit**.**
CO3: To write and execute programs using interfaces.

PRACTICALS VI:4 hrs duration per week: Any two sections to be done

Scheme of valuation :

1. 8051 Microcontroller – 2 Programs – 13 marks
2. One experiment based on Section B or Section C ------ 40 marks

40% Marks should be awarded for writing part and 60% for coding, editing and execution

SEMESTER – VI

PAPER - VII

504DC 1.6 Transducers, Sensor networks and principles of

IOT and 5G communications

COURSE OUTCOMES

CO1: Know the difference between Transducers and Sensors.

CO2: understand various types of ADC and DAC .

CO3: Able to design and verify the functionality of Internet of Things(IoT)

CO4: Know different types of protocols of Internet of Things (IoT).

UNIT I

Transducers (Basic Working): Displacement transducers - Resistive (Potentiometric, Strain Gauges – Types, Gauge Factor, bridge circuits, Semi-conductor strain gauge) Capacitive (diaphragm), Hall effect sensors, magneto-strictive transducers, Microphone, Touch Switch, Piezoelectric sensors, light(photo-conductive, photo emissive, photo voltaic, semiconductor, LDR), Temperature(electrical and non-electrical), Pressure sensor.

A-D and D-A Conversion: D-A conversion: 4 bit binary weighted resistor type, circuit and working. Circuit of R-2R ladder- Basic concept.A-D conversion characteristics, successive approximation ADC. (Mention the relevant ICs for all). **14hrs**

UNIT II

Fundamentals of IoT: Introduction, History of IoT, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, Components of an IoT Solution, IoT frameworks, IoT and M2M, Open Source and Commercial Examples, Competing Standards for IoT. **14hrs**

UNIT III

Sensors Networks: Definition, Traditional Data Storage, Analog and Digital I/O Basics, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT. **14hrs**

UNIT IV

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols. **14hrs**

Reference Books

1 Internet of Things: Principles and Paradigms by RajkumarBuyya, Amir VahidDastjerdi, and Anton Y. Dongarra.
2 Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry by MaciejKranz.
3 IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things by David Hanes, Gonzalo Salgueiro, Patrick Grossetete, and Robert Barton.
4 Internet of Things with Arduino Cookbook" by Marco Schwartz
5 Arduino Home Automation Projects" by Marco Schwartz and Oliver Manickum

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	4/6	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

Program Name	**BSc in Electronics**	Semester	**Sixth Semester**
Course Title	**PRACTICAL VII: GUIDED PROJECT**		
Course Code	G504DC2.6P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Scheme of Evaluation

Internal Assessment 25

504 DC 2.6

Course title: C Language & signals and systems

Course Objectives: After the successful completion of the course, the student will be able to:

- Learn good coding techniques required for current industrial practices.
- Gain the knowledge of programming the system using C programming language.
- To obtain skills to write, edit ,debug and analyze C programs to basic programs
- Understand basic concepts of signals and systems

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1. To understand various features and structures of high level languages
CO2. To understand various data types, memory allocation and their declaration
CO3. To understand various operators and their application
CO4 Modular and structured programming techniques in C language
CO5. To learn the various branch instructions, loop instructions and arrays
CO6. Write and execute and debug C codes for solving problems.
CO7: Know characteristics of signal, classification and signal and system relationship
CO8: To understand and appreciate examples for signals and systems

Syllabus:

Unit–1: 14 Hrs

C Programming: Introduction, Importance of C, Character set, Tokens, keywords, identifier, constants, basic data types, variables: declaration & assigning values. Structure of C program

Arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators, conditional operators, bitwise operators, expressions and evaluation of expressions, type cast operator, implicit conversions, precedence of operators.

dimensional arrays. Input output statement – sprintf(), scanf() and getch(), and library functions (math and string related functions).

Unit -2: 14hrs

Decision making, branching: if, if-else, else-if, switch statement, goto and break statements.

Decision making and looping: Entry controlled loops-while and **for** loops. Exit controlled loop and continue statement.

Arrays: Basics of arrays-definition, explanation, one dimensional arrays- declaration, initializa elements, reading, storing elements and printing, Sorting an array-bubble sorting.

Unit -3: 14hrs

Character arrays: declaration of character arrays. Reading and printing strings. String functions and manipiations.

Functions: Defining functions function arguments and passing, returning values from functions, example programs.

Pointers: Pointer declaration, assigning values to pointers, pointer arithmetic, array names used as pointer pointers used as arrays, pointers and text strings, pointers as function parameters.

Unit -IV: 14 hrs HR

Introduction to continuous-time and discrete-time signals: Introduction, classification of Sign continuous-time and discrete-time, analog and digital, deterministic and random, even and odd, periodic nonperiodic, energy and power signals. Basic Operations on Signals: operations performed on depend and independent variables, precedence rule for time-shifting and time scaling. Basic continuous-Time sign unit step, unit impulse, ramp, exponential, sinusoidal exponentially damped sinusoidal, pulse signals. B Discrete-time Signals: Step, impulse, ramp, exponential, sinusoidal, exponentially damped sinusoidal, p signals. Systems viewed as interconnections of operations. Properties of Systems- Linearity, Causality, T invariance, Memory, Stability, and Inevitability.

Linear Time Invariant Systems: Convolution Sum and procedure of find convolution sum, Properties Convolution Sum, Convolution Integral and it properties, graphical interpretation of convolut Representation for LTI Systems- Parallel and Cascade, **Properties of Systems:** Memory, causality, stab inevitability. Step response of LTI system, Sinusoidal Steady-state response or frequency-dor representation, Solution to Differential Equations-Natural, forced and total response.

References

1. E. Balagurusamy, "Programming in ANSI C", 4th Edition, Tata McGraw-Hill, 2008.
2. Yashavant P. Kanetkar, "Let us C", 18th Edition, BPB Publications, 2021.
3. Alan V Oppenheim, Alan s. Willsky and Hamid Nawab, "Signals and systems," Pearson, edition Asia/PHI, 2nd Edition, 2002.
4. Digital Signal Processing Theory and Lab Practice, 2nd Edition – DR. D Ganesh Rao and Vineeta P Gejji – Sanguine Technical Publishers, Bangalore-2008
5. Signals and Systems, 4th Edition – DR. D Ganesh Rao and SatishTunga –PEARSON Sanguine Technical Publishers, Bangalore-2008)
6. Simon Haykin and Barry Van Veen, "Signals & Systems," Wiley, 2nd Edition, 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	4/6	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

PRACTICALS

Program Name	**BSc in Electronics**	Semester	**Sixth Semester**
Course Title	**PRACTICAL VIII**		
Course Code	G504 DC 4.6P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

SECTIONA: Programming in C Laboratory

Write and execute C Program to

1. **Study of integer Arithmatics**
2. Find the area and circumference of a circle
3. Find the area and circumference of a triangle
4. **Study of increment and decrement operators**
5. Find the biggest and smallest of two numbers
6. Accepting and printing elements to one dimensional array.
7. Find the biggest and smallest of three numbers
8. Programs to understand loops- printing integers between given imits
9. Find the factorial of a given number
10. Check an integer is odd or even
11. Generation of Fibonacci series
12. Sum of N natural numbers
13. Sum of even natural numbers
14. Sum of odd natural numbers.
15. Study of bitwise logic operators
16. Reverse an integer and calculate the sum of digits
17. Find the roots of quadratic equation
18. Find the gross salary of an employee
19. Checking whether an input character is vowel or not
20. Program accept elements to any matrix and print
21. Calculation of length of a string.
22. case conversion of alphabets

23. **Concatenation of strings.**
24. **Checking whether the input character is vowel or not**
25. Reverse a string using library functions And Check whether the string is palindrome or not
26. Arrange the array in ascending and descending order using bubble sort
27. Addition of matrices.
28. Multiplication of matrices
29. Display prime numbers between intervals two limits
30. Find GCD of two numbers.
31. Generation of prime numbers
32. Function program to multiply two integers accepted through keyboard
33. Function Program to Print a LINE
34. Function Program to Factorial and hence calculate no of combinations.
35. Function Program to accept two numbers and print their sum, difference and product.
36. File program to store marks of students.
37. File program to store salary details of employees.

SECTION B: Write and execute following program using MATLAB/OCTAVE/SCILAB, etc.

1. Generate and plot unit sample, unit step, ramp, real sequences
2. Generate and plot sinusoidal, cosinusoidal and periodic sequences
3. Generate even & odd components of a sequence
4. Study linear convolution of two sequences
5. Study circular convolution of two sequences
6. Perform amplitude scaling, time scaling, folding and time-shifting operations on signals
7. Perform Upsampling and downsampling operation on a given sequence
8. Perform addition, subtraction and multiplication operation on signals
9. Find the linear convolution of two finite duration sequences.
10. Find the cross-correlation of two finite duration sequences

Not : eTogether 30 programs to be done .

Scheme of examination:

Duration of Practical Examination: 4 hrs

THREE PROGRAMS : 19MARKS

Record :06 marks

Total External Examination Marks : 25 marks

Internal Assessment- :25 marks

Total : 50 marks

Scheme of valuation:

1. C language: **Part – A: 1** program -----4marks
2. C language **Part – B: 1** program ----- 6 marks

OR

2. MATLAB :2 programs ---- 6 marks

3. C language **Part – C: 1** program -----9 marks

Total :19

40% Marks should be awarded for writing part and 60% for editing, execution and result.

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