oscilloscopes, function generators,

Spectrum analyzer etc.,

Transducers, sensors and display devices.

UNIT-I

DC and AC indicating Instruments: Accuracy and precision - Types of errors - PMMC galvanometer, sensitivity, Loading effect - Conversion of Galvanometer into ammeter, Voltmeter and Shunt type ohmmeter- Multimeter.

Electrodynamometer - Thermocouple instrument - Electrostatic voltmeter - Watt- hour meter.

UNIT-II

DC and AC bridges: Wheatstone bridge - Kelvin's bridge - Balancing condition for AC bridge - Maxwell's bridge - Schering's bridge - Wein's bridge - Determination of frequency.

UNIT-III

Oscilloscopes: Block diagram - Deflection Sensitivity - Electrostatic Deflection - Electrostatic Focusing - CRT Screen - Measurement of Waveform frequency, phase difference and Time intervals - Sampling Oscilloscope - Analog and Digital Storage Oscilloscopes.

UNIT-IV

Instrumentation Amplifiers and Signal Analysers: Instrumentation amplifier - Electronic Voltmeter and Multimeter - Digital Voltmeter - Function Generator - Wave Analyser - Fundamentals of Spectrum Analyser.

UNIT-V

Transducer and Display Devices: Strain Gauge - Unbounded Strain Gauge - LVDT - Resistance Thermometer - Photoelectric Transducer - Pen Recorder - Audio Tape Recorder - Seven Segment Display - LCD.

Text Books

1. Electronic Instrumentation and Measurement Techniques - W.D. Cooper & A.D. Helfrick, Prentice Hall of India.
2. Electronic Instrumentation and Measurement - Kalasi.

Reference Books

1. A Course in Electrical and Electronic Measurement and Instrumentation - A.K. Sawhney, Dhanpat Rai and Sons.
2. Electronic Instrumentation and Measurements - P.B. Zbar, Mc Graw Hill International.

3. Measurement Systems Application and Design - Ernest O. Doebelin, 4/e, TataMcGraw Hill Publishing Co. LTD

SEMESTER-III

COURSE 5: SEMICONDUCTOR DEVICES AND MATERIALS

Practical Credits: 1 2 hrs/week

List of Experiments

1. To study the Hall Effect: determine the Hall coefficient, type of semiconductor andcarrier concentration in the given semiconductor sample.
2. To study the four probe method: calculate the resistivity and energy band gap of givensemiconductor sample.
3. To determine the resistivity of the given semiconductor specimen using Vander Pauwmethod.
4. To design a MOSFET as switching regulator for given duty cycle and plot the current-voltage (I-V) characteristic of MOSFET using Keithley.
5. To design a phase controlled rectifier using SCR and plot the I-V characteristic of SCRusing Keithley.
6. To design a relaxation oscillator using UJT and plot the I-V characteristic of UJT usingKeithley.
7. I-V characteristics measurement of a p-n diode/LEDs using Keithley - calculate itsideality factor.

oscilloscopes, function generators,

Spectrum analyzer etc.,

Transducers, sensors and display devices.

UNIT-I

DC and AC indicating Instruments: Accuracy and precision - Types of errors - PMMC galvanometer, sensitivity, Loading effect - Conversion of Galvanometer into ammeter, Voltmeter and Shunt type ohmmeter- Multimeter.

Electrodynamometer - Thermocouple instrument - Electrostatic voltmeter - Watt- hour meter.

UNIT-II

DC and AC bridges: Wheatstone bridge - Kelvin's bridge - Balancing condition for AC bridge - Maxwell's bridge - Schering's bridge - Wein's bridge - Determination of frequency.

UNIT-III

Oscilloscopes: Block diagram - Deflection Sensitivity - Electrostatic Deflection - Electrostatic Focusing - CRT Screen - Measurement of Waveform frequency, phase difference and Time intervals - Sampling Oscilloscope - Analog and Digital Storage Oscilloscopes.

UNIT-IV

Instrumentation Amplifiers and Signal Analysers: Instrumentation amplifier - Electronic Voltmeter and Multimeter - Digital Voltmeter - Function Generator - Wave Analyser - Fundamentals of Spectrum Analyser.

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Transducer and Display Devices: Strain Gauge - Unbounded Strain Gauge - LVDT - Resistance Thermometer - Photoelectric Transducer - Pen Recorder - Audio Tape Recorder - Seven Segment Display - LCD.

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SEMESTER-III

COURSE 5: SEMICONDUCTOR DEVICES AND MATERIALS

Practical Credits: 1 2 hrs/week

List of Experiments

8. To study the Hall Effect: determine the Hall coefficient, type of semiconductor andcarrier concentration in the given semiconductor sample.
9. To study the four probe method: calculate the resistivity and energy band gap of givensemiconductor sample.
10. To determine the resistivity of the given semiconductor specimen using Vander Pauwmethod.
11. To design a MOSFET as switching regulator for given duty cycle and plot the current-voltage (I-V) characteristic of MOSFET using Keithley.
12. To design a phase controlled rectifier using SCR and plot the I-V characteristic of SCRusing Keithley.
13. To design a relaxation oscillator using UJT and plot the I-V characteristic of UJT usingKeithley.
14. I-V characteristics measurement of a p-n diode/LEDs using Keithley - calculate

itsideality factor.

	Government College (Autonomous) Rajahmundry (As Approved in the BOS meeting held on 30 AUGUST for 2023-24)	**Program & Semester** I B.Sc. (I Sem)			
Course Code ELE 001	**ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		5	0	-	4

Course Objectives:

The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences.

The course aims to develop students' critical thinking, problem-solving, and analytical skills in these areas, enabling them to apply scientific principles to real-world situations.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures
CO2	To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations
CO3	To Explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.
CO4	Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
CO5	To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT I: ESSENTIALS OF MATHEMATICS:

Complex Numbers: Introduction of the new symbol i – General form of a complex number – Modulus-Amplitude form and conversions

Trigonometric Ratios: Trigonometric Ratios and their relations – Problems on calculation of angles**Vectors:** Definition of vector addition – Cartesian form – Scalar and vector product and problems **Statistical Measures**: Mean, Median, Mode of a data and problems

UNIT II: ESSENTIALS OF PHYSICS:

Definition and Scope of Physics- Measurements and Units - Motion of objects: Newtonian Mechanics and relativistic mechanics perspective - Laws of Thermodynamics and Significance- Acoustic waves and electromagnetic waves- Electric and Magnetic fields and their interactions- Behaviour of atomic and nuclear particles- Wave-particle duality, the uncertainty principle- Theories and understanding of universe

UNIT III: ESSENTIALS OF CHEMISTRY:

Definition and Scope of Chemistry- Importance of Chemistry in daily life - Branches of chemistry and significance- Periodic Table- Electronic Configuration, chemical changes, classification of matter, Biomolecules- carbohydrates, proteins, fats and vitamins.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY:

Applications of Mathematics in Physics & Chemistry: Calculus , Differential Equations & Complex Analysis

Application of Physics in Industry and Technology: Electronics and Semiconductor Industry, Robotics and Automation, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies.

Application of Chemistry in Industry and Technology: Chemical Manufacturing, Pharmaceuticals and Drug Discovery, Materials Science, Food and Beverage Industry.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE:

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, IP, Domain Name Services, applications.

Ethical and social implications: Network and security concepts- Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques- Privacy and Data Protection

Recommended books:

1. Functions of one complex variable by John.B.Conway, Springer- Verlag.

2. Elementary Trigonometry by H.S.Hall and S.R.Knight

3.Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media(P)Ltd.

4.Basic Statistics by B.L.Agarwal, New age international Publishers

5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman

6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker

7. Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway and

John W. Jewett Jr.

8. Physics for Technology and Engineering" by John Bird

9. Chemistry in daily life by Kirpal Singh

10. Chemistry of bio molecules by S. P. Bhutan

11. Fundamentals of Computers by V. Raja Raman

12. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF ELECTRONICS
SYLLABUS FOR I B.Sc., ELECTRONICS

MODULE-I [**ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL ANDCHEMICAL SCIENCES**]
SEMESTER I
(As Approved in the BOS meeting held on 30 AUGUST for 2023-24)

STUDENT ACTIVITIES

UNIT I: ESSENTIALS OF MATHEMATICS:

1: Complex Number Exploration

Provide students with a set of complex numbers in both rectangular and polar forms. They

will plot the complex numbers on the complex plane and identify their properties 2:

Trigonometric Ratios Problem Solving

Give students a set of problems that require the calculation of trigonometric ratios and their relations.

Students will solve the problems using the appropriate trigonometric functions (sine, cosine, tangent, etc.) and trigonometric identities.

3: Vector Operations and Applications

Provide students with a set of vectors in Cartesian form.

Students will perform vector addition and subtraction operations to find the resultant vectors.

They will also calculate the scalar and vector products of given vectors.

4: Statistical Measures and Data Analysis

Give students a dataset containing numerical values.

Students will calculate the mean, median, and mode of the data, as well as other statistical measures if appropriate (e.g., range, standard deviation).
They will interpret the results and analyze the central tendencies and distribution of the data.

UNIT II: ESSENTIALS OF PHYSICS:

1. Concept Mapping

Divide students into groups and assign each group one of the topics.

Students will create a concept map illustrating the key concepts, relationships, and applications related to their assigned topic.

Encourage students to use visual elements, arrows, and labels to represent connections and interdependencies between concepts.

2. Laboratory Experiment

Select a laboratory experiment related to one of the topics, such as motion of objects or electric and magnetic fields.
Provide the necessary materials, instructions, and safety guidelines for conducting the experiment.
Students will work in small groups to carry out the experiment, collect data, and analyze the results.

After the experiment, students will write a lab report summarizing their findings, observations, and conclusions.

UNIT III: ESSENTIALS OF CHEMISTRY

1: Chemistry in Daily Life Presentation

Divide students into groups and assign each group a specific aspect of daily life where chemistry plays a significant role, such as food and nutrition, household products, medicine,or environmental issues.
Students will research and create a presentation (e.g., PowerPoint, poster, or video) that showcases the importance of chemistry in their assigned aspect.
2: Periodic Table Exploration

Provide students with a copy of the periodic table.

Students will explore the periodic table and its significance in organizing elements based on their properties.

They will identify and analyze trends in atomic structure, such as electronic configuration, atomic size, and ionization energy.

3: Chemical Changes and Classification of Matter

Provide students with various substances and chemical reactions, such as mixing acids and bases or observing a combustion reaction.
Students will observe and describe the chemical changes that occur, including changes in color, temperature, or the formation of new substances.
4: Biomolecules Investigation

Assign each student or group a specific biomolecule category, such as carbohydrates,proteins, fats, or vitamins.
Students will research and gather information about their assigned biomolecule category, including its structure, functions, sources, and importance in the human body.

They can create informative posters or presentations to present their findings to the class.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

1: Interdisciplinary Case Studies

Divide students into small groups and provide them with interdisciplinary case studies that involve the interdisciplinary application of mathematics, physics, and chemistry.

Each case study should present a real-world problem or scenario that requires the integration of concepts from all three disciplines.

2: Design and Innovation Project

Challenge students to design and develop a practical solution or innovation that integrates mathematics, physics, and chemistry principles.

Students can choose a specific problem or area of interest, such as renewable energy, environmental conservation, or materials science.

3: Laboratory Experiments

Assign students laboratory experiments that demonstrate the practical applications of Mathematics, physics, and chemistry.

Examples include investigating the relationship between concentration and reaction rate, analyzing the behavior of electrical circuits, or measuring the properties of materials.

.4: Mathematical Modeling

Present students with real-world problems that require mathematical modeling and analysis.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE:

1. Identifying the attributes of network (Topology, service provider, IP address and bandwidth of your college network) and prepare a report covering network architecture.

2. Identify the types of malwares and required firewalls to provide security.

3. Latest Fraud techniques used by hackers**.**

	Government College (Autonomous) Rajahmundry (As Approved in the BOS meeting held on 30 AUGUST for 2023-24)	**Program & Semester** I B.Sc. (I Sem)			
Course Code ELE 002	**ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		5	0	-	4

Course Objectives:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences.

The course aims to broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.
CO2	To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations.
CO3	Understand the different sources of renewable energy and their generation processes and advances in nanomaterials and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials. Understand the principles and techniques used in computer-aided drug design

	and drug delivery systems, to understand the fabrication techniques and working principles of Nano sensors. Explore the effects of chemical pollutants on ecosystems and human health.
CO4	Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
CO5	Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics.Gain knowledge of different types of transmission media, such as wired (e.g., copper cables, fiber optics) and wireless (e.g., radio waves, microwave, satellite)..

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development			Employability			Entrepreneurship	

Syllabus:

UNIT I: ADVANCES IN BASICS MATHEMATICS

Straight Lines: Different forms – Reduction of general equation into various forms – Point ofintersection of two straight lines

Limits and Differentiation: Standard limits – Derivative of a function –Problems on product ruleand quotient rule

Integration: Integration as a reverse process of differentiation – Basic methods of integration

Matrices: Types of matrices – Scalar multiple of a matrix – Multiplication of matrices – Transpose ofa matrix and determinants

UNIT II: ADVANCES IN PHYSICS:

Renewable energy: Generation, energy storage, and energy-efficient materials and devices. **Recent advances in the field of nanotechnology**: Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics- Shape Memory Materials.

UNIT III: ADVANCES IN CHEMISTRY:

Computer aided drug design and delivery, nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal - Catalysis method.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

Mathematical Modelling applications in physics and chemistry

Application of Renewable energy: Grid Integration and Smart Grids,

Application of nanotechnology: Nanomedicine,

Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics,

Application of medical physics: Radiation Therapy, Nuclear medicine

Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: Advanced Applications of computer Science

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction-Parity check and CRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

Recommended books:

1. Coordinate Geometry by S.L.Lony, Arihant Publications
2. Calculus by Thomas and Finny, Pearson Publications
3. Matrices by A.R.Vasishtha and A.K.Vasishtha, Krishna Prakashan Media(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
6. "Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A. Bohara
7. "Biophysics: An Introduction" by Rodney Cotterill
8. "Medical Physics: Imaging" by James G. Webster
9. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
10. Nano materials and applications by M.N.Borah
11. Environmental Chemistry by Anil.K.D.E.
12. Digital Logic Design by Morris Mano
13. Data Communication & Networking by Bahrouz Forouzan.

Web Links:

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO1	PSO2	PSO3
CO 1													
CO 2													
CO													

3													
CO4													
CO5													

	Government College (Autonomous) Rajahmundry (As Approved in the BOS meeting held on 30 AUGUST for 2023-24)	**Program & Semester** I B.Sc. (I Sem)			
Course Code ELE 002	**ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		5	0	-	4

Course Objectives:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences.

The course aims to broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.
CO2	To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations.
CO3	Understand the different sources of renewable energy and their generation processes and advances in nanomaterials and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials.

	Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of Nano sensors. Explore the effects of chemical pollutants on ecosystems and human health.
CO4	Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
CO5	Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics.Gain knowledge of different types of transmission media, such as wired (e.g., copper cables, fiber optics) and wireless (e.g., radio waves, microwave, satellite)..

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development			Employability			Entrepreneurship	

Syllabus:

UNIT I: ADVANCES IN BASICS MATHEMATICS

Straight Lines: Different forms – Reduction of general equation into various forms – Point ofintersection of two straight lines

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Renewable energy: Generation, energy storage, and energy-efficient materials and devices. **Recent advances in the field of nanotechnology**: Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics- Shape Memory Materials.

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Computer aided drug design and delivery, nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal - Catalysis method.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

Mathematical Modelling applications in physics and chemistry

Application of Renewable energy: Grid Integration and Smart Grids,

Application of nanotechnology: Nanomedicine,

Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics,

Application of medical physics: Radiation Therapy, Nuclear medicine

Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: Advanced Applications of computer Science

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check and CRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

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21. "Medical Physics: Imaging" by James G. Webster
22. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
23. Nano materials and applications by M.N.Borah
24. Environmental Chemistry by Anil.K.D.E.
25. Digital Logic Design by Morris Mano
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CO 1													
CO 2													
CO 3													
CO 4													
CO 5													

	Government College (Autonomous) Rajahmundry (As Approved in the BOS meeting held on 30 AUGUST for 2022-23)	**Program & Semester** II B.Sc. (II Sem)			
Course Code **ELE 004**	**CIRCUIT THEORY AND ELECTRONIC DEVICES**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	0	-	3

Course Objectives:

To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques.

To analyze circuits in time and frequency domain.

To synthesize the networks using passive elements.

To understand the construction, working and VI characteristics of electronic devices.

To understand the concept of power supply.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Apply concepts of electric network topology, nodes, branches, loops to solve circuit problems including the use of computer simulation.
CO2	Apply time and frequency concepts of analysis.
CO3	Synthesize the network using passive elements.
CO4	Know about amplifier circuits, switching circuits and oscillator circuits their design and use in electronics.
CO5	Design and construction of a power supply.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT- 1:

SINUSOIDAL ALTERNATING WAVEFORMS:

Definition of current and voltage. The sine wave, general format of sine wave for voltage or current, phase relations, average value, effective (R.M.S) values. Differences between A.C and D.C. Phase relation of R,L and C

UNIT-II:

PASSIVE NETWORKS AND NETWORKS THEOREMS (D.C):

Branch current method, Nodal Analysis, star to delta & delta to star conversions. Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power, Milliman and Reciprocity theorems .

UNIT-III:

RC, RL AND RLC CIRCUITS:

Frequency response of RC and RL circuits, their action as low pass and high pass filters. Passive differentiating and integrating circuits. Series resonance and parallel resonance circuits, Q – Factor.

UNIT-IV:

BJT, FET and UJT:

BJT: Construction, working, and characteristics of CE Configurations. Hybrid parameters and hybrid equivalent circuit of CE Transistor,

FET: Construction, working and characteristics of JFET and MOSFET. Advantages of FET over BJT.

UJT: Construction, working and characteristics of UJT. UJT as a Relaxation oscillator.

UNIT-V:

POWER SUPPLIES & PHOTO ELECTRIC DEVICES

Rectifiers: Half wave, full wave rectifiers-Efficiency-ripple factor- Filters- L-section&π-section filters. Three terminal fixed voltage I.C.regulators (78XX and &79XX). Light Emitting Diode – Photo diode and LDR.

Text books:

1. Introductory circuit Analysis (UBS Publications) Robert L. Boylestad.

2. Electronic Devices and Circuit Theory Robert L. Boylestad & Louisashelsky.

3. Circuit Analysis by P.Gnanasivam- Pearson Education

4. Electronic Devices and Circuit Theory Robert L. Boylestad &

Louis Nashelsky.
5. Electronic Devices and Circuits I – T.L.Floyd- PHI Fifth Edition

Reference books:

1. Engineering Circuit Analysis By: Hayt & Kemmerly - MG.

2. Networks and Systems – D.Roy Chowdary.

3. Unified Electronics (Circuit Analysis and Electronic Devices) byAgarwal- Arora

4. Electric Circuit Analysis- S.R. Paranjothi- New Age International.

5. Integrated Electronics – Millmam & Halkias.
6. Electronic Devices & Circuits – Bogart.
7. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd

Web Links:

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

DEPARTMENT OF ELECTRONICS
SYLLABUS FOR I B.Sc., ELECTRONICS
MODULE-IV [CIRCUIT THEORY AND ELECTRONIC DEVICES]
SEMESTER II
(As Approved in the BOS meeting held on 30 AUGUST for 2023-24)

Practical Credits: 1 2 hrs/week

1. Thevenin's Theorem-verification
2. Norton's Theorem-verification
3. Maximum Power Transfer Theorem-verification
4. LCR series resonance circuit.
5. BJT input and output characteristics
6. FET output and transfer characteristics
7. LDR characteristics
8. UJT VI Characteristics
9. IC regulated power supply(IC-7805)

Lab experiments are to be done on breadboard and simulation software (using multi sim) and output values are to be compared and justified for variation.

MODEL QUESTION PAPER

B.Sc DEGREE EXAMINATIONS

SEMESTER – II

Course 4: CIRCUIT THEORY AND ELECTRONIC DEVICES

Time: 2.30 Hrs.

Max.Marks:50

Section - A

Answer any five questions. **5 X 7M = 35M**

1. Question from Unit – I

(OR)

2. Question from Unit – I

3. Question from Unit – II

(OR)

4. Question from Unit – II

5. Question from Unit – III

(OR)

6. Question from Unit – III

7. Question from Unit – IV

(OR)

8. Question from Unit – IV

9. Question from Unit – V

(OR)

10. Question from Unit – V

Section - B

Answer any Five questions **5 X 3M =15M**

11. Question from Unit – I
12. Question from Unit – II
13. Question from Unit – III
14. Question from Unit – IV
15. Question from Unit – V
16. Question from Unit – III
17. Question from Unit – IV
18. Question from Unit – V

SEMESTER-III

COURSE 5: SEMICONDUCTOR DEVICES AND MATERIALS

Theory Credits: 3 3 hrs/week

Objective:

1. To provide basic knowledge and concepts of Semiconductor materials and devices.
2. To facilitate students learn on the physical principles and operational characteristics of Semiconductor devices and some of its important applications.

Pre-requisites: Basic understanding of semiconductors.

Outcomes:

- Ability to apply basic concepts of Inorganic and Organic Semiconductor materials forelectronic device application in modern electronic industry.
- Detailed knowledge of various classifications and applications to VLSI, LEDs and solarcells.
- Holistic view of the latest progress in two-dimensional (2D)-one-dimensional (1D) andnano materials.
- Emphasis on nano-electronic applications such as Schottky barrier transistors, flexibleElectronics.

Unit I:

Inorganic and Organic Semiconductor: Energy bands, carrier transport, mobility, drift- diffusivity, excess carrier, injection and recombination of the excess carriers, carrier statistics; High field effects: velocity saturation, hot carriers and avalanche breakdown.

Unit II:

Majority carrier Devices: MS contacts rectifier and non-rectifier, MIS structures, MESFET, hetero-junction, HEMT and band diagrams, I-V and C-V characteristics.

Unit III:

MOS structures: Semiconductor surfaces; The ideal and non-ideal MOS capacitor band diagrams and CVs; Effects of oxide charges, defects and interface states. MOSFET: Structures and Device Characteristics, Short-Channel effects. Charge coupled Devices (CCDs), application to VLSI.

Unit IV:

Nonvolatile Memory Device. Optoelectronic Devices: solar cell, photo detectors, LEDs, laser diodes. Nano structures and concepts: quantum wells, supper lattice structures, nanorod, quantum dot, CNTs, 2D materials: grapheme, BN, MoS_2 etc, matamaterials.

UNIT-V:

Multistage Amplifiers: BJT at high frequencies, frequency response of RC coupled amplifiers and transformer coupled amplifier.

Reference Books

1. Donald A. Neamen, Semiconductor Physics and Devices Basic Principles, 3rdedn.McGraw-Hil (2003)
2. B.G. Streetman and Sanjay Banerjee, Solid State Electronic Devices, 6thEdn., PrenticeHall, 2006.
3. S. M. Sze and Kwok K. Ng Physics of Semiconductor Devices, Wiley (2013).
4. M. Hussa, A. Dimoulas and A. Molle, 2D Materials for NanoElectronics, CRC press(2016)
M.S.Tyagi, Introduction

SEMESTER-III

COURSE 5: SEMICONDUCTOR DEVICES AND MATERIALS

Practical Credits: 1 2 hrs/week

List of Experiments

15. To study the Hall Effect: determine the Hall coefficient, type of semiconductor andcarrier concentration in the given semiconductor sample.
16. To study the four probe method: calculate the resistivity and energy band gap of givensemiconductor sample.
17. To determine the resistivity of the given semiconductor specimen using Vander Pauwmethod.
18. To design a MOSFET as switching regulator for given duty cycle and plot the current-voltage (I-V) characteristic of MOSFET using Keithley.
19. To design a phase controlled rectifier using SCR and plot the I-V characteristic of SCRusing Keithley.
20. To design a relaxation oscillator using UJT and plot the I-V characteristic of UJT usingKeithley.
21. I-V characteristics measurement of a p-n diode/LEDs using Keithley - calculate itsideality factor.

SEMESTER-III
COURSE 6: DIGITAL ELECTRONICS

Theory Credits: 3 3 hrs/week

Objectives:

- To understand the number systems, Binary codes and Complements.
- To understand the Boolean algebra and simplification of Booleanexpressions.
- To analyze logic processes and implement logical operations usingcombinational logic circuits.
- To understand the concepts of sequential circuits and to analyzesequential systems in terms of state machines.
- To understands characteristics of memory and their classification.
- To implement combinational and sequential circuits using VHDL.

Unit – I

NUMBER SYSTEM AND CODES: Decimal, Binary, Hexadecimal, Octal. Codes: BCD, Gray and Excess-3 codes- code conversions- Complements (1's, 2's,9's and 10's), Addition -Subtraction using complement methods.

Unit- II

BOOLEAN ALGEBRA AND THEOREMS: Boolean Theorems, De-Morgan's laws. Digital logic gates, Multi level NAND & NOR gates. Standard representation of logic functions (SOPand POS), Minimization Techniques (Karnaugh Map Method: 2,3 variables).

Unit-III

COMBINATIONAL DIGITAL CIRCUITS:

Adders-Half & full adder, Subtractor-Half and full subtractors, Parallel binary adder, Magnitude Comparator, Multiplexers (4:1)) and Demultiplexers (1:4), Encoder (8- line-to-3- line) and Decoder (3-line-to-8-line). IC-LOGIC FAMILIES: TTL logic, CMOS Logic families(NAND&NOR Gates).

UNIT-IV

SEQUENTIAL DIGITAL CIRCUITS:

Flip Flops: S-R FF , J-K FF, T and D type FFs, Master-Slave FFs, Excitation tables, Registers:- Serial In Serial Out and Parallel In and Parallel Out, Counters Asynchronous-,Mod-8,Mod- 10,Synchronous-4-bit &Ring counter.

UNIT-V

MEMORY DEVICES:

General Memory Operations, ROM, RAM (Static and Dynamic), PROM, EPROM, EEPROM,EAROM

TEXT BOOKS:

1. M.Morris Mano, " Digital Design " 3rd Edition, PHI, New Delhi.
2. Ronald J. Tocci. "Digital Systems-Principles and Applications" 6/e. PHI.New Delhi. 1999.(UNITS I to IV)
3. G.K.Kharate-Digital electronics-oxford universitypress
4. S.Salivahana&S.Arivazhagan-Digital circuits and design
5. Fundamentals of Digital Circuits by Anand Kumar Reference Books :

1. Herbert Taub and Donald Schilling. "Digital Integrated Electronics" .McGraw Hill. 1985.
2. S.K. Bose. "Digital Systems". 2/e. New Age International. 1992.
3. D.K. Anvekar and B.S. Sonade. "Electronic Data Converters :Fundamentals & Applications". TMH. 1994.
4. *Malvino and Leach. " Digital Principles and Applications". TMG Hill Edition.*

Outcomes:-

- ✓ Develop a digital logic and apply it to solve real life problems.
- ✓ Analyze, design and implement combinational logic circuits.
- ✓ Classify different semiconductor memories.
- ✓ Analyze, design and implement sequential logic circuits.
- ✓ Simulate and implement combinational and sequential logic circuits usingVHDL

SEMESTER – III
COURSE 6: DIGITAL ELECTRONICS

Practical Credits: 1 2 hrs/week

LAB LIST:

1. Verification of IC-logic gates
2. Realization of basic gates using discrete components (resistor, diodes & transistor)
3. Realization of basic gates using Universal gates (NAND & NOR gates) 4.Verify Half adder and full adder using gates
5. Verify Half subtractor and full subtractor using gates.
6. Verify the truth table Multiplexer and demultiplexer.
5. Verify the truth table Encoder and decoder.
6. Verify the truth table of RS , JK, T-F/F using NAND gates
7. 4-bit binary parallel adder and subtractor using IC 7483
8. BCD to Seven Segment Decoder using IC -7447/7448

SEMESTER – III
COURSE 7: ANALOG ELECTRONICS

Theory Credits: 4 5 hrs/week

Objectives:

1. The design and working of RC coupled amplifiers, transformer coupled amplifiers and power amplifiers,

2. The concept of negative and positive feedback,

3. Pulse shaping and Schmitt trigger, and

4. The op-amp characteristics, frequency response and its linear and non-linear applications.

UNIT-I

Amplifiers: General principles of small signal amplifiers - Classifications - RC Coupled amplifiers - Gain - Frequency response - Input and output impedance - Multistage amplifiers - Transformer coupled amplifiers - Equivalent circuits at low, medium and high frequencies – Emitter follower.

Class A and Class B power amplifiers - Single ended and push-pull configurations - Power dissipation and output power calculations.

UNIT-II

Feedback Amplifiers: Basic concept of feedback amplifiers - Transfer gain with feedback - General characteristics of negative feedback amplifier - Effect of negative feedback on gain - Gain stability - Distortion and bandwidth - Input and output resistance in the case of various types of feedback - Analysis of voltage and current in feedback amplifier circuits.

UNIT-III

Operational Amplifiers: Principles - Transfer characteristics - Various offset parameters - Differential gain - CMRR - Slew rate – Bandwi

UNIT-IV

Op-amp Circuits: Basic operational amplifier circuits under inverting and non- inverting modes - Adder - Subtractor - Integrator - Differentiator - Comparator - Sine, square and triangular waveform generators - Active filters - Sample and Hold circuits.

UNIT-V

Oscillators: Positive feedback - Stability issues - Feedback requirement of oscillations -

Barkhausen criterion for oscillation - Hartley, Colpitts, Phase shift and Wien bridge oscillators - Condition for oscillation and frequency derivation - Crystal oscillator - UJT relaxation oscillator. Monostable, bistable and astable multivibrators - Schmitt trigger.

Text Books

1. Introduction to Integrated Electronics - *V. Vijayendran,* S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai, 2005.
2. Electronic Circuits and Systems - *Y.N. Bapat,* Tata McGraw Hill Publishing Co. Ltd.

Reference Books

1. Electronic Devices and Circuits - *G.K. Mithal,* Khanna Publishers, Delhi.
2. Hand Book of Electronics - *Gupta & Kumar,* Pragati Prakashan, Meerut.
3. Electronic Devices and Circuit Theory - *R. Boylestad & L. Nashelsky,* Prentice Hallof India Private Limited, 6/e.
4. Electronic Devices and Circuits - *J.P. Agarwal & Amit Agarwal,* PrakasamPublishers.
5. Linear Integrated Circuits - *D. Roy Choudhury & Shail Jain,* New Age International

(P) Limited.

SEMESTER-III

COURSE 8: ELECTRONIC COMMUNICATION SYSTEMS

Theory Credits: 3 3 hrs/week

The students will learn :

a. fundamentals of antenna, their characteristics and types,

b. amplitude modulation and demodulation and radio wave transmission andreception,

c. frequency modulation and demodulation and FM radio wave transmission andreception,

d. Principle of analog and digital pulse modulation and their applications,

e. transmission and detection of digital signals.

UNIT-I

Antenna - Effective resistance - Efficiency - Directive gain - Bandwidth, Beam widthand polarization - Dipole - Folded dipole - Arrays - Yagi - Uda - Helical - Discone - Parabolic - Dish Antennas - Ground wave, sky wave and space ware propagation - Skip distance - Maximum usable frequency.

UNIT-II

Modulation - Needs for Modulation - Types of Modulation - Amplitude Modulation - Generation and detections circuits - Balanced Modulator - DSB/SC and SSB Modulation - VSB modulation. Block diagram of AM Radio transmitter and super heterodyne Receiver.

UNIT-III

Frequency Modulation - Definition - Derivation of Modulated wave - Generation of FM - Varactor diode and Reactance tube Modulators - Detectors - Balanced slope detector, Foster Seeley discriminator, ratio detector - Block diagram of FM transmitter and receiver.

UNIT-IV

Pulse Modulation - Sampling theorem - PAM, PWM, , PCM - quantizing, sampling, coding, decoding, quantization error, delta modulation and adaptive delta modulation.

UNIT-V

Multiplexing - FDM, TDM, CDMA - ASK, FSK, PSK –Advantages of

DigitalCommunication - Introduction to Microwave, Fiber optic, Satellite Communications

- RADAR - range equation.

Text Books

Electronic Communication Systems - *George Kennedy*, McGraw Hill BookCompany, 4/e, 2005.

2. Communication Engineering - *T.G. Palanivelu*, Anuradha Publicatons, 1/e, 2002.

Reference Books

1. Communication System - *Roddy & Coolen*, 4/e, Pearson Education, 2005.

2. Principles of Communication Engineering - *Anok Singh*, 4/e, SathyaprakasamPublications, 2004.

3. Electronic Communication Systems *Wayne Tomasi*, 4/e, Pearson Education, 2004.

SEMESTER-IV

COURSE 9: ELECTRICAL AND ELECTRONIC INSTRUMENTATION

Theory Credits: 4 5 hrs/week

The students will learn:

Basic concepts of indicating instruments.

Various electronic instruments such as CRO,

Storage oscilloscopes, function generators,

Spectrum analyzer etc.,

Transducers, sensors and display devices.

UNIT-I

DC and AC indicating Instruments: Accuracy and precision - Types of errors - PMMC galvanometer, sensitivity, Loading effect - Conversion of Galvanometer into ammeter, Voltmeter and Shunt type ohmmeter- Multimeter.

Electrodynamometer - Thermocouple instrument - Electrostatic voltmeter - Watt- hour meter.

UNIT-II

DC and AC bridges: Wheatstone bridge - Kelvin's bridge - Balancing condition for AC bridge - Maxwell's bridge - Schering's bridge - Wein's bridge - Determination of frequency.

UNIT-III

Oscilloscopes: Block diagram - Deflection Sensitivity - Electrostatic Deflection - Electrostatic Focusing - CRT Screen - Measurement of Waveform frequency, phase difference and Time intervals - Sampling Oscilloscope - Analog and Digital Storage Oscilloscopes.

UNIT-IV

Instrumentation Amplifiers and Signal Analysers: Instrumentation amplifier - Electronic Voltmeter and Multimeter - Digital Voltmeter - Function Generator - Wave Analyser - Fundamentals of Spectrum Analyser.

UNIT-V

Transducer and Display Devices: Strain Gauge - Unbounded Strain Gauge - LVDT - Resistance Thermometer - Photoelectric Transducer - Pen Recorder - Audio Tape Recorder - Seven Segment Display - LCD.

Text Books

1. Electronic Instrumentation and Measurement Techniques - W.D. Cooper & A.D. Helfrick, Prentice Hall of India.

2. Electronic Instrumentation and Measurement - Kalasi.

Reference Books

1. A Course in Electrical and Electronic Measurement and Instrumentation - A.K. Sawhney, Dhanpat Rai and Sons.
2. Electronic Instrumentation and Measurements - P.B. Zbar, Mc Graw Hill International.
3. Measurement Systems Application and Design - Ernest O. Doebelin, 4/e, TataMcGraw Hill Publishing Co. LTD

SEMESTER-III

COURSE 5: SEMICONDUCTOR DEVICES AND MATERIALS

Practical Credits: 1 2 hrs/week

List of Experiments

22. To study the Hall Effect: determine the Hall coefficient, type of semiconductor andcarrier concentration in the given semiconductor sample.
23. To study the four probe method: calculate the resistivity and energy band gap of givensemiconductor sample.
24. To determine the resistivity of the given semiconductor specimen using Vander Pauwmethod.
25. To design a MOSFET as switching regulator for given duty cycle and plot the current-voltage (I-V) characteristic of MOSFET using Keithley.
26. To design a phase controlled rectifier using SCR and plot the I-V characteristic of SCRusing Keithley.
27. To design a relaxation oscillator using UJT and plot the I-V characteristic of UJT usingKeithley.
28. I-V characteristics measurement of a p-n diode/LEDs using Keithley - calculate itsideality factor.

SEMESTER-III
COURSE 6: DIGITAL ELECTRONICS

Theory Credits: 3 3 hrs/week

Objectives:

- To understand the number systems, Binary codes and Complements.
- To understand the Boolean algebra and simplification of Booleanexpressions.
- To analyze logic processes and implement logical operations usingcombinational logic circuits.
- To understand the concepts of sequential circuits and to analyzesequential systems in terms of state machines.
- To understands characteristics of memory and their classification.
- To implement combinational and sequential circuits using VHDL.

Unit – I

NUMBER SYSTEM AND CODES: Decimal, Binary, Hexadecimal, Octal. Codes: BCD, Gray and Excess-3 codes- code conversions- Complements (1's, 2's,9's and 10's), Addition -Subtraction using complement methods.

Unit- II

BOOLEAN ALGEBRA AND THEOREMS: Boolean Theorems, De-Morgan's laws. Digital logic gates, Multi level NAND & NOR gates. Standard representation of logic functions (SOPand POS), Minimization Techniques (Karnaugh Map Method: 2,3 variables).

Unit-III

COMBINATIONAL DIGITAL CIRCUITS:

Adders-Half & full adder, Subtractor-Half and full subtractors, Parallel binary adder, Magnitude Comparator, Multiplexers (4:1)) and Demultiplexers (1:4), Encoder (8- line-to-3- line) and Decoder (3-line-to-8-line). IC-LOGIC FAMILIES: TTL logic, CMOS Logic families(NAND&NOR Gates).

UNIT-IV

SEQUENTIAL DIGITAL CIRCUITS:

Flip Flops: S-R FF , J-K FF, T and D type FFs, Master-Slave FFs, Excitation tables, Registers:- Serial In Serial Out and Parallel In and Parallel Out, Counters Asynchronous-,Mod-8,Mod- 10,Synchronous-4-bit &Ring counter.

UNIT-V

MEMORY DEVICES:

General Memory Operations, ROM, RAM (Static and Dynamic), PROM, EPROM, EEPROM,EAROM

TEXT BOOKS:

6. M.Morris Mano, " Digital Design " 3rd Edition, PHI, New Delhi.
7. Ronald J. Tocci. "Digital Systems-Principles and Applications" 6/e. PHI.New Delhi. 1999.(UNITS I to IV)
8. G.K.Kharate-Digital electronics-oxford universitypress
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Outcomes:-

- ✓ Develop a digital logic and apply it to solve real life problems.
- ✓ Analyze, design and implement combinational logic circuits.
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- ✓ Analyze, design and implement sequential logic circuits.
- ✓ Simulate and implement combinational and sequential logic circuits usingVHDL

SEMESTER – III
COURSE 6: DIGITAL ELECTRONICS

Practical Credits: 1 2 hrs/week

LAB LIST:

4. Verification of IC-logic gates
5. Realization of basic gates using discrete components (resistor, diodes & transistor)
6. Realization of basic gates using Universal gates (NAND & NOR gates) 4.Verify Half adder and full adder using gates
7. Verify Half subtractor and full subtractor using gates.
8. Verify the truth table Multiplexer and demultiplexer.
9. Verify the truth table Encoder and decoder.
10. Verify the truth table of RS , JK, T-F/F using NAND gates
11. 4-bit binary parallel adder and subtractor using IC 7483
12. BCD to Seven Segment Decoder using IC -7447/7448

SEMESTER – III
COURSE 7: ANALOG ELECTRONICS

Theory Credits: 4 5 hrs/week

Objectives:

1. The design and working of RC coupled amplifiers, transformer coupled amplifiers and power amplifiers,

2. The concept of negative and positive feedback,

3. Pulse shaping and Schmitt trigger, and

4. The op-amp characteristics, frequency response and its linear and non-linear applications.

UNIT-I

Amplifiers: General principles of small signal amplifiers - Classifications - RC Coupled amplifiers - Gain - Frequency response - Input and output impedance - Multistage amplifiers - Transformer coupled amplifiers - Equivalent circuits at low, medium and high frequencies – Emitter follower.

Class A and Class B power amplifiers - Single ended and push-pull configurations - Power dissipation and output power calculations.

UNIT-II

Feedback Amplifiers: Basic concept of feedback amplifiers - Transfer gain with feedback - General characteristics of negative feedback amplifier - Effect of negative feedback on gain - Gain stability - Distortion and bandwidth - Input and output resistance in the case of various types of feedback - Analysis of voltage and current in feedback amplifier circuits.

UNIT-III

Operational Amplifiers: Principles - Transfer characteristics - Various offset parameters - Differential gain - CMRR - Slew rate – Bandwi

UNIT-IV

Op-amp Circuits: Basic operational amplifier circuits under inverting and non- inverting modes - Adder - Subtractor - Integrator - Differentiator - Comparator - Sine, square and triangular waveform generators - Active filters - Sample and Hold circuits.

UNIT-V

Oscillators: Positive feedback - Stability issues - Feedback requirement of oscillations -

Barkhausen criterion for oscillation - Hartley, Colpitts, Phase shift and Wien bridge oscillators - Condition for oscillation and frequency derivation - Crystal oscillator - UJT relaxation oscillator. Monostable, bistable and astable multivibrators - Schmitt trigger.

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8. Electronic Devices and Circuit Theory - *R. Boylestad & L. Nashelsky,* Prentice Hallof India Private Limited, 6/e.

9. Electronic Devices and Circuits - *J.P. Agarwal & Amit Agarwal,* PrakasamPublishers.

10. Linear Integrated Circuits - *D. Roy Choudhury & Shail Jain,* New Age International

(P) Limited.

SEMESTER-III

COURSE 8: ELECTRONIC COMMUNICATION SYSTEMS

Theory Credits: 3 3 hrs/week

The students will learn :

f. fundamentals of antenna, their characteristics and types,

g. amplitude modulation and demodulation and radio wave transmission andreception,

h. frequency modulation and demodulation and FM radio wave transmission andreception,

i. Principle of analog and digital pulse modulation and their applications,

j. transmission and detection of digital signals.

UNIT-I

Antenna - Effective resistance - Efficiency - Directive gain - Bandwidth, Beam widthand polarization - Dipole - Folded dipole - Arrays - Yagi - Uda - Helical - Discone - Parabolic - Dish Antennas - Ground wave, sky wave and space ware propagation - Skip distance - Maximum usable frequency.

UNIT-II

Modulation - Needs for Modulation - Types of Modulation - Amplitude Modulation - Generation and detections circuits - Balanced Modulator - DSB/SC and SSB Modulation - VSB modulation. Block diagram of AM Radio transmitter and super heterodyne Receiver.

UNIT-III

Frequency Modulation - Definition - Derivation of Modulated wave - Generation of FM - Varactor diode and Reactance tube Modulators - Detectors - Balanced slope detector, Foster Seeley discriminator, ratio detector - Block diagram of FM transmitter and receiver.

UNIT-IV

Pulse Modulation - Sampling theorem - PAM, PWM, , PCM - quantizing, sampling, coding, decoding, quantization error, delta modulation and adaptive delta modulation.

UNIT-V

Multiplexing - FDM, TDM, CDMA - ASK, FSK, PSK –Advantages of

DigitalCommunication - Introduction to Microwave, Fiber optic, Satellite Communications

- RADAR - range equation.

Text Books

Electronic Communication Systems - *George Kennedy*, McGraw Hill BookCompany, 4/e, 2005.

4. Communication Engineering - *T.G. Palanivelu*, Anuradha Publicatons, 1/e, 2002.

Reference Books

4. Communication System - *Roddy & Coolen*, 4/e, Pearson Education, 2005.

5. Principles of Communication Engineering - *Anok Singh*, 4/e, SathyaprakasamPublications, 2004.

6. Electronic Communication Systems *Wayne Tomasi*, 4/e, Pearson Education, 2004.

SEMESTER-IV

COURSE 9: ELECTRICAL AND ELECTRONIC INSTRUMENTATION

Theory Credits: 4 5 hrs/week

The students will learn:

Basic concepts of indicating instruments.

Various electronic instruments such as CRO,

Storage oscilloscopes, function generators,

Spectrum analyzer etc.,

Transducers, sensors and display devices.

UNIT-I

DC and AC indicating Instruments: Accuracy and precision - Types of errors - PMMC galvanometer, sensitivity, Loading effect - Conversion of Galvanometer into ammeter, Voltmeter and Shunt type ohmmeter- Multimeter.

Electrodynamometer - Thermocouple instrument - Electrostatic voltmeter - Watt- hour meter.

UNIT-II

DC and AC bridges: Wheatstone bridge - Kelvin's bridge - Balancing condition for AC bridge - Maxwell's bridge - Schering's bridge - Wein's bridge - Determination of frequency.

UNIT-III

Oscilloscopes: Block diagram - Deflection Sensitivity - Electrostatic Deflection - Electrostatic Focusing - CRT Screen - Measurement of Waveform frequency, phase difference and Time intervals - Sampling Oscilloscope - Analog and Digital Storage Oscilloscopes.

UNIT-IV

Instrumentation Amplifiers and Signal Analysers: Instrumentation amplifier - Electronic Voltmeter and Multimeter - Digital Voltmeter - Function Generator - Wave Analyser - Fundamentals of Spectrum Analyser.

UNIT-V

Transducer and Display Devices: Strain Gauge - Unbounded Strain Gauge - LVDT - Resistance Thermometer - Photoelectric Transducer - Pen Recorder - Audio Tape Recorder - Seven Segment Display - LCD.

Text Books

1. Electronic Instrumentation and Measurement Techniques - W.D. Cooper & A.D. Helfrick, Prentice Hall of India.

2. Electronic Instrumentation and Measurement - Kalasi.

Reference Books

1. A Course in Electrical and Electronic Measurement and Instrumentation - A.K. Sawhney, Dhanpat Rai and Sons.
2. Electronic Instrumentation and Measurements - P.B. Zbar, Mc Graw Hill International.
3. Measurement Systems Application and Design - Ernest O. Doebelin, 4/e, TataMcGraw Hill Publishing Co. LTD

SEMESTER-IV

COURSE 11: MICROPROCESSOR SYSTEMS

Practical Credits: 1 2 hrs/week

List of Experiments

Programs using Intel 8085 /8086

1. Addition and Subtraction (8 bit and 16-bit)
2. Multiplication and Divition (8-bit)
3. Largest number in an array.
4. Smallest number in an array.
5. BCD to ASCII and ASCII to BCD .
6. Program To Convert Two Bcd Numbers In To Hex
7. Program To Convert Hex Number In To Bcd Number.
8. Program To Find The Square Root Of A Given Number.
9. Interfacing Experiments Using 8086 Microprocessor (Demo):

1. Traffic Light Controller
2. Elevator,
3. 7-Segment Display

SEMESTER-V

COURSE 12: CELLULAR MOBILE COMMUNICATION

Theory Credits: 4 5 hrs/week

The students will learn:

a. basics of digital cellular system, cordless telephony and cell structure

b. GSM wireless protocol and markup language fundamentals

c. basics of WLL and Bluetooth technology

UNIT-I

Advanced mobile phone service - Global system for mobile communication - Digital cellular system -

Cordless telephony - Third generation wireless systems.

UNIT-II

7 Cell structure - Hand off - roaming management - Hand off detection - Channel assignment techniques - Interference - ACI, CCI - Intersystem hand off and authentication - Network signaling - Cellular digital packet data

UNIT-III

GSM - Network signaling, mobility management, short message service - International roaming, administration and operation.

UNIT-IV

Wireless application protocol - Architecture - Datagram - Transport layer securities - Transaction protocol - Session protocol application environment, wireless markup language, WML - Script wireless telephony applications.

UNIT-V

Third generation mobile services - Wireless local loop - Bluetooth technology.

Text Books

1. Mobile Communications - *Jochen Schiller*, 7/e, Pearson Education, 2003.

2. Principles of Wireless Networks - *Kauch Pahalavan & Prahanet Krishnamoorthy*,2/e, Pearson Education, 2004.

Reference Books

1. Wireless and Mobile Networks Architecture - *Yi-Bing Lin & Imnch Chlantee*, JohnWiley, 2001.

2. Wireless and Mobile Communication - *Rapparport*, Pearson Education, 2001.

SEMESTER-V
COURSE 13: COMPUTER NETWORK

Theory Credits: 4 5

hrs/week

Objective

The students will learn:

a. Provides a general introduction to computer networking that would be useful toall personnel who deal with distributed systems,

Encompassing both technical and managerial aspects.

b. To help students better understand the challenges and opportunities faced by modern business, topics include LAN and WAN implementations, the Internet and internet applications.

UNIT-I
Network structure Point to Point, Broadcast, Multicast - Horizontal and vertical distribution - Star, Mesh, tree, bus structures - OSI 7 layer model - Architecture - Functions of layers - Packet switches, circuit switching and message switching.

UNIT-II
Physical layer - Transmission media - Channel allocation methods - ALOHA, S- ALOHA, FINITE ALOHA - LAN Protocols IEEE802.3, 802.4, 802.5, 802.6 and 802.11.

UNIT-III
Data link layer - Framing - Error detection - Error correction - CRC - Stop and wait - Go band N - Sliding window Protocol - Selective repeat.

UNIT-IV
Network layer - Routing algorithms and congestion control algorithms - Repeaters, Bridges, Routers and Gateways, Inter networking - Introduction to transport layer and session layer.

UNIT-V

Presentation layer - coding, compression and cryptography - Introduction to Application layer - High performance networks - ATM, Fast Ethernet, FDDI, DQDB, SONET and SDH.

Text Books
1. Computer Networks - Andrew S. Tanenbaum, 4/e, Pearson Education, 2005.
2. Data and Computer Communication - W. Stallings, 7/e, Pearson Education, 2006.

Reference Books
1. Introduction to Data Communications and Networking - Behrouz & Forouzan,4/e, McGraw Hill Book Company, 2004.
2. Telecommunication Networks - Protocols Modeling and Analysis - Misha Stewartz,2/e, Pearson Education, 2002.

SEMESTER-V
COURSE 14 A: INDUSTRIAL ELECTRONICS

Theory Credits: 3 3 hrs/week

Note-1: For Semester–V, for the domain subject Electronics, any one of the above three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (A, B, C allotment is random, not on any priority basis).

Note-2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the skills embedded in syllabus citing related real field situations.

I. Learning Outcomes: Students after successful completion of the course will be able to:

1. Identify various facilities required to set up a basic Instrumentation Laboratory.
2. Acquire a critical knowledge of various Electrical Instruments used in the Laboratory.
3. Demonstrate skills of using instruments like Rectifiers, Multimeter, Power supplies, Voltage Regulators etc. through hands on experience.
4. Understand the Principle and operation of different Electronic Heating devices.

Syllabus:

UNIT-I (20 hours)

Rectifiers and filters: Rectifiers– Half wave, full wave and bridge rectifiers- Efficiency- Ripple factor- Regulation – Harmonic components in rectified output – Types of filters- Choke input (inductor) filter- Shunt capacitor filter- L section and section filters.
Voltage Regulators: Transistor Series voltage regulator - Transistor Shunt voltage regulator – Three terminal regulators (78XX and 79XX).

UNIT-II (10 hours)

Power Supplies: Block diagram of regulated power supply – A simple regulated transistorized power supply (circuit and working) – Principle and working of switch mode power supply (SMPS).

UNIT-III (10 hours)

Voltage Multipliers: Half wave voltage doubler, Full wavevoltage doubler, Voltage Tripler circuit diagramand working mentioning of applications of voltage multipliers.

UNIT-IV (10 hours)

Controlled rectifiers: SCR Half wave rectifier circuit, working with wave forms, mathematical analysis for resistive load - SCR Full wave rectifier circuit, working with wave forms, mathematical analysis for resistive load – SCR as inverter parallel and series circuits.

UNIT-V (10 hours)

Heat effects: Resistance, inductance and dielectric heating. Principle of operations and its applications.

Reference Books:

1. Unified Electronics Volume II by J.P Agarwal and Amit Agarwal.
2. Industrial Electronics, S.B. Biswas, Dhanapur Rai & Sons.
3. Industrial Electronics, G.K. Mithal, Khanna Publishers.
4. Electronic Devices and Circuits – G.K. Mithal.
5. Electronic Devices and Circuits-Millman and Halkias- Tata Mc Graw Hill (TMH)
6. Microelectronics- J. Millman and A. Grabel – TMH

SEMESTER-V

COURSE 14 A: INDUSTRIAL ELECTRONICS

Practical Credits: 1 2 hrs/week

(ANY SIX EXPERIMEMTS SHOULD BE DONE)

1. D.C Power supply and filters.
2. Transistor series regulator
3. Transistor as a shunt regulator
4. Voltage regulator using IC-7805and IC-7905.
5. Voltage doubler using diodes
6. Voltage Tripler using diodes
7. SCR VI characteristics.
8. SCR Series inverter
9. SCR parallel inverter.

SEMESTER-V

COURSE 15 A: DIGITAL SYSTEM DESIGN

Theory Credits: 3 3 hrs/week

a. the fundamentals of Boolean algebra and simplification of Boolean functions

b. the combinational logic circuits and their design using HDL

c. the sequential logic circuits and their design using HDL

UNIT-I

Boolean Algebra and Logic Gates: Review of binary number systems - Binary arithmetic - Binary codes - Boolean Algebra and theorems - Boolean functions - Simplifications of Boolean functions using Karnaugh map and tabulation methods - Logic gates.

UNIT-II

Combinational Logic: Combinational circuits - Analysis and design procedures - Circuits for arithmetic operations - Code conversions - Introduction to Hardware Description Language (HDL).

UNIT-III

Design with MSI Devices: Decoders and Encoders - Multiplexers and Demultiplexers - Memory and programming logic - HDL for combinational circuits.

UNIT-IV

Synchronous Sequential Logic: Sequential circuits - Flip-flops - Analysis and design procedures - State r eduction and state assignments - Shift registers - Counters - HDLfor sequential logic circuits, shift registers and counters.

UNIT-V

Asynchronous Sequential Logic: Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables - Race free state assignment - Hazards.

Text Books

1. Digital Logic and Computer Design - *M. Morris Mano,* Prentice Hall of IndiaPrivate Limited.

2. A Verilog HDL Premier - *J. Baskar,* Pearson Education.

Reference Books

1. Analysis and Modeling of Digital Systems - *Zain Allabedin Navabee,* 2/e , McGrawHill Publishing Co. Ltd., New Delhi.

2. An Engineering Approach to Digital Design - *Fletcher,* Prentice Hall of IndiaPrivate Limited.

3. Modern Digital Electronics - *R.P. Jain,* 2/e, Tata McGraw Hill Publishing Co. Ltd.,New Delhi.

4. Digital Fundamentals - *T.L. Floyd,* 8/e, Pearson Education.

Co-Curricular Activities

(a) Mandatory: (*Training of students by teacher in field related skills: (lab:10 + field:05*)

1. For Teacher: Training of students by the teacher in the in the laboratory/fieldfor not less than 15 hours on the field techniques/skills of understanding the operation, Maintenance and utility of various electrical and electronic instruments both in the Laboratory as well as in daily life.

For Student: Students shall (individually)visit a local electrical and electronics shop or small firm to familiarize with the various electrical and electronic instruments available in the market and also to understand their functionality, principle of operation and applications as well as the troubleshooting of these instruments.(Or) Student shall visit a diagnostic centre and observe the ECG machine and the ECG pattern(Or) Student shall visit a diagnostic centre and observe the CT scan and MRI scan.(Or) Student shallvisit a mobile smart phone repair shop and observe the different components on the PCB(Motherboard), different ICs (chips) used in the motherboard and trouble shootingof touch screen in smart phones.

Observations shall be recorded in a hand-written Fieldwork/Project work not exceeding10 pages in the given format to be submitted to the teacher.

2. Max marks for Fieldwork/Project work: 05.

3. Suggested Format for Fieldwork/Project work: *Title page,*

student details, indexpage, details of place visited, observations, findings and acknowledgements.

4. Unit tests (IE)

Suggested Co-Curricular Activities

1. Training of students by related industrial / technical experts.
2. Assignments (including technical assignments like identifying different measuring instruments and tools and their handling, operational techniqueswith safety and security.
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Making your own stethoscope at home.
5. Making seven segment display at home.
6. Preparation of videos on tools and techniques in various branches of instrumentation.
7. Collection of material/figures/photos related to products of Measuring Instruments, Display Modules and Biomedical Instruments and arrange them in a systematic way in a file.
8. Visits to Instrumentation Laboratories of local Universities or Industries like Cement, Chemical or Sugar Plants etc. or any nearby research organizations, private firms, etc.
9. Invited lectures and presentations on related topics by Technical /industrial experts

SEMESTER-V

COURSE 14 B: EMBEDDED SYSTEMS DESIGN

Theory Credits: 4 5 Hrs/Week

UNIT 1: (15Hrs)

Introduction to Embedded Systems:
Embedded systems overview, Design Challenge, Processor Technology, IC Technology, and Design Technology.

UNIT 2: (15Hrs)

Custom Single Purpose Processor – Hardware Development: Introduction, Combinational logic,Sequential logic, Custom Single Purpose Processor Design, RT-Level Custom Single-Purpose Processor.

UNIT 3: (15Hrs)

General Purpose Processor – Software Development: Introduction, Basic Architecture, Operation, Programmer's View, ASIPs, and Development Environment: Host and Target Machines, Linker / Locators for Embedded Software, Getting Embedded Software into the target system. Debugging Techniques: Testing on your Host Machine, and Instruction Set Simulators.

UNIT 4: (10Hrs)

RTWA for Embedded Systems: Introduction, Timers, Counters and Watchdog Timers, UART, Pulse Width Modulators, LCD Controllers, Keypad Controllers, Stepper Motor Controllers, Analog – to – Digital Converters, and Real Time Clocks.

UNIT 5: (10Hrs)

Advanced Communication Principles: Parallel Communication, Serial Communication, Wireless Communication, Serial Protocols: I^2C, CAN, FireWire, and USB. Parallel Protocols: PCI BUS and ARM BUS. Wireless Protocols: IrDA, Bluetooth, and IEEE 802.11.

TEXT BOOKS:

1. Embedded System Design – A Unified Hardware / Software Introduction By Frank Vahid /Tony Givargis – WILEY EDITION.
2. Embedded Systems Architecture, Programming and Design – 2^{nd} Edition By Raj Kamal –Tata McGraw-Hill Education.

REFERENCES:

1. An Embedded Software Premier - David E- Siman, PEARSON
2. Education Embedded / real - time systems - DR. K.V.K.K. Prasad,dreamtech
3. The art of programming Embedded systems, Jack G. Ganssle, academicpress
4. Intelligent Embedded systems, Louis L. Odette, Adison Wesly, 1991

SEMESTER-V
COURSE 15 B: CONSUMER ELECTRONICS

Theory Credits: 3 3 Hrs/Week

Learning Outcomes:

- To study Microwave ovens – block diagram - working - types – wiring and safetyinstructions. – care and cleaning
- To study washing machines – block diagram - working - types – wiring and safetyinstructions. – care and cleaning
- To study Air conditioners and refrigerators – block diagram - working - types – wiringand safety instructions. – care and cleaning
- To study Home/Office digital devices – block diagram - working - types – wiring andsafety instructions. – care and cleaning
- To study Digital access devices like – block diagram - working - types – wiring andsafety instructions. – care and cleaning

Unit – I
Microwave Ovens – Microwaves (Range used in Microwave ovens) – Microwave oven block diagram – LCD timer with alarm – Single-Chip Controllers – types of Microwave oven – Wiring and Safety instructions – care and Cleaning.

Unit – II
Washing Machines – Electronic controller for washing machines – Washing machine hardware and software – Types of washing machines – Fuzzy logic washing machines Featuresof washing machines.

Unit – III
Air Conditioners And Refrigerators - Air Conditioning – Components of air conditioning systems – All water air conditioning systems – All air conditioning systems – Unitary and central air conditioning systems – Split air conditioners.

Unit – IV
Home/Office Digital Devices – Fascimile machine – Xerographic copier – calculators – Structure of a calculator – Internal organization of a calculator – Servicing electronic calculators – Digital clocks – Block diagram of a digital clock.

Unit – V
Digital Access Devices – Digital computer – Internet access – online ticket reservation –functions and networks – barcode scanner and decoder – Electronic Fund Transfer
– Automated Teller Machines(ATMs) – Set-Top boxes – Digital cable TV – Video on demand.

TEXTBOKS:

1. S.P. Bali, Consumer Electronics – Pearson Education, New Delhi,2005.
2. R.G. Gupta Audio and Video systems Tata McGraw Hill (2004)

Learning outcomes:

- The Student can gain good knowledge on microwave ovens and implement inpractical applications.
- The Student can gain good knowledge on Washing Machines and implementing practical applications.
- The Student can gain good knowledge on Air conditioners and Refrigerators and implement in practical applications.
- The Student can gain good knowledge on Digital access devices and implementing practical applications.
- Ability to measure strain, displacement, velocity, angular velocity , temperature, pressure Vacuum, and Flow.

SEMESTER V

COURSE 15 B: CONSUMER ELECTRONICS

Practical Credits: 1 2 hrs/week

(At least two Activities should be done)

1. Study of PA systems for various situations – Public gathering , closed theatre/ Auditorium, Conference room, Prepare Bill of Material(Costing)
2. Installation of Audio/Video systems – site preparation electrical requirements, cables and connectors
3. Market Survey of products (at least one from each module)
4. Identification of block and tracing the system. Assembly and Disassembly of system using Toolkit
5. Assembly and Disassembly of system and printer.

NOTE: one activity as directed in practical course is equivalent to 4 experiments

SEMESTER – VI
INTERNSHIP

Programme: B.Sc. Honours in Electronics (Minor)

w.e.f. AY 2023-24
COURSE STRUCTURE & ALLOCATION OF CREDITS

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	II	1	Fundamental of Electricity and Electronics	3	3
			Fundamental of Electricity and Electronics Practical Course	2	1
II	III	2	Semiconductor devices and Materials	3	3
			Semiconductor devices and Materials Practical Course	2	1
	IV	3	Electrical and electronics instrumentation	3	3
			Electrical and electronics instrumentation Practical Course	2	1
		4	Microprocessor system	3	3
			Microprocessor system Practical Course	2	1
III	V	5	Cellular Mobile Communication	3	3
			Cellular Mobile Communication Practical Course	2	1
		6	Computer Network	3	3
			Computer Network Practical Course	2	1

Departmental Activity Proposals
GOVERNMENT COLLEGE (A):: RAJAMAHENDRAVARAM
DEPARTMENT OF PHYSICS & ELECTRONICS
As Approved in the BOS meeting held on 30th AUGUST 2023 for 2023-2024

S.No	Name of the Activity	Tentative Dates
1	Guest Lectures	Last Week of December 2023
2	Field Trip	Third Week of January 2024
3	Guest Lectures	Last Week of January 2024
4	State level Seminar on Micro Electronics	First Week of February 2024
6	Open Day (All the labs are open for the City people to visit)	Third Week of February 2024
7	National Science Day Celebrations	28th February 2024
8	Guest Lectures	First Week of March 2024
9	Einstein's Birth Day Celebrations	14th March 2024