ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

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

w.e.f. AY 2023-24

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	Essentials and Applications of Mathematical, Physical and Chemical Sciences	3+2	4
	I	2	Advances in Mathematical, Physical and Chemical Sciences	3+2	4
	II	3	Fundamental of Electricity and Electronics	3	3
			Fundamental of Electricity and Electronics Practical Course	2	1
	II	4	Circuit theory and electronic devices	3	3
			Circuit theory and electronic devices Practical Course	2	1
II	III	5	Semiconductor devices and Materials	3	3
			Semiconductor devices and Materials Practical Course	2	1
		6	Digital Electronics	3	3
			Digital Electronics Practical Course	2	1
		7	Analog Electronics	3	3
			Analog Electronics Practical Course	2	1
		8	Electronic communication system	3	3
			Electronic communication system Practical Course	2	1
	IV	9	Electrical and electronics instrumentation	3	3
			Electrical and electronics instrumentation Practical Course	2	1
		10	Microcontrol system	3	3
			Microcontrol system Practical Course	2	1
		11	Microprocessor system	3	3
			Microprocessor system Practical Course	2	1

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
III	V	12	Cellular Mobile Communication	3	3
			Cellular Mobile Communication Practical Course	2	1
		13	Computer Network	3	3
			Computer Network Practical Course	2	1
		14 A	Industrial Electronics	3	3
			Industrial Electronics Practical Course	2	1
		OR			
		14 B	Embedded system Design	3	3
			Embedded system Design Practical Course	2	1
		15 A	Digital system Design	3	3
			Digital system Design Practical Course	2	1
		OR			
		15 B	Consumer Electronics	3	3
			Consumer Electronics Practical Course	2	1
	VI	Internship			
IV	VII	16 A	Medical Electronics	3	3
			Medical Electronics Practical Course	2	1
		OR			
		16 B	Advanced Communication Systems	3	3
			Advanced Communication Systems Practical Course	2	1
		17 A	Principles and utility of electronic domestic applications	3	3
			Principles and utility of electronic domestic applications Practical Course	2	1
		OR			
		17 B	Digital and Data Communication Systems	3	3
			Digital and Data Communication Systems Practical Course	2	1
		18 A	RF Networks	3	3
			RF Networks Practical Course	2	1
		OR			
		18 B	Wireless Sensor Network Design	3	3
			Wireless Sensor Network Design Practical Course	2	1
		SEC			
		19 A	Sensors	3	3
			Sensors Practical Course	2	1
		OR			
		19 B	Bio-medical Instrumentation	3	3
			Bio-medical Instrumentation Practical Course	2	1
		20 A	Digital Signal Processing	3	3

			Digital Signal Processing Practical Course	2	1
		OR			
		20 B	IoT Fundamentals	3	3
			IoT Fundamentals Practical Course	2	1
	VIII	21 A	Microprocessors and Microcontrollers	3	3
			Microprocessors and Microcontrollers Practical Course	2	1
		OR			
		21 B	Electromagnetics	3	3
			Electromagnetics Practical Course	2	1
		22 A	Antenna and Waves Propagation	3	3
			Antenna and Waves Propagation Practical Course	2	1
		OR			
		22 B	Power Electronics	3	3
			Power Electronics Practical Course	2	1
		23 A	Microwave and Opto Electronics	3	3
			Microwave and Opto Electronics Practical Course	2	1
		OR			
		23 B	Wireless Broadband Networks	3	3
			Wireless Broadband Networks Practical Course	2	1
		SEC			
		24 A	Consumer Electronics	3	3
			Consumer Electronics Practical Course	2	1
		OR			
		24 B	Mobile Computing	3	3
			Mobile Computing Practical Course	2	1
		25 A	Robotics	3	3
			Robotics Practical Course	2	1
		OR			
		25 B	Introduction to MEMs	3	3
			Introduction to MEMs Practical Course	2	1

SEMESTER-I

COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL ANDCHEMICAL SCIENCES

Theory Credits: 4 5 hrs/week

Course Objective:

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.

Learning outcomes:

1. Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.

2. 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

3. 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.

4. 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.

5 To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.

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

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

2. your college network) and prepare a report covering network architecture.

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

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

SEMESTER-I

COURSE 2: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Theory Credits: 4 5 hrs/week

Course Objective:

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.

Learning outcomes:

1. 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.

2. 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.

3. 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.

3. Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of nanosensors. Explore the effects of chemical pollutants on ecosystems and human health.

4. 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.

5 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)..

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.

STUDENT ACTIVITIES

UNIT I: ADVANCES IN BASIC MATHEMATICS

1: Straight Lines Exploration

Provide students with a set of equations representing straight lines in different forms, such as slope-intercept form, point-slope form, or general form.

Students will explore the properties and characteristics of straight lines, including their slopes, intercepts, and point of intersection.

2: Limits and Differentiation Problem Solving

Students will apply the concept of limits to solve various problems using standard limits.

Encourage students to interpret the results and make connections to real-world applications, such as analyzing rates of change or optimizing functions.

3: Integration Exploration

Students will explore the concept of integration as a reverse process of differentiation and apply basic methods of integration, such as the product rule, substitution method, or integration by parts.

Students can discuss the significance of integration in various fields, such as physics and chemistry

4: Matrices Manipulation

Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose.

Students can apply their knowledge of matrices to real-world applications, such as solving systems of equations or representing transformations in geometry.

UNIT II: ADVANCES IN PHYSICS:

1: Case Studies

Provide students with real-world case studies related to renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials.

Students will analyze the case studies, identify the challenges or problems presented, andpropose innovative solutions based on the recent advances in the respective field. They will consider factors such as energy generation, energy storage, efficiency, sustainability, materials design, biomedical applications, or technological advancements.

2: Experimental Design

Assign students to design and conduct experiments related to one of the topics: renewableenergy, nanotechnology, biophysics, medical physics, or shape memory materials.

They will identify a specific research question or problem to investigate and design anexperiment accordingly.

Students will collect and analyze data, interpret the results, and draw conclusions based ontheir findings.

They will discuss the implications of their experimental results in the context of recent advances in the field.

3: Group Discussion and Debate

Organize a group discussion or debate session where students will discuss the ethical, social, and environmental implications of the recent advances in renewable energy, nanotechnology,biophysics, medical physics, and shape memory materials.

Assign students specific roles, such as proponent, opponent, or moderator, and provide themwith key points and arguments to support their positions.

UNIT III: ADVANCES IN CHEMISTRY:

1. Experimental Design and Simulation

In small groups, students will design experiments or simulations related to the assigned topic.

For example, in the context of computer-aided drug design, students could design a virtual screening experiment to identify potential drug candidates for a specific disease target.

For nano sensors, students could design an experiment to demonstrate the sensitivity andselectivity of nano sensors in detecting specific analytes.
Chemical biology-related activities could involve designing experiments to study enzyme-substrate interactions or molecular interactions in biological systems.
Students will perform their experiments or simulations, collect data, analyze the results, anddraw conclusions based on their findings.

2. Case Studies and Discussion

Provide students with real-world case studies related to the impact of chemical pollutants onecosystems and human health.
Students will analyze the case studies, identify the sources and effects of chemical pollutants,and propose mitigation strategies to minimize their impact.

Encourage discussions on the ethical and environmental considerations when dealing withchemical pollutants.
For the dye removal using the catalysis method, students can explore case studies wherecatalytic processes are used to degrade or remove dyes from wastewater.

Students will discuss the principles of catalysis, the advantages and limitations of thecatalysis method, and its applications in environmental remediation.
3: Group Project

Assign students to work in groups to develop a project related to one of the topics.

The project could involve designing a computer-aided drug delivery system, developing a nano sensor for a specific application, or proposing strategies to mitigate the impact of

chemical pollutants on ecosystems.
Students will develop a detailed project plan, conduct experiments or simulations, analyzedata, and present their findings and recommendations.
Encourage creativity, critical thinking, and collaboration throughout the project.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

1: Mathematical Modelling Experiment

Provide students with a mathematical modelling experiment related to one of the topics. For example, in the context of renewable energy, students can develop a mathematical model tooptimize the placement and configuration of solar panels in a solar farm.
Students will work in teams to design and conduct the experiment, collect data, and analyzethe results using mathematical models and statistical techniques.
They will discuss the accuracy and limitations of their model, propose improvements, and interpret the implications of their findings in the context of renewable energy or the specificapplication area.

2: Case Studies and Group Discussions

Assign students to analyze case studies related to the applications of mathematical modellingin nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.
Students will discuss the mathematical models and computational methods used in the case studies, analyze the outcomes, and evaluate the effectiveness of the modelling approach.
Encourage group discussions on the challenges, ethical considerations, and potentialadvancements in the field.

Students will present their findings and engage in critical discussions on the advantages andlimitations of mathematical modelling in solving complex problems in these areas.

3. Group Project

Assign students to work in groups to develop a group project that integrates mathematical modelling with one of the application areas: renewable energy, nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.

The project could involve developing a mathematical model to optimize the delivery of radiation therapy in medical physics or designing a mathematical model to optimize wastemanagement practices.
Students will plan and execute their project, apply mathematical modelling techniques,analyze the results, and present their findings and recommendations.
Encourage creativity, critical thinking, and collaboration throughout the project.

UNIT V: Advanced Applications of computer Science

Students must be able to convert numbers from other number system to binary number systems

1. Identify the networking media used for your college network
2. Identify all the networking devices used in your college premises.

SEMESTER-II

COURSE 3: FUNDAMENTALS OF ELECTRICITY AND ELECTRONICS

Theory Credits: 4 5 hrs/week

Objectives

The students will learn:

1) basics of electrostatics, Gauss theorem and its applications,
concept of a capacitor, various types of capacitors and dielectric constant,
magnetic effects of current, cells and the measuring instruments like ammeter andvoltmeter,
2) basics of p-n junction, rectifying action of a diode, regulated power supplies andwave shaping circuits, and
3) transistor and its three modes of operation, h-parameter model of a transistor andthe frequency response of an amplifier.

UNIT-I

Electrostatics: Electric charges - Coulomb's law - Electric field - Electric intensity and electric potential - Relation between electric potential and intensity - Electric intensity and potential due to a uniform charged conducting sphere at a point outside, on, andinside the conductor.

Electric dipole - Dipole moment - Intensity and potential due to a dipole - Statementand proof of Gauss law - Application of Gauss law to uniformly charged solid sphere.

UNIT-II

Capacitors: Definition and unit of capacity - Capacitance of a parallel plate capacitor - Effect of dielectric on capacity - Capacitors in series and parallel - Energy stored in acharged capacitors - Loss of energy on sharing of charges between two capacitors - Force of attraction between plates of charged parallel plate capacitor - Kelvin's attracted disc electrometer - Measurement of potential and dielectric constant.

Type of capacitors - Mica capacitor, Electrolytic capacitors, Variable air capacitor - Uses of capacitors.

UNIT-III

Electrical Measurements: Carey-Foster bridge - Determination of specific resistance - Potentiometer - Calibration of low and high range voltmeters - Calibration of Low range ammeter.

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Magnetic Effect of Current: Biot-Savart's law [Force on a conductor carrying currentplaced in a magnetic field - Principle, construction and theory of a moving coil ballistic galvanometer - Measurement of figure of merit of B.G. - Comparison of capacitors using B.G.

UNIT-IV

Diode circuits and power Supplies: Junction diode characteristics - Half and full wave rectifiers - Expression for efficiency and ripple factor - Construction of low range power peak using diodes - Bridge rectifier - Filter circuits - Zener Diode - Characteristics - Regulated power supply using Zener diode - Clipper and Clamper using diodes.
Differentiator and integrator using resistor and capacitor.

UNIT-V

Transistor circuits: Characteristics of a transistor in CB, CE modes - Relatively merits Graphical analysis in CE configuration - Transistor as a amplifier - RC coupled

Single stage amplifier - Frequency response - Thevenin's and Norton's theorems - h parameters.

Basis logic gates AND, OR, and NOT - Construction of basic logic gates using diodesand transistors.

Text Books

Electricity and Magnetism - *M. Narayanamoorthi and Others*, National PublishingCo., Chennai.
Electricity and Magnetism - *R. Murugeshan*, S. Chand & Co. Ltd., New Delhi,Revised Edition, 2006.
Principles of Electronics - *V.K. Mehta*, S. Chand & Co., 4/e, 2001.
Basic Electronics - *B.L. Theraja*, S. Chand & Co., 4/e, 2001.

Reference Books

Electricity and Magnetism - *Brijlal & Subrahmanyam*, Ratan Prakashan Mandir,Agra.
Fundamentals of Electricity and Magnetism - *B.D. Duggal & C.L. Chhabra*, ShobanLal Nagin Chand & Co., Jallundur.
Physics, Vol. II - *Resnick, Halliday & Krane*, 5/e, John Wiley & Sons, Inc.,.
Basic Electronics - *B. Grob*, McGraw - hill, 6/e, NY, 1989.
Elements of Electronics - *Bagde & Singh*, S. Chand

SEMESTER-II

COURSE 4: CIRCUIT THEORY AND ELECTRONIC DEVICES

Theory Credits: 3 3 hrs/week

Objectives:

- To explain the basic concepts and laws of DC and AC electricalnetworks 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 ofelectronic devices.
- To understand the concept of power supply.

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

Outcomes:-

- ✓ Apply concepts of electric network topology, nodes, branches, loops to solvecircuit problems including the use of computer simulation.
- ✓ Apply time and frequency concepts of analysis.
- ✓ Synthesize the network using passive elements.
- ✓ Know about amplifier circuits, switching circuits and oscillator circuits theirdesign and use in electronics.
- ✓ Design and construction of a power supply.

SEMESTER-II

COURSE 4: CIRCUIT THEORY AND ELECTRONIC DEVICES

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. UJT VI characteristics
8. LDR characteristics
9. IC regulated power supply(IC-7805)

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

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, 3rd edn.McGraw-Hil (2003)
2. B.G. Streetman and Sanjay Banerjee, Solid State Electronic Devices, 6th Edn., 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)
5. M.S.Tyagi, Introduction to Semiconductor Materials and Devices, Willey, StudentEdition

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.

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 (SOP and 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-

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 university press
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

a. the design and working of RC coupled amplifiers, transformer coupled amplifiersand power amplifiers,

b. the concept of negative and positive feedback,

c. pulse shaping and Schmitt trigger, and

d. 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

1. 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 :

a. basic concepts of indicating instruments.

b. various electronic instruments such as CRO, storage oscilloscopes, functiongenerators, spectrum analyzer etc.,

c. 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 10: MICRO CONTROLLER SYSTEM

Theory Credits: 3 3 hrs/week

OBJECTIVES:

- To understand the concepts of microcontroller based system.
- To enable design and programming of microcontroller based system.
- To know about the interfacing Circuits.

UNIT-I: (10Hrs) Introduction, comparison of Microprocessor and micro controller, Evolution of microcontrollers from 4-bit to 32 bit , Development tools for micro controllers, Assembler-Compiler-Simulator/Debugger.

UNIT -II: (10Hrs)

Microcontroller Architecture: Overview and block diagram of 8051, Architecture of 8051, program counter and memory organization, Data types and directives, PSW register, Registerbanks and stack, pin diagram of 8051, Port organization, Interrupts and timers.

UNIT-III:(10Hrs)

Addressing modes, instruction set of 8051: Addressing modes and accessing memory usingvarious addressing modes, instruction set: Arithmetic, Logical, Simple bit, jump, loop and call instructions and their usage. Time delay generation and calculation, Timer/Counter Programming,

Unit -IV: (15Hrs)

Assemble language programming Examples: Addition, Multiplication, Subtraction, division, arranging a given set of numbers in largest/smallest order.

UNIT-V : (15Hrs)

Interfacing and Application of Microcontroller: Interfacing of – PPI 8255, DAC (0804), Temperature measurement (LM35), interfacing seven segment displays, displaying information on a LCD, control of a stepper Motor (Uni-Polar),

TEXT BOOKS:

1. The 8051 microcontroller and embedded systems using assembly and c- kennet j. Ayalam,Dhananjay V. gadre, cengage publishers

2. The 8051 microcontrollers and Embedded systems - By Muhammad Ali

Mazidi and JaniceGillispie Mazidi – Pearson Education Asia, 4th Reprint, 2002.

REFERENCE BOOKS:

1. Microcontrollers Architecture Programming, Interfacing and System Design – Rajkamal.

2. The 8051 Microcontroller Architecture, Programming and Application - Kenneth J.Ajala , west publishing company (ST PAUL, NEW YORK, LOS ANGELES, SAN FRANCISCO).

3. Microcontroller theory and application-Ajay V. Deshmukh

OUTCOMES:

- The student can gain good knowledge on microcontrollers and implement in practicalapplications
- learn Interfacing of Microcontroller
- get familiar with real time operating system

SEMESTER-IV

COURSE 10: MICRO CONTROLLER SYSTEM

Practical Credits: 1 2 hrs/week

LAB LIST:

1. Addition And Subtraction Of Two 8-Bit Numbers.
2. Multiplication And Division Of Two 8-Bit Numbers.
3. Largest number /smallest in an array.
4. Exchange Of Higher And Lower Nibbles In Accumulator.
5. Addition Of Two 8-Bit Numbers (Keil Software).
6. Addition Of Two 16-Bt Numbers (Keil Software)
7. Subtraction Of Two 8-Bit Numbers (Keil Software).
8. Subtraction Of Two 16-Bit Numbers (Keil Software).
9. Multiplication Of Two 8-Bit Numbers (Keil Software).
11. Program For Swapping And Compliment Of 8-Bit Numbers (Keil Software).
12. Program To Find The Largest Number In Given Array (Keil Software).
13. Program To Find The Smallest Number In Given Array (Keil Software).
14. Interfacing Led To 8051 Microcontroller (Keil Software).
15. Interfacing Buzzer To 8051 Microcontroller (Keil Software).
16. Interfacing Relay To 8051 Microcontroller (Keil Software).
17. Interfacing Seven Segments To 8051 Microcontroller (Keil Software).

SEMESTER-IV

COURSE 11: MICROPROCESSOR SYSTEMS

Theory Credits: 3 3 hrs/week

OBJECTIVES:

- To understand basic architecture of 16 bit and 32 bit microprocessors.
- To understand interfacing of 16 bit microprocessor with memory and peripheralchipsinvolving system design.
- To understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors
- To understand RISC based microprocessors.
- To understand concept of multi core processors.

UNIT -I:

CPU ARCHITECTURE *Introduction to Microprocessor, INTEL -8085(P) Architecture, CPU, ALU unit, Register organization, Address, data and control Buses. Pin configuration of 8085. Addressing modes* 8086 Microprocessor: Architecture, Pin description. Instruction format, Instruction Executiontiming, Addressing modes

UNIT -II:

8085 Instruction Set:

Data transfer Instruction, Logical Instructions, Arithmetic Instructions, Branch Instructions,Machine Control instructions.

UNIT -III:

Assembly Language Programming using 8085, Programmes for Addition, Subtraction, Multiplication,Division, largest and smallest number in an array. BCD to ASCII and ASCIIto BCD.

UNIT -IV:

Basic 8086 Configurations – Minimum mode and Maximum Mode, Interrupt Priority Management I/O Interfaces: Serial Communication interfaces, Parallel Communication, Programmable Timers, Keyboard and display, DMA controller

UNIT -V: ARM PROCESSOR: Introduction to 16/32 bit processors, Arm architecture & organization, Arm based MCUs, Programming model, Instruction set.

TEXTBOOKS:

1. Microprocessor Architecture, Programming and Applications

2. with the 8085 – PenramInternational Publishing, Mumbai.- Ramesh S. Gaonakar
3. Microcomputer Systems the 8086/8088 family – YU-Cheng Liu and Glenn SA Gibson

4. Microcontrollers Architecture Programming, Interfacing and System Design

– Raj Kamal Chapter: 15.1, 15.2, 15.3, 15.4.1

5. 8086 and 8088 Microprocessor by Tribel and avatar singh

REFERENCES:

1. Microprocessors and Interfacing – Douglas V.Hall

2. Microprocessor and Digital Systems – Douglas V. Hall

3. Advanced Microprocessors & Microcontrollers - B.P.Singh & Renu Singh – New Age

4. The Intel Microprocessors – Architecture, Programming and Interfacing – Bary B.Brey.

5. Arm Architecture reference manual –Arm ltd.

OUTCOMES:

- The student can gain good knowledge on microprocessor and implement in practicalapplications
- Design system using memory chips and peripheral chips for 16 bit 8086microprocessor.
- Understand and devise techniques for faster execution of instructions, improve speedof operations and enhance performance of microprocessors.
- Understand multi core processor and its advantages
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SEMESTER-IV

COURSE 11: MICROPROCESSOR SYSTEMS

Practical Credits: 1 2 hrs/week

List of Experiment

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,

b. encompassing both technical and managerial aspects.

c. to help students better understand the challenges and opportunities faced bymodern business,

d. topics include LAN and WAN implementations, the Internet and internetapplications.

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, Multimeters, 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:

5. Unified Electronics Volume II by J.P Agarwal and Amit Agarwal.
6. Industrial Electronics, S.B. Biswas, Dhanapur Rai & Sons.
7. Industrial Electronics, G.K. Mithal, Khanna Publishers.
8. Electronic Devices and Circuits – G.K. Mithal.
9. Electronic Devices and Circuits-Millman and Halkias- Tata Mc Graw Hill (TMH)
10. 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 shall visit 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 likeCement, 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

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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, andDesign 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 BUSand 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 – 2nd 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 implementin practical applications.
- The Student can gain good knowledge on Air conditioners and Refrigeratorsand implement in practical applications.
- The Student can gain good knowledge on Digital access devices and implementin 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. Assemblyand 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-VII
COURSE 16 A: MEDICAL ELECTRONICS

Theory Credits: 4 5 hrs/week

After studying this paper, the students will be able to handle most of the electronic instrumentation in the medical field.

UNIT-I

Bio-Amplifiers: Bio potentials - Bio-electricity - Necessity for special types of amplifiers for biological signal amplifications - Different types of Bio-OP - Amps.

UNIT-II

Bio-Potential Recording: ECG - EEG - EMG - ERG - Specific types of electrodes used - Different lead systems - their waveforms.

UNIT-III

Measurement of Biological Parameters: Measurement of respiration rate - Measurement of heart beat rate - Measurement of temperature - Measurement of blood pressure - Patient monitoring set up - Blood flow meters EM and plesthsmographic technique.

UNIT-IV

High Energy Radiation Applications: Applications of X-ray and isotopes for diagnostics and therapeutic applications - Application of Lasers in biological medium.

UNIT-V

High Frequency Applications: Diathermy effect - Short, wave diathermy - Ultrasonic diathermy - Microwave diathermy.

Text Book

1. Biomedical Instrumentation - *M. Arumugham*, 2/e, Anuradha Agencies Publishers

Reference Books

1. Clinical Engineering - *Jacobster & Webster*, PHI.
2. Applied Biomedical Instrumentation - *Geddes & Baker*, John Wiley & Sons.

SEMESTER-VII

COURSE 16 B: ADVANCED COMMUNICATION SYSTEMS

Theory Credits: 3 3 hrs/week

OBJECTIVES:

- To impart basic concepts of various communication systems.

OUTCOMES:

- The students will be able to understand the basics andtechnology of Advanced Communication Systems.

Unit – I (10 Hrs)

Introduction: Elements of a communication system, classification of signals, information and channel capacity. Review of analog modulation and pulse modulation techniques.

Unit – II

Digital modulation techniques: Fundamentals of binary ASK, PSK, DPSK and FSK modulation schemes, comparison of digital modulation schemes, M – ary signaling schemes, synchronization methods.

Digital transmission of analog signals: Sampling, sampling theorem, signal distortion in sampling, Nyquist rate, aliasing, quantization of analog signals, the PCM system, delta modulation schemes.

Unit –III

Multiplexing and multiple access: FDM/FDMA/ multiple access, TDM/ multiple access, comparison of FDMA and TDMA, code division multiple access, space division and polarization multiple access, access algorithms ALOHA. Multiple access techniques for local area networks.

Unit – IV

Source coding for digital data: Source coding theorem, Huffman coding, channel coding theorem,matched filter, matched filter receiver.

Error control codes: Linear block codes, binary cyclic codes, convolution codes.

Unit – V (14 Hrs)

Wireless communication: Introduction, 1^{st} and 2^{nd} generation cellular systems. Cellular communication from 1G to 3G and 4G systems, future wireless networks.

Signal fading: Introduction, principals of signal fading, propagation and path loss models.

Introduction to multiple antenna techniques: Concepts in multi-antenna configurations – SISO,SIMO, MISO, MIMO, advantages, multiple transmit and receive antennas, spatial multiplexing,multi user MIMO.

References Books:

1. Digital communication fundamentals and applications- B Sklar, 2nd edition, Prentice Hall,2001.
2. Electronic communication systems – fundamentals to advanced: Wayne Tomasi, PearsonEducation, 5th
3. edition, 2009
4. Wireless communications and networking- Vijay K Garg, Elseiver, 2007.
5. MIMO – OFDM wireless communication with MATLAB, Yong Soo Cho, John Wiley andSons, IEEE press, 2010.
6. Digital and Analog communication systems- Sam Shanmugam, Wiley Student Edition, 2008reprint.
7. Data communication- William Schweber, McGraw-Hill, 1988
8. Digital communications- Simon Haykin, Wiley, 1988.

SEMESTER-VII

COURSE 16 B: ADVANCED COMMUNICATION SYSTEMS

Practical Credits: 1 2 hrs/week

List of Experiments

1. Amplitude Modulation(AM) and Demodulation
2. Amplitude Shift Keying (ASK) modulation and Demodulation
3. Frequency Modulation (FM) and Frequency Shift Keying (FSK)
4. Phase Locked Loop (PLL) and Frequency Multiplier
5. Voltage Controlled Oscillator (VCO)
6. Time Division Multiplexing using (TDM)
7. Binary Phase Shift Keying (BPSK)
8. Pulse Width Modulation (PWM)

SEMESTER-VII

COURSE 17 A: PRINCIPLES AND UTILISATION OF ELECTRONICDOMESTIC APPLIANCES

Theory Credits: 4 5 hrs/week

UNIT-I: MICROWAVE OVENS

Microwaves - Properties and generation - Microwave oven block diagram - LCD timerwith alarm - Controllers - 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 - Features of 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

Facsimile machine - Xerographic copier - Calculators - Structure of a calculator - Internal Organization of a calculators - Servicing electronic calculators - Digital clocks
- Block diagram of a digital clock.

UNIT-V: DIGITAL ACCESS DEVICES

Digital computer - Internet access - Online ticket reservation - Functions andnetworks - Barcode Scanner and decoder - Electronic Fund Transfer - Automated Teller Machines (ATMs) - Set-Top boxes - Digital cable TV - Video on demand.

BOOKS FOR STUDY

1. Consumer Electronic - S.P. Bali, Pearson Education, New Delhi, 2005.

SEMESTER-VII

COURSE 17 B: DIGITAL AND DATA COMMUNICATION SYSTEMS

Theory Credits: 3 3 hrs/week

Objectives:

At the end of this course students will be able to visualize how analog signals are converted to digital signals for voice and data transmission; the concept of multiplexing to fulfill the demand of high speed digital transmission across the globe; the various methods of generation of digital signals (ASK,FSK,PSK,QAM) according to the application requirements; implement optimization techniques, data coding, channel requirements, signal to noise ratio, bandwidth, error finding within the received information and information theory.

Outcomes:

- With advent of areas such as GSM, GPS, Bluetooth, RFID, DTMF, Mobile, Ethernet, RF,XBEE, Networking, Data Acquisition, Smart city and Smart Card, Internet of things the knowledge of the subject is an essential need.
- Today multiplexing have become an extremely important asset to telecommunication processes and has greatly improved the way that we transmit and receive independent signals over AM and FM radio, telephone lines, and optical fibers.
- Digital communication has become ubiquitous for success in the workplace. It helps in networking, demonstrates efficiency, stable foundation for documentation etc.
- The most important part in transmission is noise immunity. So after understanding the above topics the students will be able to implement optimization techniques and will have a better understanding of data coding, channel requirements, signal to noise ratio, bandwidth, error finding within the received information

Unit I:

Digital Transmission: Sampling and quantization, Low pass sampling – Aliasing, Signal Reconstruction, Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding of speech signal. PCM, DPCM, DM, ADM Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ – Manchester, ISI – Nyquist criterion for distortionless transmission Multiplexing: Many to one/one to Many, Frequency division Multiplexing, Time division Multiplexing, Multiplexing applications, introduction to multiple access techniques

Unit II:

Digital Modulation Scheme: Random Processes and Spectral Analysis: Concept of Probability, Random variable, Random Process, Classification of Random Processes, Power spectral density , Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, DPSK quadrature modulation/demodulation techniques.(QPSK and MSK),M-ary Digital carrier Modulation/demodulation, QAM

Unit III:

Performance Analysis Of Digital Communication System: General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, General Expression for Error Probability of optimum receivers.

Information Theory: Measure of Information, Source Encoding, Entropy, Channel capacity, Error Correcting codes: Hamming code, linear block codes, cyclic codes, Huffman coding, Shannon-Fano coding, code tree & Trellis diagram.

Unit IV:

Introduction To Data Communication and Networking: Data Communication, network architecture, Networks, Protocols and Standards, data link layer Standards Organizations. Line Configuration, Topology, Transmission Modes

Types of transmission media: Guided Media, Unguided Media, Transmission Impairments, Circuit switching

Unit V:

Introduction to Wireless Networks: Evolution of Wireless Networks, Applications, Challenges,

Overview of various Wireless Networks.

Wireless transmission: Frequencies for radio transmission, signals, antennas, Signal propagation.Multiplexing (Space Division Multiplexing, Frequency Division Multiplexing, TimeDivision Multiplexing, Code Division Multiplexing, Orthogonal Frequency Division Multiplexing),

Reference Books:

1. B.P.Lathi,"Modern Digital and Analog Communication Systems", Oxford University PressPublication
2. H. Taub, D.L. Schilling, G. Saha,"Principles of Communications", McGraw-Hill InternationalPublication
3. SimonHaykin,"Communication Systems", Wiley India Publication.
4. H.P.HSU and D.Mitra,"Analog and Digital Communications", Tata McGraw-Hill publication.

SEMESTER-VII

COURSE 17 B: DIGITAL AND DATA COMMUNICATION SYSTEMS

Practical Credits: 1 2 hrs/week

List Of Experiments

1. To analyze a PCM system and interpret the modulated and demodulated waveforms for asampling frequency
2. To analyze a Delta modulation-demodulation and observe effect of slope overload
3. To analyze a FSK modulation system and interpret the modulated and demodulatedwaveforms
4. To analyze a PSK modulation system and interpret the modulated and demodulatedwaveforms
5. To demonstrate Time Division Multiplexing and De-multiplexing process using Pulseamplitude modulation signals
6. To simulate Binary Amplitude shift keying technique using MATLAB software
7. To simulate Binary Frequency shift keying technique using MATLAB software
8. To simulate Binary Phase shift keying technique using MATLAB software
9. To simulate Quadrature Phase shift keying technique using MATLAB software
10. To simulate Differential Phase shift keying technique using MATLAB software

SEMESTER-VII
COURSE 18 A: RF Networks

Theory Credits: 3 3 hrs/week

OBJECTIVES:

- To model high frequency circuit using scattering matrixes
- To acquire knowledge on the RF filter design
- To design microwave amplifier
- To get familiar with design of RF oscillator
- To learn about the high frequency antennas

OUTCOMES:

On completion of the course the student should be able to

- Apply scattering parameters in RF circuit and systems
- Develop filters for high frequency applications
- Design amplifiers for RF transceivers
- Understand the RF oscillator design techniques
- Develop antennas for high frequency applications.

UNIT I NETWORKS AND MATRICES

Scattering and chain scattering matrices, Generalized scattering matrix, Analysis of two portnetworks, Interconnection of networks. Positive real concepts, scattering matrix, representation of microwave components (directional coupler, circulators, hybrids and isolators).

UNIT II HIGH FREQUENCY CIRCUIT DESIGN

Tuned Circuits, Filter design- Butterworth filter, Chebyshev filter, impedance matching. High frequency amplifier, BJT and FET amplifier, Broadband Amplifiers RF Oscillators, Colpitts, Hartley Oscillators, PLL. High Frequency Integrated Circuits.

UNIT III MICROWAVE AMPLIFIER DESIGN

Types of amplifiers, Power gain equations. Introduction to narrow band amplifiers basic concepts, Maximum gain design, Low noise design. High power design, Negative resistance, reflection amplifiers – various kinds – stability considerations, Microwave transistor amplifier design – inputand output matching networks – constant noise figure circuits.

UNIT IV MICROWAVE TRANSISTOR OSCILLATOR DESIGN

One port and two port negative resistance oscillators. Oscillator configurations, Oscillator design using large signal measurements, Introduction to Microwave CAD packages, Microwave integratedcircuits, MIC design for lumped elements

UNIT V RF AND MICROWAVE ANTENNAS

Radiation from surface current and line current distribution, Basic Antenna parameters, Feeding structure-Patch Antenna, Ring Antenna, Micro strip dipole, Micro strip arrays, Traveling wave Antenna, Antenna System for Mobile Radio-Antenna Measurements and Instrumentation. Propagation characteristics of RF and Microwave signals, Introduction to EBG structures.

REFERENCES:

1. Matthew M.Radmanesh, "RF and Microwave Design Essentials", Author House,Bloomington, 2007.
2. Reinhold Ludwig and Gene Bogdanov, "RF Circuit Design — Theory and Applications",Pearson, 2nd Edition, 2012.
3. E.da Silva, "High Frequency and Microwave Engineering", Butterworth HeinmannPublications, Oxford, 2001.
4. David.M.Pozar, "Microwave Engineering", John Wiley and Sons, 4th Edition, 2012.
5. Kraus.J.D, Marhefka.R.J. Khan.A.S. "Antennas and Wave Propagation", Tata Mc Graw Hill,New Delhi, 5th Edition, 2017

SEMESTER-VII
COURSE 18 A: RF Networks

Practical Credits: 1 2 hrs/week

LIST OF EXPERIMENTS

1. Measurement of transmission line parameters using network analyzer
(a) Inductor (b) Capacitor
2. Measurement of transmission line parameters using network analyzer
(a) Reflection coefficient (b) VSWR
3. Design of Microstrip transmission line
(a) $\lambda/2$ line (b) $\lambda/4$ line (c) $\lambda/8$ line
4. Design and characterization of RF filters
5. Design of impedance matching network
6. Measurement of RF signals and their spectrum
7. Design and characterization of antennas
8. Design and characterization of LNA
9. Design and characterization of Mixer
10. Design and characterization of VCO

SEMESTER-VII

COURSE 18 B: WIRELESS SENSOR NETWORK DESIGN

Theory Credits: 3 3 hrs/week

OBJECTIVES :

- To understand the fundamentals of wireless sensor network
- To gain knowledge on the MAC and Routing Protocols of WSN
- To get exposed to 6LOWPAN technology
- To acquire knowledge on the protocols required for developing real time applications using WSN and 6LOWPAN.
- To gain knowledge about operating system related to WSN and 6LOWPAN

OUTCOMES:

- To be able to design solutions for WSNs applications
- To be able to develop efficient MAC and Routing Protocols:
- To be able to design solutions for 6LOWPAN applications
- To be able to develop efficient layered Protocols in 6LOWPAN
- To be able to use Tiny OS and Contiki OS in WSNs and 6LOWPAN applications

UNIT I INTRODUCTION

Principle of Wireless Sensor Network -Introduction to wireless sensor networks- Challenges, Comparison with ad hoc network, Node architecture and Network architecture, design principles, Service interfaces, Gateway, Short range radio communication standards-IEEE 802.15.4, Zigbee and Bluetooth. Physical layer and transceiver design considerations.

UNIT II MAC AND ROUTING PROTOCOLS

MAC protocols – fundamentals, low duty cycle protocols and wakeup concepts, contention and Schedule-based protocols - SMAC, BMAC,TRAMA, Routing protocols ― Requirements, Classification -SPIN, Directed Diffusion, COUGAR, ACQUIRE, LEACH, PEGASIS.

UNIT III 6LOWPAN

6LoWPAN Architecture - protocol stack, Adaptation Layer, Link layers – Addressing, Routing - Mesh-Under - Route-Over, Header Compression - Stateless header compression - Context-based header compression, Fragmentation and Reassembly , Mobility ― types, Mobile IPv6, Proxy Home Agent, Proxy MIPv6, NEMO –Routing – MANET, ROLL, Border routing.

UNIT IV APPLICATION

Design Issues, Protocol Paradigms -End-to-end, Real-time streaming and sessions, Publish/subscribe, Web service paradigms, Common Protocols -Web service protocols, MQ telemetry transport for sensor networks (MQTT-S), ZigBee compact application protocol (CAP),Service discovery, Simple network management protocol (SNMP), Real-time transport and sessions, Industry- Specific protocols.

UNIT V TOOLS

TinyOS – Introduction, NesC, Interfaces, modules, configuration, Programming in TinyOS using NesC, TOSSIM, Contiki – Structure, Communication Stack, Simulation environment – Cooja simulator, Programming

Reference Books:

1. Holger Karl , Andreas willig, “Protocol and Architecture for Wireless Sensor Networks”, JohnWiley Publication, 2006.
2. Anna Forster, “Introduction to Wireless Sensor Networks”, Wiley, 2017.
3. Zach Shelby Sensinode and Carsten Bormann, “ 6LoWPAN: The Wireless Embedded Internet” John Wiley and Sons, Ltd, Publication, 2009.
4. Philip Levis, “TinyOS Programming”, 2006 – www.tinyos.net.
5. The Contiki Operating System. http://www.sics.se/contiki.

SEMESTER-VII

COURSE 18 B: WIRELESS SENSOR NETWORK DESIGN

Practical Credits: 1 2 hrs/week

LIST OF EXPERIMENTS

1. Routing protocol of WSN
2. Characteristics Analysis of ZIGBEE
3. Characteristics Analysis of Bluetooth
4. MAC protocol of WSN
5. Study of 6LOWPAN OS and Simulator
6. RPL analysis
7. Topology Analysis of 6LOWPAN
8. RFID based application using zigbee/Bluetooth/6lowpan
9. Proximity based application using zigbee/Bluetooth/6lowpan
10. MINI PROJECT

SEMESTER-VII
COURSE 18 B: SENSORS

Theory Credits: 3 3 hrs/week

UNIT-I Chemical Sensors
Physical Sensors, Surface Micro Machined Capacitive Pressure sensor, integrated flow sensor, Chemical and Biochemical Sensors, Conductivity sensor, Hydrogen Sensitive MOSFET,
Tri-Oxide Sensors, Schottky diode type sensor, Solid Electrolyte, Electrochemical Sensors. Sensor Matrix for Two-Dimensional measurement of concentrations.
UNIT-II Optical Sensors
Holography, Echolocation and bio-holography, Sensors used in space and environmental applications. Application in meteorology, Natural resources application sensor used in Instrumentation methods.
UNIT-III Biomedical Sensors
Biological Sensors in Human Body, Different types of Transducer system, Physiological Monitoring, chemo receptors, Hot and Cold receptors, Sensors for smell, sound, vision, taste.
UNIT-IV Aerospace Sensor
Gyroscope laser and fibre optic gyroscopes, Accelerometers. Laser, Aerospace application of laser, Resolvers, Altimeters, Angle of attack sensors, servos.
UNIT-V Advanced Sensor Design
Sensor design, sensor characteristics, Design of signal conditioning devices for sensors. Design of 2 and 4 wire transmitters with 4, 20 Ma output. Pressure Sensor using Si-Si bonding,
Catheter pressure sensors, TIP pressure sensors, High pressure sensors, Silicon accelerometers

References
1. Sensors Hand Book - Sabaree Soloman, McGraw Hill ,1998
2. Medical Instrumentation Application and Design - J.G. Webster Houghton Mifilin Co.
3. Introduction to Medical Equipment Technology - Carr and Brown, Addison Wesley, 1999
4. Optical Fibre Sensors, Volume 1 & 2 - Culshaw B and Dakin J (Eds), Artech House, Norwood, 1989
5. Guided Weapon Control Systems - P. Garnell, Pergamon Press, 1980

SEMESTER-VII
COURSE 19 A: SENSORS

Practical Credits: 1 2 hrs/week

List of Experiments:

1) Voltage and Current Detection Circuitry
2) Temperature and Pressure Detection Circuitry
3) Water flow and Level detection Circuitry
4) Light sensor
5) Humidity sensor
6) Measurement of Power and Energy
7) Measurement of Resistance by bridge
8) Analog temperature
9) Digital temperature and humadity sensor
10) Ultrasonic sensor

SEMESTER-VII
COURSE 19 B: BIOMEDICAL INSTRUMENTATION

Theory Credits: 3 3 hrs/week

Objectives:

- Biomedical Instrumentation and Signal Processing
- It applies quantitative, analytical, software and hardware methods which help in better understanding of basic biological processes and to develop innovative techniques for the diagnosis, treatment and prevention of diseases.

Outcomes:

The students, after the completion of the course, are expected to ….

- Explain the different physiological systems of human
- Summarize various electrical and non electrical parameters measuring devices.
- Illustrate non electrical parameters measurement methods
- Classify the various recording methods used in medical field
- Infer the graphical and imaging applications in biomedical system.
- Summarize the life assisting and therapeutic devices

Unit I: Basic Principles of Biomedical Electronics

Bioelectrical signals, distribution of electrical potentials in different parts of the body, their magnitude and relationship to the physical status, processing of bio-electronic signals, different transducers for data acquisition; man-instrument system, biometrics

Unit II: Recording Systems

General consideration of electronic recording: preamplifier, main amplifier and driver amplifier; considerations of noise; display systems: Oscilloscopes- long persistence, memory facility, multi-channel displays, flat panel displays, touch screens

Unit III: Patient Safety and imaging techniques

Electronic shock hazards in biomedical instrumentation, Leakage current; grounding techniques; patient monitoring systems: foetus monitoring system and ICU; Need for imaging human body, imaging techniques: NMR, MRI, ultrasonic, X-ray tomography, endoscope, flexible bronchoscope and gastro scope

Unit IV: Biomedical Instruments

Electro-encephalography (EEG), Electrocardiography (ECG), Electromyography (EMG), hemo- dialysis machine, traction, cardiac pacemakers, cardiac defibrillators; use of telemetry in diagnosis, Lasersin biomedical field

Unit V:

EMC Applications: Digital circuit power distribution, Digital circuit radiations, Conducted emissions, RF and transient immunity, electrostatic discharge, PCB layout and design, EMC measurements. Standards, reliability, automated test equipment.

Reference Books:

1. Handbook of Biomedical Instrumentation –R. S. Khandpur, TMH, New Delhi
2. Biomedical Instrumentation – Leslie Cromwell, PHI Publication, New Delhi
3. Biomedical Engineering System – Leslie Cromwell, PHI Publication, New Delhi
4. Biomedical Phenomenon – Robert Plonsay, John Wiley & Sons
5. Computers in medicine – R. D. Lele, TMH, New Delhi
6. Introduction to Biomedical Equipment Technology: J. J. Carr and J. M. Brown, PearsonEducation Asia Publication, Singapore
7. W. C. Bossshart , ―PCB Design and Technology‖ Tata McGraw Hill, 1987.
8. Clyde F. Coombs, ―Electronic Instrument Handbook‖, McGraw Hill, Third Edition, 2005.

SEMESTER-VII

COURSE 19 B: BIOMEDICAL INSTRUMENTATION

Practical Credits: 1 2 hrs/week

1. Design and study of op-amp based EEG signal amplifier.(input through simulation)
2. Design and study of electronic stethoscope
3. Design and study of body temperature measuring system
4. Design and study of respiratory rate measuring system
5. Design and study of arm pressure measuring system
6. Design of digital heart rate measuring system

SEMESTER-VII
COURSE 20 A: DIGITAL SIGNAL PROCESSING

Theory Credits: 3 3 hrs/week

UNIT – I I
Discrete Time Signals and System: Discrete Time Signals (Elementary examples, classification: periodic and a periodic Signals energy and Power signals, Even and Odd Signals) .Discrete Time System : Block diagram representation of discrete time systems, classification of discrete time systems time variant and time – invariant, linear and non-linear, casual and anti- casual, stable and unstable.

UNIT-II
Analysis and response (convolution sum) of discrete - time linear LTI system, Recursive andNonrecursive discrete time system. Constant coefficient differences equations and their solutions, impulse response of LTI system, structures of LTI systems Recursive and Non- recursive realization of FIR system.
The Z transform: The Z-transform and one-sided Z-transform, properties of Z-transform,inverse of the Z-transform, Solution of difference equations.

UNIT-III
The Discrete Fourier Transform: The DFT and IDFT, relationship, DFT with Z-transform,the DFT as a linear transformation Relationship of DFT with Z-transform, properties of DFT:periodicity, linearity, summery and time reversal of a sequence. Circular convolution, and correlation by DFT method, Overlap add and save filtering by DFTmethod.

UNIT-IV
Fast Fourier Transform : Operation counts by direct copulation of DFT, Radix – 2 FFT algorithm- Decimation –in-time (DIT) and Decimation – in frequency (DIF) algorithm, Efficientcomputation DFT of Two real sequences , Efficient Computation of DFT of a 2 N-pt real sequences.
UNIT – V
Design and Digital Filters:
Casually and its implication, Design of linear phase FIR filters using different windows. Designof IIR filters – Impulse Invariance Method and Bilinear transformation method. Application of Adaptive Filters: System Identification or System Modeling, Adaptive ChannelEqualization, Adaptive Line Enhancer, Adaptive Noise Cancelling; Adaptive Direct-Form FIRFilters-The LMS Algorithm: Minimum Mean Square Error Criterion, The LMS Algorithm.

References:

1. Digital Signal Processing – Principles, Algorithms and Applications by J. G. Proakis and D.
G. Manolakis, 3rd Edition, Pearson.
2. DSP by Ramesh babu
3. Digital Signal Processing by S. Salivahanan, TMH
1. Digital Signal Processing – schaums Outlines series
3. DSP by Oppen Ham & Shaffer

SEMESTER-VII

COURSE 20 A: DIGITAL SIGNAL PROCESSING

Practical Credits: 1 2 hrs/week

List of Experiments:

1. Different types of signal generation using MATLAB
2. Linear convolution of sequences (without using the inbuilt function 'conv' available inMATLAB)
3. Circular convolution of two sequences, Comparison of result with that of Linearconvolution
4. Finding auto correlation of a sequence

4 .Finding cross correlation of two sequences

6. Finding power spectral density of a sequence
7. Finding the convolution of periodic sequence using DFT and IDFT
8. Implementation of FFT (Fast Fourier Transform) algorithm

(i) Decimation in Time (DIT)

(ii) Decimation in Frequency (DIF)

9. Design of FIR filter(low pass, high pass and band pass) using windowingtechnique(haming window, rectangular window and Kaiser window)
10. Design of IIR filter (Design of Butterworth and Chebyshev filter)
11. Convolution of long duration sequences using overlap add, overlap save mete

SEMESTER-VII
COURSE 20 B: IoT FUNDAMENTALS

Theory Credits: 3 3 hrs/week

OBJECTIVES :

- To assess the vision and introduction of IoT.
- To Implement Data and Knowledge Management and use of Devices in IoT Technology.
- To Understand State of the Art - IoT Architecture.
- To build a small low-cost embedded system using Single Board Computers
- To learn the various case study of IoT systems.

OUTCOMES:

- Upon the completion of the course the student will be able to
- Interpret the vision of IoT from a global context.
- Compare and Contrast the use of Devices, Gateways and Data Management in IoT.
- Design a portable IoT using any Single Board Computer and relevant protocols
- Analyze applications of IoT in real time scenario
- Deploy an IoT application and connect to the cloud.

UNIT – I INTRODUCTION AND APPLICATIONS (12)

Introduction to IoT — Definition, Characteristics, functional requirements, motivation, Physical design - things in IoT, IoT protocols, Logical Design - functional blocks, communication models, Communication APIs, Applications – Home Automation, Cities, Environment, Energy, Agriculture,
Health, Industry.

UNIT - II IoT DESIGN & SYSTEM MANAGEMENT (12)

IoT &M2M — Machine to Machine, Difference between IoT & M2M, Software Defined Network, Network function virtualization, IoT system management – SNMP, NETCONF, YANG, IoT Design methodology.

UNIT – III IoT PROTOCOLS & SYSTEM (12)

Protocols – HTTP, UPnP, CoAP, MQTT, XMPP. IoT systems logical design using python - python data types & data structures, control flow, functions or modules. Modules & package of python, python packages of interest for IoT-JSON, XML, HTTP & URL Lib, SMTP Lib. Exemplary Device: Raspberry Pi - Linux on Raspberry Pi – Programming Raspberry Pi with Python.

UNIT – IV IoT CLOUD & DATA ANALYTICS (12)

Introduction to Cloud storage Models – WAMP – Xively Cloud for IoT – Python Web Application Framework-Django – Designing a RESTful based Web API. Data Analytics for IoT – Apache Hadoop, Apache Oozie.

UNIT – V IoT SECURITY (12)

IoT attacks - Phase attacks, Attacks as per architecture,Attacks based on components. Security Protocols - Time-Based Secure Key Generation and Renewal - Security access algorithmsfor unidirectionaldata transmissions, Security access algorithmsfor bidirectionaldata transmissions.

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things - A hand on approach" ,UniversitiesPress (India) Private Limited, 2014.
2. Pethuru Raj, Anupama C. Raman, "The Internet of Things — Enabling Technologies,Platforms and Use cases" , CRC Press, Taylor & Francis Group, 2017.
3. William Stallings, Lawrie Brown, "Computer Security: Principles and Practice", Pearson, 3rd Edition, 2014.
4. Fei Hu, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, andImplementations," 1st Edition, CRC Press, 2016.
5. Rajkumar Buyya, "Internet of Things — Principles and Paradigms" , Published by Morgan Kaufmann, Elsevier, 2016.

SEMESTER-VII

COURSE 20 B: IoT FUNDAMENTALS

Practical Credits: 1 2 hrs/week

Lab

List of Experiments:

1. Exercise on Eclipse IoT Project.
2. Experiments on few Eclipse IoT Projects.
3. Any Experiment on architecture of Iot Toolkit.
4. Exercise on smart object API Gateway service reference implementation in IoT Toolkit.
5. Experiment on HTTP-to-CoAP semantic mapping Proxy in IoT Toolkit.
6. Experiment on Gate way as a service deployment in IoT Toolkit.
7. Experiment on application framework and embedded software agents for IoT Toolkit.
8. Excercise on working principle of Rasberry Pi.
9. Experiment on connectivity of Rasberry Pi with existing system components.

SEMESTER-VIII

COURSE 21 A: MICROPROCESSORS AND MICROCONTROLLERS

Theory Credits: 3 3 hrs/week

Objectives:

1. To understand basic architecture of 8085 microprocessor
2. To understand the instruction set and write programs in assembly language
3. To interface 8085 microprocessor with common peripheral devices
4. To understand the differences in architecture and applications between Microprocessors and Microcontrollers
5. To understand basic architecture , instruction set and simple interfacing of PIC16F887 Microcontroller.

Outcomes:

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

1. Understand the basic blocks of microcomputers i.e. CPU, Memory, I/O and architecture of microprocessor‘s and Microcontroller‘s
2. Apply knowledge and demonstrate proficiency of designing hardware interfaces for memory and I/O as well as write assembly language programs for target microprocessor and microcontroller.
3. Derive specifications of a system based on the requirements of the application and select the appropriate Microprocessor or Microcontroller

Unit-1

Introduction to Microprocessor: Introduction, Basic block diagram, Speed,Word size, Memory capacity, Classification of microprocessors.

8085Microprocessor, 8086 Microprocessor: Features, Architecture -block diagram, General purpose registers, register pairs, flags, stack pointer, program counter, types of buses. Multi-plexed address and data bus, generation of control signals, pin description of microprocessor 8085 and 8086.

Unit-2

8086 Instructions: Operation code, Operand & Mnemonics. Instruction set of 8086, instruction classification, addressing modes, instruction format. Data transfer instructions, arithmetic instructions, increment & decrement instructions, logical instructions, branch instructions and machine control instructions. Assembly language programming examples.

Unit-3

Stack operations, subroutine, call and return instructions. Delay loops, use of counters, timing diagrams-instruction cycle, machine cycle, T- states, time delay, Interrupt structure of 8085A microprocessor, processing of vectored and non-vectored interrupts, latency time and response time; Handling multiple interrupts Comparison of 8085 Microprocessor with 8086 Microprocessor (Internal Architecture, Data Addressing Mode)

Unit-4

Peripheral Devices: 8255-Programmable Peripheral Interface, 8253- Programmable interval Timer, 8259- Priority Interrupt Controller, Microcontrollers: Introduction, different types of microcontrollers, embedded microcontrollers, processor architectures. Harvard vs. Princeton, CISC vs. RISC architectures, microcontroller memory types, microcontroller features, clocking, I/O pins, interrupts, timers, peripherals.

Unit-5

Introduction to PIC16F887 Microcontroller: Core features, Architecture, pin diagram, memory organization- Program and data memory organization, I/O Ports, addressing modes, instruction set. Interfacing to PIC16F887: LED, Switches, Solid State Relay, Seven Segment Display, DC Motor, Interfacing program examples using C language/ Assembly Language.

Reference Books

1. Microprocessor Architecture, Programming and Applications with 8085, Ramesh S.Gaonkar – Wiley Eastern Limited- IV Edition.
2. Fundamentals of Microprocessor & Microcomputer: B. Ram—Danpat Rai Publications.
3. Microchip PIC16F87X datasheet
4. PIC Microcontrollers, Milan Verle, , mikro Elektronika, 1st edition (2008)
5. Muhammad Ali Mazidi, ―Microprocessors and Microcontrollers‖, Pearson, 2006
6. B. Brey, The Intel Microprocessors- Architecture, Programming and Interfacing, Pearson Education (2003)

SEMESTER-VIII

COURSE 21 A: MICROPROCESSORS AND MICROCONTROLLERS

Practical Credits: 1 2 hrs/week

Microprocessor and Microcontrollers Lab

1. Program to transfer a block of data.
2. Program for multibyte addition
3. Program for multibyte subtraction
4. Program to multiply two 8-bit numbers.
5. Program to divide a 16 bit number by 8 bit number.
6. Program to search a given number in a given list.
7. Program to generate terms of Fibonacci series.
8. Program to find minimum and maximum among N numbers
9. Program to find the square root of an integer.
10. Program to find GCD of two numbers.
11. Program to sort numbers in ascending/descending order.
12. Program to verify the truth table of logic gates.
13. Interfacing using 8255
14. Interfacing using 8253
15. Interfacing using 8259

SEMESTER-VIII
COURSE 21 B: ELECTROMAGNETICS

Theory Credits: 3 3 hrs/week

Course Objectives
1. To introduce the basic mathematical concepts related to electromagnetic vector fields.
2. To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.
3. To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
4. To impart knowledge on the concepts of Faraday‘s law, induced emf and Maxwell‘s equations.
5. To impart knowledge on the concepts of Concepts of electromagnetic waves and Transmission lines.

Course Outcome
1.Understand the basic mathematical concepts related to electromagnetic vector fields. .
2. Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
3. Apply the principles of magneto statics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.
4. Understand the concepts related to Faraday‘s law, induced emf and Maxwell‘s equations.
5. Apply Maxwell‘s equations to solutions of problems relating to transmission lines and uniform plane wave propagation

Unit-1
Vector Analysis: Scalars and Vectors, Vector Algebra, Rectangular (Cartesian) Coordinate System, VectorComponents and Unit Vector, Vector Field, Products, Cylindrical Coordinates, Spherical Coordinates,Differential Length, Area and Volume, Line, Surface and Volume integrals, Del Operator, Gradient of aScalar, Divergence and Curl of a Vector, the Laplacian.

Unit-2 Electrostatic Fields: Electric Field, Field due to Discrete and Continuous ChargeDistributions, Electric Flux Density, Gauss’s Law and Applications, Divergence Theorem and Maxwell’sFirst Equation. Electric dipole. ElectricFields in Conductors, Current and Current Density, Continuity of Current, Metallic Conductor Properties andBoundary Conditions, Method of Images. Dielectric materials, Polarization, Dielectric Constant, Isotropic andAnisotropic dielectrics, Boundary conditions.

Unit- 3
Poisson’s Equation and Laplace’s Equation: Derivation of Poisson’s and Laplace’s equation, UniquenessTheorem, Examples of Solution of Laplace’s Equation: Cartesian, Cylindrical and Spherical Coordinates.

Magneto statics: Maxwell’s Equation, Magnetic Flux and Magnetic Flux Density, Scalar and VectorMagnetic Potentials. Magnetization in Materials and Permeability, Anisotropic materials, Magnetic BoundaryConditions, Inductors and Inductances, Magnetic Energy, Magnetic Circuits. Forces and Torques.

Unit-4
Time-Varying Fields and Maxwell’s Equations: Faraday’s Law of Electromagnetic Induction, StationaryCircuit in Time-Varying Magnetic Field, Transformer and Motional EMF,

Displacement Current, Maxwell'sEquations in differential and integral form and Constitutive Relations. Potential Functions, Lorentz gauge andthe Wave Equation for Potentials, Concept of Retarded Potentials. Electromagnetic Boundary Conditions.Time-Harmonic Electromagnetic Fields and use of Phasors

Unit-5

Electromagnetic Wave Propagation: Wave Equation in a source free isotropic homogeneous media, Uniform PlaneWaves in Lossless and Lossy unbounded homogeneous media, Wave Polarization, Phase and Group velocity,Flow of Electromagnetic Power and Poynting Vector. Uniform Plane wave incident on a Plane conductorboundary, concept of reflection and standing wave.Guided Electromagnetic Wave Propagation: Waves along Uniform Guiding Structures, TEM, TE and TM waves.

Suggested Books:

1. Murray. R. Spiegel, Vector Analysis, Schaum series, Tata McGraw Hill (2006)
2. M. N. O. Sadiku, Elements of Electromagnetics, Oxford University Press (2001)
3. W. H. Hayt and J. A. Buck, Engineering Electromagnetics, Tata McGraw Hill (2006)
4. D. C. Cheng, Field and Wave Electromagnetics, Pearson Education (2001)
5. J. A. Edminster, Electromagnetics, Schaum Series, Tata McGraw Hill (2006)
6. N. Narayan Rao, Elements of Engineering Electromagnetics, Pearson Education (2006)
7. Introduction to Electrodynamics, D.J. Griffiths, Pearson Education (2012)
8. Electromagnetic Wave and Radiating System, Jordan and Balmain, Prentice Hall (1979)

SEMESTER-VIII

COURSE 21 B: ELECTROMAGNETICS

Practical Credits: 1 2 hrs/week

Electromagnetics Lab (using Scilab/ any other similar freeware)
60 Lectures

1. Understanding and Plotting Vectors.
2. Transformation of vectors into various coordinate systems.
3. 2D and 3D Graphical plotting with change of view and rotation.
4. Representation of the Gradient of a scalar field, Divergence and Curl of Vector Fields.
5. Plots of Electric field and Electric Potential due to charge distributions.
6. Plots of Magnetic Flux Density due to current carrying wire.
7. Programs and Contour Plots to illustrate Method of Images
8. Solutions of Poisson and Laplace Equations – contour plots of charge and potential distributions
9. Introduction to Computational Electromagnetics: Simple Boundary Value Problems by Finite Difference/Finite Element Methods.

SEMESTER-VIII

COURSE 22 A: ANTENNA AND WAVES PROPAGATION

Theory Credits: 3 3 hrs/week

Objectives

1. Students will be introduced to antennas, their principle of operation
2. Antenna analysis and their applications.
3. Introduce the student to wave propagation over ground, through troposphere and ionosphere; diversity principles,
4. Propagation effects in microwave systems, satellite, space, and radar links
5. Transmission Lines, Antenna and Wave Propagation

Outcomes

1. Define various antenna parameters
2. Analyze radiation patterns of antennas
3. Evaluate antennas for given specifications.
4. Illustrate techniques for antenna parameter measurements
5. To understand the various applications of antennas.

Unit-1

Electromagnetic Wave Propagation: Propagation in Good Conductors, Skin Effect, Reflection of uniform Plane Waves at normal incidence, Plane Wave reflection at Oblique Incidence, Wave propagation in dispersive media, concept of phase velocity and group velocity.

Unit-2

Transmission Lines: Typical Transmission lines- Co-axial, Two Wire, Microstrip, Coplanar and Slot Lines, Transmission Line Parameters, Transmission Line Equations, Wave propagation in Transmission lines, lowloss, lossless line, Distortionless line, Input Impedence, Standing Wave Ratio ,Power. and lossy lines, Shorted Line, Open-Circuited Line, Matched Line, Smith Chart, Transmission Line Applications.

Unit-3

Waveguides and Waveguide Devices: Wave propagation in waveguides, Parallel plate waveguides, TEM, TM and TE modes, Rectangular waveguides, circular waveguides, Power transmission and attenuation, Rectangular cavity resonators, directional couplers, isolator, circulator.

Unit-4

Radiation of electromagnetic waves: Concept of retarded potentials, Antenna Parameters: Radiation Mechanism, Current Distribution on a Thin Wire Antenna, Radiation Pattern, Radiation Power Density, Radiation Intensity, Beamwidth, Directivity, Antenna Efficiency, Gain, Beam Efficiency, Bandwidth, Polarization, Input Impedance Antenna Radiation Efficiency, Effective Length and Equivalent Areas, Maximum Directivity and Maximum Effective Area, Friis Transmission Equation and Radar Range Equation

Unit-5

Types of Antenna: Hertzian dipole, Half wave dipole, Quarter-wave dipole, Yagi-Uda, microstrip, Parabolic antenna, Helical antenna, Antenna array.

Suggested books:

1. M. N. O. Sadiku, Principles of Electromagnetics, Oxford University Press (2001)

2. Karl E. Longren, Sava V. Savov, Randy J. Jost., Fundamentals of Electromagnetics with MATLAB,PHI
3. W. H. Hayt and J.A. Buck, Engineering Electromagnetics, Tata McGraw Hill (2006)
4. D. C. Cheng, Field and Wave Electromagnetics, Pearson Education (2001)
5. J. A. Edminster, Electromagnetics, Schaum Series, Tata McGraw Hill (2006)
6. N. Narayan Rao, Elements of Engineering Electromagnetics, Pearson Education (2006)
7. G. S. N. Raju, Antennas and Propagation, Pearson Education (2001)

SEMESTER-VIII

COURSE 22 A: ANTENNA AND WAVES PROPAGATION

Practical Credits: 1 2 hrs/week

Antenna and Wave Propagation Lab

1. Program to determine the phasor of forward propagating field
2. Program to determine the instantaneous field of a plane wave
3. Program to find the Phase constant, Phase velocity, Electric Field Intensity and Intrinsic ratio
4. Program to find skin depth, loss tangent and phase velocity
5. Program to determine the total voltage as a function of time and position in a loss less transmission line
6. Program to find the characteristic impedance, the phase constant an the phase velocity
7. Program to find the output power and attenuation coefficient
8. Program to find the power dissipated in the lossless transmission line
9. Program to find the total loss in lossy lines
10. Program to find the load impedance of a slotted line
11. Program to find the input impedance for a line terminated with pure capacitive impedance
12. Program to determine the operating range of frequency for TE10 mode of air filled rectangular waveguide
13. Program to determine Directivity, Bandwidth, Beamwidth of an antenna
14. Program to determine diameter of parabolic reflector
15. Program to find out minimum distance between primary and secondary antenna

SEMESTER-VIII

COURSE 22 B: POWER ELECTRONICS

Theory Credits: 3 3 hrs/week

Objective:

1. To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronics.
2. To familiarize students to the principle of operation, design and synthesis of different power conversion circuits and their applications.
3. To provide strong foundation for further study of power electronic circuits and systems.
4. The working of power semiconductor devices such as power diode, power transistor, TRIAC, MOSFET, IGBT
5. The different types of rectifiers for single phase and three phase controls the working of inverters, choppers and cycloconverters and their application inindustry

Outcomes:

1. At the end of the course, a student will be able to:
2. Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices.
3. Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits
4. Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.
5. Formulate and analyze a power electronic design at the system level and assess the performance.

Unit-I

Power Semiconductor Devices: Power diode, Power transistor, TRIAC, MOSFET and IGBT - turn on methods, driver circuits - SCR characteristics - Two transistor analogy - Methods of turning ON and turning OFF - Series and parallel connections of SCRs.

Unit-II

Phase controlled converters: Single phase controlled rectifier - Half wave controlled rectifier with 1.Resistive load 2.RL load 3. RL load and battery - Full wave controlled rectifier with above types of loads - Three phase controlled rectifier - HVDC transmission.

Unit-III

Inverters: Single phase and three phase inverters - Series and parallel inverters - Bridge inverters - Current source inverter.

Unit-IV

Choppers and Cycloconverters: Various types of DC choppers - Step up chopper - AD chopper - Single phase AC chopper - Step up and step down cycloconverters - Three phase to single phase and three phase to three phase cycloconverters.

Unit-V

Control circuits and application: Generation of control pluses - Microprocessor based implementation - Static circuit breakers for DC and AC circuits - Regulated power supply - UPS - SMPS.

Suggested Books:

1. Power Electronics, P.C. Sen, TMH
2. Power Electronics & Controls, S.K. Dutta
3. Power Electronics, M.D. Singh & K.B. Khanchandani, TMH
4. Power Electronics Circuits, Devices and Applications, 3rd Edition, M.H. Rashid, Pearson Education
5. Power Electronics, Applications and Design, Ned Mohan, Tore.
6. Power Electronics, K. HariBabu, Scitech Publication.
7. Power Electronics, M.S. Jamil Asghar, PHI.
8. A Textbook of Electrical Technology-Vol-II, B.L. Thareja, A.K. Thareja, S.Chand

Reference Books

1. Thyristorised Power Controllers - G.K. Debye, Wiley Eastern Ltd.
2. An Introduction to Thyistors and Their Applications - M. Ramamoorthy, 2/e, East West press.

SEMESTER-VIII

COURSE 22 B: POWER ELECTRONICS

Practical Credits: 1 2 hrs/week

Power Electronics Lab

1. Study of I-V characteristics of DIAC
2. Study of I-V characteristics of a TRIAC
3. Study of I-V characteristics of a SCR
4. SCR as a half wave and full wave rectifiers with R and RL loads
5. DC motor control using SCR.
6. DC motor control using TRIAC.
7. AC voltage controller using TRIAC with UJT triggering.
8. Study of parallel and bridge inverter.
9. Design of snubber circuit
10. VI Characteristic of MOSFET and IGBT (Both)
11. Study of chopper circuits

SEMESTER-VIII

COURSE 23 A: MICROWAVE AND OPTOELECTRONICS

Theory Credits: 3 3 hrs/week

Objectives

1.To understand the theoretical principles underlying microwave devices and networks.
2.To design microwave components such as power dividers, hybrid junctions, microwave filters, ferrite devices, and single-stage microwave transistor amplifiers.
3.To improve skills in written communication, through a project report.
4.To understand and quantify the effects of noise in microwave systems.
5.To quantify the signal and noise characteristics of microwave systems such as communication networks, radars, and radiometers, and relate this to the design. process

Outcomes

1.Knowledge about Microwave Solid State Devices.
2.Ability to identify and study the performance of Wave Guides and Resonators
3.Study the performance of Microwave Components.
4.Study the comparative performance analysis of Microwave Tubes and Circuits.
5.Knowledge about Microwave Measurements.
6.Study the measurement of impedance using smith chart.

Unit I :

Microwave Components:

Directional couplers, tees, hybrid ring, S-parameters, attenuators, cavity resonators ,mixers & detectors, matched Load, phase shifter ,wave meter, Ferrite devices: Isolators, circulators.

Unit II :

Microwave Tubes:

Limitation of conventional tubes; Construction, operation and properties of Klystron amplifier, reflex Klystron, magnetron, TWT, BWO , Crossed field amplifiers.

Unit III :

Microwave Solid State Device:

Varactor diode, Tunnel diode, Schottky diode, GUNN diode, IMPATT, TRAPATT and PIN diodes. MASER, parametric amplifiers.

Unit IV :

Optoelectronic modulator:

Introduction, analog and Digital modulation, Electro Optic modulators, magneto optic devices, Acoustopics devices, optical, Swithcing and Logic devices.

Unit V :

Introduction To Radar:

Block Diagram and operation, Radar Frequencies, Simple form of Radar Equation, Detection and Prediction of Range Performance, Pulse Repetition frequency and Range Ambiguities, Applications of Radar.

Suggested books

1. J. Wilson and J.Haukes, “Opto Electronics – An Introduction”, Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
2. Bhattacharya “Semiconductor Opto Electronic Devices”, Prentice Hall of India Pvt., Ltd., New Delhi, 1995.

3. Jasprit Singh, “Opto Electronics – As Introduction to materials and devices”, McGraw-Hill International Edition, 1998.
4. AmnonYariv, Optical Electronics, Holt Rine hart & Winston, Philadelphia, 1991
5. Bhattacharya P., Semiconductor Optoelectronic Devices,, PHI, New Delhi.1995
6. Ben G. Streetmann& Sanjay Banerjee, Solid State Electronic Devices, 5thEdn, 2000.
7.Collin RE. Foundations for microwave engineering. John Wiley & Sons; 2007.
8. Annapurna Das, Sisir K Das, Microwave Engineering, TMH Publication, 2001

SEMESTER-VIII
COURSE 23 A: MICROWAVE AND OPTOELECTRONICS

Practical Credits: 1 2 hrs/week

List of Experiments:
(At least 8 experiments should be conducted from the list of experiments.)
1. Characterization of E-Plane, H-Plane and Magic(Hybrid) Tee
2. Characterization of microwave Isolator and Circulator
3. Characterization of Microwave directional couplers
4. Characterization of Microwave attenuators
5. Characterization of Microwave phase shifters
6. Design of Wilkinson power divider
7. VI Characteristics of GUNN Diode
8. Study of PIN diode as a microwave switch
9. Operating modes of Klystron microwave source
10. Microwave measurements using a Vector Network Analyzer
a. Return loss
b. Insertion Loss
c. Bandwidth
d. Smith Chart
11. Study of a FM-CW radar
12. Impedance matching using Smith Chart
13. Operation of Vector Signal Generator and Analyzer

SEMESTER-VIII

COURSE 23 B: WIRELESS BROADBAND NETWORKS

Theory Credits: 3 3 hrs/week

Objectives:

1. To study the various network layer and transport layer protocols for wireless networks
2. To study the connecting networks.
3. To study the emerging techniques in 5G network.

Outcomes:

Upon completion of the course, the student would be able to

1: Design and implement the various protocols in wireless networks.
2: Analyze the architecture of 3G network standards.
3: Analyze the difference of LTE-A network design from 4G standard.
4: Design the interconnecting network functionalities by layer level functions.
5: Explore the current generation (5G) network architecture.

UNIT I:

WIRELESS PROTOCOLS: Mobile network layer- Fundamentals of Mobile IP, data forwarding procedures in mobile IP, IPv4, IPv6, IP mobility management, IP addressing - DHCP, Mobile transport layer-Traditional TCP, congestion control, slow start, fast recovery/fast retransmission, classical TCP improvementsIndirect TCP, snooping TCP, Mobile TCP

UNIT II :

3G EVOLUTION: IMT-2000 - W-CDMA, CDMA 2000 - radio & network components, network structure, packet-data transport process flow, Channel Allocation, core network, interference-mitigation techniques, UMTS-services, air interface, network architecture of 3GPP, UTRAN – architecture, High Speed Packet Data-HSDPA,HSUPA.

UNIT III:

4G EVOLUTION :Introduction to LTE-A – Requirements and Challenges, network architectures – EPC, E- UTRAN architecture - mobility management, resource management, services, channel -logical and transport channel mapping, downlink/uplink data transfer, MAC control element, PDU packet formats, scheduling services, random access procedure.

UNITIV

LAYER-LEVEL FUNCTIONS : Characteristics of wireless channels - downlink physical layer, uplink physical layer, MAC scheme -frame structure, resource structure, mapping, synchronization, reference signals and channel estimation, SC-FDMA, interference cancellation – CoMP, Carrier aggregation, Services - multimedia broadcast/multicast, location-based services.

UNIT V:

5G EVOLUTION: 5G Roadmap - Pillars of 5G - 5G Architecture, The 5G internet - IoT and context awareness - Networking reconfiguration and virtualization support - Mobility QoS control - emerging approach for resource over provisioning, Small cells for 5G mobile networks-capacity limits and achievable gains with densification - Mobile data demand, Demand Vs Capacity, Small cell challenges, conclusion and future directions.

Suggested Books:

1. Kaveh Pahlavan, “Principles of wireless networks”, Prentice-Hall of India, 2008.
2. Vijay K.Garg, “Wireless Network Evolution - 2G & 3G”. Prentice Hall; August 11,
3. Clint Smith,P.E, Dannel Collins, “3G Wireless Networks” Tata McGrawHill, 2nd Edition, 2011.
4. Sassan Ahmadi, “LTE-Advanced – A practical systems approach to understanding the 3GPP LTE Releases 10 and 11 radio access technologies”, Elsevier, 2014.
5. Jonathan Rodriguez, "Fundamentals of 5G Mobile networks", John Wiley, 2015

Lab experiment:

1. Recommended to perform a field work and submit project report on wireless broadband network.

SEMESTER-VIII

COURSE 24 A: CONSUMER ELECTRONICS

Theory Credits: 3 3 hrs/week

Objectives:

The subject aims to provide the student with:

1. An understanding of basic characteristics of sound, microphones, loudspeakers, sound recording with its reproduction and public address systems.
2. An understanding of signal generation to test various sections of TV receiver.
3. An introduction to various electronic household and office appliances.
4. An understanding of the concepts and techniques in marketing.

Outcomes:

The student after undergoing this course will be able to:

1. Evaluate the choice of appropriate microphones and loudspeakers for recording and reproduction of sound for various environmental surroundings.
2. Design block level and circuit level systems for sound recording and reproduction.
3. Explain the construction and working of the different types of electronic household and office appliances.
4. Identify major risks associated with the circuits in electrical appliances and strategies to mitigate those risks.
5. Develop, evaluate, and implement marketing management in a variety of business environments.

Unit - 1

Electro acoustical Transducers: Microphones, Loudspeakers, Pick-up characteristics, specifications and applications. Sound Recording and Reproduction: Principle and Block schematic of disc recording system, magnetic recording system, optical recording system, compact disc and video recording. Audio Amplifier and subsystems: Audio mixers, tone controls, Graphic equalizers,

Features of Hi-Fi and stereo systems, Dolby system, Public Address systems.

Unit - 2

Testing, Alignment & Servicing of Television Receivers: Testing and Alignment of TV receivers, TV Wobbuloscope, Video Pattern Generators, Marker Generator, Colour bar generator, Vectroscope.Cable Television: Modern cable TV system, signal processing, Cable TV converter, Satellite Television, Direct broadcast satellite TV. Digital Television System, Three-dimensional (3D) TV, stereoscopic effect with the aid of special glasses, autostereoscopic methods.

Projection Television: Laser Projection system, LCD projection system.

High Definition television systems: HDTV Systems, HDTV standards and compatibility.

Unit - 3

Modern home appliances with electronic control: Microwave oven, washing machine, Air-conditioner, Digital video disc (DVD) player , Blu –Ray Disc, MP3 player, Digital Camera, Remote control, Inverters, UPS, Refrigerator, Iron, Kittle. Working principle of photocopying, scanner, fax machine, Risograph, solar cell panels and solar water heater. Maintenance and safety measures. Electricity in home: electric lighting, electric heating, Dangers of Electricity & Safety Precautions.

Unit - 4

Marketing planning: Importance of marketing planning, steps involved in marketing planning process scanning the marketing environment and spotting the business opportunities, setting the market objectives. Marketing strategy: the meaning & significance of marketing strategy, formulating the marketing strategy. Techniques and practices for mass production for reliable production.

Unit – 5(12Hours) Costing: overview of costing and marketing communication. Entrepreneurship Awareness. Introduction to Energy auditing. Patents: Introduction to patents.

Recommended Readings:

1. Gupta B. R.; Consumer Electronics; S.K. Kataria & Sons
2. R. G. Gupta; Audio and Video Systems: Principles, Maintenance and Troubleshooting; Tata McGraw-Hill
3. S. P. Bali; Consumer Electronics; Pearson
4. V. S. Ramaswamy, J. Namakumari; Marketing management planning, implementation and control, 2nd Edition; McMillan
5. Tom Duncan; Electronics for Today and Tomorrow; Hodder Education
6. R. G. Gupta; Television engineering and video systems; Tata McGraw-Hill
7. H. S. Kalsi; Electronic Instrumentation; Tata McGraw Hill

SEMESTER-VIII
COURSE 24 A: CONSUMER ELECTRONICS

Practical Credits: 1 2 hrs/week

List of Experiments:
(At least 8 experiments should be conducted from the list of experiments.)
1. Determination of frequency response of microphone.
2. Determination of frequency response of loudspeaker.
3. Determination of frequency response of crossover networks.
4. To study the working of a microwave oven.
5. Study of Semi-Automatic Washing machine trainer &Fault finding.
6. To study the various components of a Fully Automatic Washing Machine.
7. To study Risograph machine.
8. To study the basic operation of facsimile.
9. To study the various components of sound mixer.
10. To Study Fault simulation and step-by-step Fault finding of B/W TV.
11. To study the basic operation of TV pattern generator
12. To identify and understand different sections and components of mobile phone unit such as ringer section, dialer section, receiver section, transmitter section, etc.
13. To study the basic operation of photocopying machine.
14. To study the various components of Iron and kittle.

SEMESTER-VIII
COURSE 24 B: MOBILE COMPUTING

Theory Credits: 3 3 hrs/week

Objectives:

To learn Wireless technologies and planning Ad-hoc Network.
Outcomes:
Instructional Method and Pedagogy:

1. At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
2. Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
3. Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
4. One internal exam will be conducted as a part of internal theory evaluation.
5. Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
6. Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
8. Experiments shall be performed in the laboratory related to course contents.

UNIT I (Hours 12)
Basic history of Mobile Computing
Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing through internet, Wireless network architecture,
Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing.

UNIT II (Hours 12)
Overview of Wireless n/w. and Technologies
Introduction, Different generations. Introduction to 1G, 2G, 3G and 4G, Bluetooth, Radio frequency identification(Rfid),Wireless Broadband, Mobile IP: Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, routing in mobile host, Adhoc networks, Mobile transport layer: Indirect TCP, Snooping

UNIT III (Hours 12)
TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. ,IPv6
Wireless network topologies, Cell fundamentals and topologies, Global system for mobile communication, Global system for mobile communication, GSM architecture, GSM entities, call routing in GSM,PLMN interface, GSM addresses and identifiers, network aspects in GSM,GSM frequency allocation, authentication and security, Short message services, Mobile computing over SMS,SMS, value added services through SMS,accessing the SMS bearer,

Security in wireless networks.

UNIT IV (Hours 12)
Basic history of Mobile Computing
Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing through internet, Wireless network architecture,
Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing.

UNIT V (Hours 12)
Wireless Application Protocol(WAP) WAP,MMS,GPRS application CDMA and 3G
Spread-spectrum Technology, CDMA versus GSM, Wireless data, third generation networks, applications in 3G Wireless LAN, Wireless LAN advantages,IEEE802.11 standards ,Wireless LAN architecture, Mobility in Wireless LAN, Deploying Wireless LAN, Deploying Wireless LAN, Mobile ad hoc networks and sensor networks, wireless LAN security, WiFi v/s 3G Voice over Internet protocol and convergence, Voice over IP,H.323 framework for voice over IP,SIP, comparison between H.323 ad SIP, Real time protocols, convergence technologies, call routing, call routing, voice over IP applications, IMS, Mobile VoIP, Security issues in mobile. Information security, security techniques and algorithms, security framework for mobile environment.

Reference Books:
1. Mobile Computing , Asoke K Telukder, Roopa R Yavagal, TMH
2. Mobile Communications, Jochen Schiller, Pearson
3. Wireless Communications and Networks, 3G and beyond, ITI Saha Misra, TMH.
4. Principle of wireless Networks by Kaveh Pahlavan and Prashant Krishnamurthy, Pearson 2002.

SEMESTER-VIII

COURSE 24 B: MOBILE COMPUTING

Practical Credits: 1 2 hrs/week

List of experiments:

Name of Experiment

1) What is Mobile Computing? Explain the three tier architecture of mobile computing with diagram.
2) Write a WML program to create a card.
3) Write a WML program to create a deck that contain two cards and provide the Functionality of calling two cards from one another.
4) Write a WML program to display list of following card and provide the functionality to load a particular card,
   a. Sales
   b. Product
   c. Services
5) Write a WML program for usage of template tag.
6) Write a WML program to display the text in the following format.
   a) Bold
   b) Underlined
   c) Emphasized
   d) Big font
   e) Small font
   f) Strong font
7) Write a WML program to implement the functionality of Login by username.
8) Write a WML program to create following selection list.
   a. Red
   b. Green
   c. Yellow
   d. Blue
9) Write a WML program to display the image on the screen after 5 seconds
10) Write a WML program to develop the calculator.

SEMESTER-VIII
COURSE 25 A: ROBOTICS

Theory Credits: 3 3 hrs/week

Objectives: This course aims

1. To familiarize students with basic terminologies of the robotics
2. Essential knowledge to be acquainted in the field of Robotics.
3. It also aims to inculcate thorough understanding about basic terminologies, grippers, sensors, actuators and robot kinematics

Outcome

1 Understand terminologies related to robotics
2 Identify gripper, sensor and actuator of a robot
3 Apply mathematics for manipulator positioning and motion planning
4 Analyse robot mechanism using kinematics
5 Acquainted with various applications and futuristic robotic technology.

Unit-I

Introduction to robotics: Brief History, Definition, Robot Anatomy, Three laws, Classification of robots,Robot terminologies: work volume, Degree of Freedom, resolution, accuracy, repeatability, dexterity, compliance, payload capacity, speed of response etc.,Wrist assembly, Joint notations,Selection criteria of any robot, Industrial applications of robot, Futuristic robotics

Unit-II

Robot drive systems: Robot drive systems End effectors and Automation Types of drives – Hydraulic, Pneumatic and Electric, Comparison of all such drives, DC servo motors, Stepper motors, AC servo motor – salient features and applications, pulse count calculations End effectors - Types of Grippers – Mechanical, Magnetic, vacuum, pneumatic and hydraulic, selection and design considerations,

Unit-III

Robot sensors and Machine Vision: Need for sensors, types of sensors used in Robotics, classification and applications of sensors, Characteristics of sensing devices, Selections of sensors. Robot Vision setup (RVS), block diagram, components, working of RVS, Human vision Vs Robot Vision, Gradient calculations, Applications of RVS

Unit-IV

Mathematical Preliminaries of Robotics Spatial Descriptions: positions, orientations, and frame, mappings: changing description from frame to frame, Operators: translations, rotations and transformations, Homogeneous transformations, transformation arithmetic, compound Transformations, inverting a transform, transform equations, Euler Angles, Fixed Angles, Euler Parameters.

Unit-V

Robot Kinematics: Manipulator Kinematics, Link Description, Link to reference frame connections, Denavit-Hartenberg Approach, D-H Parameters, Position Representations, Forward Kinematics, Inverse Kinematics,

Suggested Books:

1. S. K. Saha, Introduction to Robotics 2e, TATA McGraw Hills Education (2014)
2. AsitavaGhoshal, Robotics: Fundamental concepts and analysis, Oxford University Press (2006)
3. Dilip Kumar Pratihar, Fundamentals of Robotics, Narosa Publishing House, (2019)
4. R. K. Mittal, I. J. Nagrath, Robotics and Control, TATA McGraw Hill Publishing Co Ltd, New Delhi (2003)
5. S. B. Niku, Introduction to Robotics – Analysis, Contro, Applications, 3rd edition, John Wiley & Sons Ltd., (2020)
6. J. Angeles, Fundamentals of Robotic Mechanical Systems Theory Methods and Algorithms, Springer (1997)
7. MikellGroover, Mitchell Weiss, Roger N. Nagel, Nicholas Odrey, AshishDutta, Industrial Robotics 2nd edition, SIE, McGraw Hill Education (India) Pvt Ltd (2012)
8. R. D. Klafter, Thomas A. Chmielewski, and MechaelNegin, Robotic Engineering – An Integrated Approach, EEE, Prentice Hall India, Pearson Education Inc. (2009)

SEMESTER-VIII
COURSE 25 A: ROBOTICS

Practical Credits: 1 2 hrs/week

List of Practicals on Robotics:

1. Study of components of real robot and its performance
2. Basics of 3D modeling software
3. Modeling of Robot Joints
4. Assembly of 2DOF/3DOF Robot Manipulator
5. Use of drives for robotic joints and its simulation
6. Roboanalyzer: A learning software of robotics study
7. Understanding coordinate frames and transformation
8. Formulation of DH parameters of robot configuration
9. Simulation using open source software of robot kinematics using DH Parameters
10. Forward kinematic analysis of a robot
11. Inverse kinematic analysis of a robot
12. Introduction of MATLAB and Robotic Toolkit introduction

SEMESTER-VIII

COURSE 25 B: INTRODUCTION TO MEMs

Theory Credits: 3 3 hrs/week

Objectives:

The subject aims to provide the student with:

1. An overview of Microsystems and their applications in various branches of Engineering medical science and basic sciences.
2. An understanding of the principles and applications of the Microsystems and Micro actuators.
3. An understanding of the different materials used in the MEMS technology.
4. An ability to analyze the various techniques and parameters used in the micro system fabrication.
5. An understanding of the microsystem packaging techniques.

Outcomes:

The student after undergoing this course will be able to:

1. Explain the applications of MEMS in various branches of Engineering medical science and basic sciences.
2. Explain the principles and operation of the different microsensors and microactuators.
3. Analyze the various techniques and parameters in the microsystem fabrication.
4. Explain the microsystem packaging techniques.

Unit - 1

Basic device technology: depletion region and diffusion capacitance, junction breakdown, breakdown voltage enhancement in pn junction. Thermal properties and second breakdown phenomenon, calculation of reverse leakage current. IC technology: Lithography, diffusion, ion implantation, oxidation and epitaxial growth.

MEMS and Microsystems: Applications, Multidisciplinary nature of MEMS. The effects of miniaturization and scaling.

Unit - 2

Working principles of Microsystems: Micro sensors -Biomedical sensors and biosensors, Optical sensors, pressure sensors.

Microactuation: Actuation using piezoelectric crystals, Actuation using Electrostatic forces, (Parallel plate, Comb drive actuators) MEMS with Micro actuators: Micro grippers, micro motors, micro valves, micro pumps, micro accelerometers, Microfluidics.

Unit - 3

Materials for MEMS: Substrates and wafers, silicon as substrate material, Single crystal silicon and wafers, crystal structure, The Miller Indices, Mechanical properties of Silicon, Silicon Compounds, Silicon Piezoresistors, Gallium Arsenide, Quartz, polymers for MEMS, Packaging materials. Microsystem fabrication – Environment for Microfabrication, Photolithography, Ion implantation, Diffusion, Oxidation, Chemical vapour deposition, Sputtering, Epitaxy, Etching.

Unit - 4

Overview of Micro manufacturing: Bulk micro manufacturing, Surface micro machining Microsystems Design - Design considerations – Selection of signal transduction ,Process design, Design of a silicon die for a micro pressure sensor,

Unit - 5

Microsystem packaging :Microsystem packaging, The three levels of micro system packaging ,interfaces in micro system packaging, Signal mapping and transduction RF MEMS and optical MEMS components.

Recommended Books:

1. Tai-Ran Hsu; MEMS and Microsystems, Design and Manufacture; TMH
2. Mark Madou; Fundamentals of Micro fabrication; CRC Press
3. Julian W Gardner; Microsensors: Principles and Applications; John Wiley & Sons
4. Sze S. M.; Semiconductor Sensors; McGraw-Hill
5. Nadim Maluf; An Introduction to Micro Electro Mechanical System Design; Artech House
6. Chang Liu; Foundations of MEMS; Pearson Education Inc.
7. M. H. Bao; Micro Mechanical Transducers, Volume 8, Handbook of Sensors and Actuators; Elsevier
8. Chang C. Y., Sze S. M.; VLSI Technology; McGraw

SEMESTER-VIII

COURSE 25 B: INTRODUCTION TO MEMs

Practical Credits: 1 2 hrs/week

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. Microsensors
2. Microactuators
3. Materials for MEMS
4. The Miller Indices
5. Microsystem fabrication
6. Micro manufacturing
7. Microsystem Design
8. Microsystem packaging