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[Est. 1857, State University, NAAC 'A' Grade, CGPA 3.32, NIRF 2019 Rank: 20]

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Undergraduate Programme in

Electronics and Communication Science

Curriculum and Syllabus for

B.Sc Electronics and Communication Science

(With effect from the Academic Year 2020-21)

February 2020

Note: The Committee is designed Learning Outcome Based Curriculum Framework of Under Graduate Electronics and Communication Programmes prescribed by UGC

SEMESTER I
CORE PAPER 1 - CIRCUIT THEORY

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 3

COURSE OBJECTIVES

1. To apply circuit theorems to simplify and find solutions to electrical circuits.
2. To solve simple circuits using ohm‟s law, Kirchhoff‟s laws and the properties of the elements.
3. To build up basic problem solving skills through organizing available information and applying circuit laws.
4. To Build up strong problem solving skills by effectively formulate a circuit problem into a mathematical problem using circuit laws and theorems.
5. To Simplify circuits using series and parallel equivalents and using Thevenin and Norton equivalents
6. To understand application of resistors capacitors , inductors and transient circuit response.

COURSE OUTCOME

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

1. Simplify and identify solutions to electrical circuits.
2. Implement the techniques to solve simple circuits using ohm‟s law, Kirchhoff‟s laws and the properties of the elements
3. Categorize series and parallel equivalents and using Thevenin and Norton equivalents
4. Recognize resistors capacitors, inductors and transient circuit responses

UNIT I

Resistors : Introduction to linear and non linear components (active and passive) – Types of resistors (wire wound, carbon composition, film type, Cermets‟) – Resistor color coding – power rating of resistors – Series and Parallel combination of resistors.

Capacitors : Capacitance-Factors controlling capacitance-Types of capacitors: Fixed Capacitors, Variable Capacitors – Non electrolytic and electrolytic capacitors. Voltage rating of capacitors – capacitors in series and parallel – Energy stored in capacitors

UNIT II

Inductors : Inductors (air core, iron core, ferrite core) – comparison of different cores – Inductance of an Inductor – Mutual Inductance – Coefficient of coupling – Variable Inductors – Inductors in Series and Parallel without M – Reactance and Impedance offered by a coil – Q factor

Transformer: working – turns ratio – voltage ratio – current ratio – power in secondary – autotransformers – transformer efficiency – core losses – types of cores.

UNIT III

Ohm‟s law – Kirchoff‟s current law – Kirchoff‟s voltage law – voltage division technique - concepts of series circuit – current division technique – concepts of parallel circuits – internal resistance of sources – method of solving a circuit by Kirchoff‟s laws – loop analysis – nodal analysis – simple problems

UNIT IV

Network Theorems : Super Position Theorem – Thevenin‟s Theorem – Norton‟s Theorem – Thevenin to Norton Conversion (Theorem Statement and Simple problems)

UNIT V

Applications of Basic components : Filters (Low Pass Filter, High Pass Filter using passive components.)

AC signal : RMS value– average value–. AC analysis (Pure resistive, Pure inductive circuit and Pure capacitive circuit)

TEXTBOOKS

1. Sedha R S, A Text book of Applied Electronics, S. Chand & Company Ltd
2. Muthusubramanian R, Salivahanan S, Basic Electrical and Electronics Engineering, Tata McGraw Hill Education Private Ltd.
3. Narayanamoorthi M and Others, Electricity and Magnetism, S. Chand & Company Ltd
4. Murugeshan R, Electricity and Magnetism, S. Chand & Company

5. Giovanni Saggio, Principles of Analog Electronics, CRC Press

REFERENCE BOOKS

1. Sree Harsha N R, Anupama Prakash and D P Kothari D P, The foundations of Basic Circuit Theory, IOP Publishing
2. Hayt and Kemmerly, Engineering Circuit Analysis, 2nd Edition, McGraw Hill
3. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of electric circuits, 6th Edition, McGraw Hill
4. Theraja V, Basic Electronics Solid State, S. Chand & Company Ltd
5. Bernard Grob, Basic Electronics, McGraw Hill Book Company

WEBSITES

1. Khan academy. Org
2. NPTEL
3. http://www.electronicsteacher.com
4. http://www.abcofelectronics.com
5. http://www.science-ebooks.com
6. www.ocw.mit.edu
7. www.academic.earth

SEMESTER I
PAPER II - CORE PRACTICAL I

SUBJECT CODE	PRACTICAL	MARKS : 100 INTERNAL : 40 EXTERNAL : 60

CREDITS : 3

(Atleast seven experiments should be done for the examination)

1. Study of CRO, Multimeter and other Testing Devises (Study Purpose)
2. Testing of components
3. To verify Ohm‟s Law using voltmeter and Ammeter
4. Study of Kirchoff‟s law
5. Resistance in Series and Parallel
6. Capacitors in Series and Parallel
7. Study of Super Position Theorem
8. Verification of Thevenin‟s Theorem
9. Study of RC Circuit – Series Resonance
10. Study of Current limitation by resistor using LED.
11. Low pass filter using Capacitor

REFERENCE BOOKS

1. Zbar, Malvino and Miller, Basic Electronics, A Text Lab Manual, Tata McGraw Hill.
2. Sugaraj Samuel R., Horsley Solomon, B.E.S. Practicals.

SEMESTER II
CORE PAPER 2 - ELECTRONIC DEVICES

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 3

COURSE OBJECTIVES

1. To understand the use of diodes as power supply rectifiers
2. To understand the operation of transistors as switching circuits
3. To understand the fundamentals of operation of the semiconductor electronic devices

COURSE OUTCOME

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

1. Recognize the diodes as rectifiers
2. Identify the operation of transistors and as switching circuits
3. Compare the operation of transistors and FETs
4. Describe the fundamental operation of semiconductor electronic devices

UNIT I

Semiconductor Basics : Conductor – Semiconductor – Introduction to Intrinsic and Extrinsic semiconductor – P type and N type semiconductor – PN junction diode – V-I characteristics - Half wave, Full wave & Bridge rectifier – expression for efficiency and ripple factor - Construction of Basic logic gates using Diodes.

UNIT II

Special Purpose Diodes : Zener and Avalanche Break down, Zener diode - V-I characteristics regulated power supply using Zener diode- LED, Photodiode, PIN Diode, Varactor Diode, Tunnel Diode – Principle, Working& Applications.

UNIT III

Transistors : Transistor symbols NPN & PNP – Transistor biasing for active, saturation & cutoff – Operation of a BJT - Characteristics of a transistor in CE, CB & CC modes – Early effect – Punch-through– Transistor testing– Transistor as a switch – - Construction of Basic logic gates using Transistors (qualitative analysis)- Transistor as an amplifier - UJT – Basic construction and working - Characteristics.

UNIT IV

Field Effect Transistors : FET – Construction - Working - Static – Transfer characteristics – Parameters of FET – FET as an amplifier – MOSFET – Enhancement MOSFET – Depletion MOSFET – Construction & Working – Drain characteristics of MOSFET – Comparison of JFET & MOSFET.

UNIT V

Power Devices: Power Transistors- SCR – TRIAC – DIAC and IGBT – Characteristics and working.

TEXT BOOKS

1. Theraja B.L., Basic Electronics Solid state, S. Chand & Company Ltd.
2. Kishore K Lal, Electronic Devices and Circuits, B S Publicatiobns
3. Owen Bishop, Electronics circuits and systems, 4th Edition, Elsevier
4. Godse A.P., Bakshi U.A., (2009), (1st edition), Electronics Devices, Technical Publications, Pune.

REFERENCE BOOKS

1. Charles Kittel, (2004) , Introduction to Solid State Physics, 8th edition
2. Roy Choudary D., Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd.
3. Pillai.S O, Solid State Physics, New Age International (P) Limited, 6th edition
4. Sedha R S, A TextBook of Applied Electronics, S. Chand & Company Ltd.
5. Jacob Millman and Christos C. Halkias, Integrated Electronics, Tata Mcgraw-Hill
6. Robert L. Boylestad, Louis Nashelsky, Electron Devices and Circuit Theory, Dorling Kindersley (India Pvt. Ltd.), 10th edition

WEBSITES

1. Khan academy.org
2. NPTEL
3. http://www.electronicsteacher.com
4. http://www.science-ebooks.com
5. http://www.abcofelectronics.com
6. www.ocw.mit.edu
7. www.academic.earth

SEMESTER II
PAPER II - CORE PRACTICAL II

SUBJECT CODE	PRACTICAL	MARKS : 100 INTERNAL : 40 EXTERNAL : 60

CREDITS : 3

(Atleast seven experiments should be done for the examination)

1. V-I Characteristics of Junction Diode.
2. Rectifier circuits – Half Wave, Center-tapped Full wave.
3. Bridge Rectifier.
4. V-I Characteristics of Zener Diode.
5. Regulated Power Supply using Zener Diode.
6. Transistor as a switch.
7. Transistor Characteristics of CE Configuration.
8. Logic gates using Diodes.
9. Logic gates using Transistor.
10. Characteristics of UJT.
11. Characteristics of JFET
12. Characteristics of SCR
13. Characteristics of TRIAC
14. Rectifier circuits using SCR

REFERENCE BOOKS

1. Zbar, Malvino and Miller, Basic Electronics, A Text Lab Manual, Tata McGraw Hill.
2. Sugaraj Samuel R., Horsley Solomon, B.E.S. Practicals.
3. Srinivasan M. N., and Others, A text book of practical Physics, Sultan Chand and Sons, New Delhi

SEMESTER III
CORE PAPER 3 - ANALOG ELECTRONICS

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES

To understand the operations and the applications of the various classes of an Amplifier.

1. To familiarize the student with the analysis and design of basic transistor amplifier circuits, feedback amplifiers and multi vibrator circuits.
2. To understand the concepts of Multi Stage Amplifier.
3. To study the operation of Hartley, Colpitts, RC Phase shift, crystal and wien bridge oscillators.
4. To determine the operating characteristic of Unijunction Transistor Oscillator.
5. To study the characteristics of Operational Amplifier.
6. To study the various applications of Operational amplifier and IC 555.

COURSE OUTCOME

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

1. Design and analyze of electronic circuits,
2. Recognize power amplifier circuits, their design and uses in electronics and communication circuits.
3. Know the concept of Multistage and feedback amplifier and their characteristics.
4. Design the different oscillator circuits for various frequencies.
5. Design of circuits using Operational Amplifier and IC 555.

UNIT I

Amplifiers : General principles of small signal & large signal amplifiers. Classification of Amplifiers – Concept of Multistage Amplifier – RC coupled amplifiers - Working – Frequency response – Transformer coupled amplifiers – working – frequency response (Qualitative Analysis) – Direct coupled amplifier – Working - Emitter Follower.

UNIT II

Power Amplifier & Feedback Amplifier : Classification – Class A, B, C amplifiers class A – single ended amplifier – Transformer coupled amplifier – Cross over distortion (definition) – complementary symmetry class B Push pull amplifier – power dissipation and output power calculations.

Feedback: Basic concepts of feedback – Derivation for transfer gain with feedback - effects of negative feedback on input and output resistances, gain, gain stability, distortion and bandwidth – Types of feedback (Voltage series, Voltage shunt, Current series, Current shunt)

UNIT III

Sinusoidal and Non Sinusoidal Oscillators – Barkhausen criterion for oscillation – RC and LC oscillators – Hartley, Colpitt"s, Phase shift & Wien bridge oscillators – Working - frequency of oscillations – Crystal oscillator – UJT Relaxation Oscillator.

UNIT IV

Operational Amplifiers & Timer – IC Identification – op-amp parameters – frequency response of an op-amp – Differential amplifier – CMRR – Inverting amp – Non-inverting amp – voltage follower – IC 555 – pin functions – Internal Architecture.

UNIT V

Applications – Opamp: Summing amplifier – Comparator – Integrator – Differentiator – Square wave generators – Triangular wave generators.

IC 555: Astable – Monostable – Schmitt trigger.

TEXT BOOKS:

1. Jocob Millman and Christos C.Halkias, Integrated Electronics, McGraw Hill.
2. Roy Choudary D, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000.
3. Sedha, R.S. A TextBook of Applied Electronics, S. Chand & company Ltd.
4. Ramakant A. Gayakwad, OP-AMP and Linear ICs, 4th Edition, Prentice Hall / Pearson Education, 1994.
5. G.K.Mithal, Basic Electronic Devices and circuits, 2nd Edition, G.K.Publishers Pvt. Ltd. 1998.

REFERENCE BOOKS:

1. Allen Mottershead, Electronic Devices and Circuits-an Introduction - Prentice Hall.
2. Mithal G.K., Electronic Devices and Circuits, Khanna Publishers.
3. Donald L.Schillling, Charles Belove, Discrete and Integrated Electronic Circuits, McGraw Hill.
4. Jacob Milliman, Micro Electronics, McGraw Hill.

SEMESTER III

CORE PAPER 4 - NUMERICAL METHODS

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 3

COURSE OBJECTIVES

1. To identify and classify the numerical problems to be solved
2. To choose the most appropriate numerical method for its solution based on characteristics of the problem
3. To understand the characteristics of the method to correctly interpret the results
4. To understand the basic methods, algorithms and programming techniques to solve mathematical problems.

COURSE OUTCOME

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

1. Demonstrate the mathematical skills of the students in the areas of numerical methods
2. Analyze the accuracy of common numerical methods
3. Categorize to solve the numerical problems
4. Define the most appropriate numerical method for its solution
5. Locate the method to correctly interpret the results

UNIT I

Interpolation: Finite differences – operators Δ,δ**,E,D –** relation between operators – linear interpolation – interpolation with equal intervals – Newtons forward interpolation formula – Newton backward interpolation formula.

UNIT II

Numerical solutions of Algebraic, Transcendental and Differential equations: Bisection method – Regula falsi method- Newton Raphson method – Horner‟s method – Solution of ordinary differential equation – Euler‟s method (Only Basic)

UNIT III

Simultaneous Linear Algebraic Equations: Method of triangularisation – Gauss elimination method – Inverse of a matrix – Gauss Jordan method.

UNIT IV

Methods of curve fitting: Principles of Least squares – fitting a straight line – linear regression – fitting an exponential curve.

UNIT V

Numerical integration: General Quadrature formula – Trapizoidal rule, Simpson‟s 1/3 rule and 3/8 rule –Applications – Weddle‟s rule.

BOOKS FOR STUDY AND REFERENCE :

1. Numerical Analysis – B.D. Gupta
2. Numerical Mathematical Analysis – J.B. Scorborough.
3. Numerical Mathematics – Balasubramanian and others.
4. Numerical Methods in Science and Engineering – M.K. Venkataraman.
5. Numerical methods by P. Kandasamy, K. Thilagavathy and K. Gunavathy. S. Chand &Co.(2002)
6. Numerical methods by V. Rajaraman, Prentice – Hall India Pvt. Ltd., (2003).

SEMESTER III

CORE PAPER 5 - DIGITAL ELECTRONICS

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES

1. To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
2. To perform decimal, octal, hexadecimal, and binary conversions.
3. To apply Boolean algebra to solve logic functions.
4. To implement simple logical operations using combinational and sequential logic circuits.
5. To identify and differentiate digital electronics applications**.**

COURSE OUTCOME

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

1. Identify the structure of various number systems and its application in digital design
2. Analyze various combinational and sequential circuits
3. Analyze how to interface digital circuits with analog components

UNIT I

Number System and Codes : Decimal, binary, octal, hex numbers, conversion from one to another – codes, BCD, excess 3, gray codes conversion from one to another – Error detection codes.

UNIT II

Boolean Algebra and Theorems : Basic, Universal logic gates – Boolean Identities - Boolean theorems, De Morgan‟s Theorem – sum of products, products of sums expressions, simplification by Karnaugh Map method, simplification based on basic Boolean theorems – don‟t care conditions.

UNIT III

Combinational Digital Circuits : Arithmetic Building blocks, Half & Full Adders and Half & Full Subtractors, BCD adders – multiplexers, De-multiplexers, encoders, decoders – Characteristics for Digital ICs - RTL, DTL, TTL, ECL CMOS (NAND & NOR Gates).

UNIT IV

Sequential Digital Circuits : Flip-flops, RS, Clocked SR, JK, D, T, master-slave Flip flop – Conversion of Flip flop - shift registers – ripple counters – synchronous counters and asynchronous counters (4-bit counter).

UNIT V

DAC: Accuracy-Resolution- Variable Resistor Network, R-2R ladder Network

ADC: Accuracy-Resolution-Successive Approximation-Dual Slope

TEXT BOOKS

1. Jain R P, Modern digital Electronics, 3rd Edition, TMH, 2003.
2. Puri, V.K., Digital Electronics, Tata Mc Graw Hill
3. Marris mano M., Computer System Architecture, 2nd Edition, Prentice Hall, 1998
4. Malvino and Leach, Digital Principles and applications, McGraw Hill, 1996 IV Edition
5. Vijayendran V, Introduction to Integrated Electronics, S.Viswanathan Printers and Publishers, 2005

REFERENCE BOOKS

1. Millman J., Micro Electronics, McGraw Hill International Book Company, New Delhi 1990 Edition.
2. William H. Gothman, Digital electronics – An int. to theory and practice,2nd Edition, PHL of India, 2007.
3. Morris Mano M., “Digital Logic and Computer Design” PHI 2005.
4. Morris Mano M. “Digital Design” PHI 2005.
5. Godse A.P., Digital Electronics, Technical Publications.

WEBSITES

1. Khan academy.org
2. NPTEL
3. http://www.electronicsteacher.com
4. http://www.abcofelectronics.com
5. www.ocw.mit.edu

SEMESTER III

ALLIED 3 - BASIC PHYSICS I

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES

1. Physics is a systematic study of the natural world, a discipline that measures reality through application of observation with logic and reason. In order to make use of such a discipline we need certain foundational information.
2. To provide basic principles and fundamentals of Physics.
3. To understand What is Physics and the different fields of Physics.
4. To understand the fundamental laws and their applications in measuring many physical quantities.

5. To prepare students for careers where Physics principles can be applied to the development of Technology.
6. To understand basic Principles of physics and their applications in every day life.

COURSE OUTCOME

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

1. Define the basics of properties of matter, how Young‟s modulus and rigidity modulus are defines and how they are evaluated for different shapes of practical relevance
2. Describe the fundamentals of harmonic oscillator model, including damped and forced oscillators and grasp the significance of terms like quality factor and damping coefficient
3. Describe the general equation of wave motion in general and TM waves in stretched strings and longitudinal waves in gases
4. Recognize the general terms in acoustics like intensity, loudness, reverberation etc, and study in detail about production, detection, properties and uses of ultrasonic waves

UNIT I

Rotation : Moment of inertia – Radius of gyration – Moment of inertia of a circular ring, circular disc, solid sphere – Kinetic energy of a rolling object – Acceleration of a body rolling down an inclined plane – Uniform circular motion – Centripetal force – Banking of curved tracks.

UNIT II

Elasticity : stress – strain diagram – factors affecting elasticity -Young‟s modulus – Bending moment – Bending of beams – Young‟s modulus by non-uniform bending – Rigidity Modulus - Torsion in a wire – Torsional Pendulum – Definition of Poisson‟s ratio.

UNIT III

Viscosity : Streamline and turbulent flow – Comparison of viscosities by burette method – – Stoke‟s law – Terminal velocity – Viscosity of a highly viscous liquid – Lubrication.

Surface Tension : Molecular theory of surface tension – Excess of pressure inside a soap bubble – surface tension by drop weight method - interfacial surface tension.

UNIT IV

Heat and Thermodynamics : Thermal conductivity – Lee‟s Disc methods – Radial flow of heat – Thermal insulation in buildings – Laws of thermodynamics – Carnot‟s cycle as heat engine and refrigerator – Carnot‟s theorem – Concept of entropy

UNIT V

Acoustics : Acoustics of buildings – Absorption coefficient – Intensity – Loudness – Reverberation time – Ultrasonics – production – Piezoelectric methods – Applications of ultrasonics in Engineering and Medicine – solar energy – Applications of Solar energy in everyday life – Satellites – Orbital Velocity – Uses of Satellite .

TEXT BOOKS

1. Brijlal and Subramanyam -Properties of matter-S.Chand & Company.
2. Dr.Dhanalakshmi , Dr.Sabesan -Allied Physics
3. Kamalakkannan, Jayaraman- Allied Physics.
4. Srinivasan. M.N - A text book of Sound-. Himalaya Publishing house.
5. Mathur.D.S, 5th Edition, 2004 -Heat and Thermodynamics, Sultan Chand & Sons.
6. Dr. Arumugam M., 2nd edition ,Engineering Physics, , Anuradha Publications.

REFERENCE BOOKS:

1. Narayanamoothy and others-Mechanics
2. Halliday.D., Resnick.R. and Walker.J, Wiley, NY 1994.-Fundamentals of Physics.
3. Nelkon and Parker-Advanced level Physics
4. Weber, Manning and White-College Physics
5. Brijlal and Subramanyam-A text book of Sound

WEBSITES:

- Khan academy.org
- NPTEL
- www.ocw.mit.edu
- www.academic.ea

SEMESTER III
PAPER II - CORE PRACTICAL III

SUBJECT CODE	PRACTICAL	MARKS : 100 INTERNAL : 40 EXTERNAL : 60

CREDITS : 3

(Atleast five experiments should be done for the examination)

1. Single stage R-Coupled Amplifier
2. Emitter Follower
3. FET Amplifier
4. Colpitt‟s Oscillator
5. Hartley Oscillator
6. R-C Phase Shift Oscillator
7. Relaxation Oscillator
8. IC Regulated Power Supply
9. OPAMP - Inverting and Non Inverting modes, Unity Follower
10. OPAMP – Summing Amplifiers (Inverting and Non Inverting Modes)
11. OPAMP - Integrator and Differentiator
12. OPAMP –Square Wave Generator
13. OPAMP – Sine Wave Generator
14. Monostable Multivibrator using IC 555 timer
15. Astable Multivibrator using IC 555 timer
16. Schmitt Trigger using IC 555 timer

REFERENCE BOOKS

1. Zbar, Malvino and Miller ,Basic Electronics, A Text Lab Manual , Tata McGraw Hill.
2. R.Sugaraj Samuel & Horsley Solomon, B.E.S. Practical .
3. Srinivasna M N and Others, A text book of practical Physics, Sultan Chand and Sons, New Delhi

SEMESTER III
PAPER II - CORE PRACTICAL IV

SUBJECT CODE	PRACTICAL	MARKS : 100 INTERNAL : 40 EXTERNAL : 60

CREDITS : 3

(Atleast five experiments should be done for the examination)

1. Universality of NAND & NOR gates.
2. Verification of Boolean laws using NAND gates (Associative, Commutative & Distributive Laws)
3. Verification of Boolean laws using NOR gates (Associative, Commutative & Distributive Laws)
4. Sum of Products using NAND gates and Product of Sums using NOR Gates.
5. 4-bit binary parallel adder and Subtractor IC 7483
6. Counter using IC 7473
7. Study of RS, D, T and JK Flip-Flops with IC‟s.
8. Study of Encoder & Decoder.
9. Study of Multiplexer & De-Multiplexer.
10. Half and Full Adder using Simple & NAND Gates.
11. Half and Full Subtractor using Simple & NAND Gates.
12. Study of 7490 BCD Counter – MOD Counters.
13. BCD to Seven segment decoder 7447/7448.

REFERENCE BOOKS

1. Zbar, Malvino and Miller ,Basic Electronics, A Text Lab Manual , Tata McGraw Hill.
2. R.Sugaraj Samuel & Horsley Solomon, B.E.S. Practical .

SEMESTER IV
CORE PAPER 6 - PRINCIPLES OF COMMUNICATION

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 3

COURSE OBJECTIVES

1. To learn the basic principles of analog and digital communication system
2. To familiarize the student with modulation techniques
3. To recognize and understand common modulation schemes for continuous wave modulation including amplitude modulation, frequency modulation and phase modulation.
4. To recognize and understand common digital pulse modulation schemes including delta modulation and pulse-code modulation
5. To understand the common analog pulse modulation schemes including pulse-amplitude modulation, pulse-width modulation and pulse-position modulation

COURSE OUTCOME

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

1. Describe the basic principles of communication system
2. Differentiate analog and digital communication systems
3. Demonstrate the parameters for various types of modulation and demodulation techniques
4. Identify basic communication problem
5. Analyze transmitter and receiver circuits
6. Compare design issues, advantages, disadvantages and limitations of communication systems
7. Define satellite system
8. Differentiate the advantages and disadvantages of geostationary satellites

UNIT I

Communication system: Block diagram Introduction, components of communication system: amplifier, transmitter, channel receiver, band spectrum modulation, types of modulation, Noise, types of noise ,noise calculation.

Transmitters & Receivers : AM transmitter, block diagram and working of Low Level and High Level Transmitters, FM transmitter Receivers: Block Diagram of Receiver, Receiver parameters: sensitivity, selectivity and fidelity, Super Heterodyne Receiver, Double Conversion Receiver. AM receivers, FM receivers.

UNIT II

Modulation & Demodulation : Pulse Code Modulation: Need for digital transmission, Quantizing, Uniform and Non-uniform Quantization, Quantization Noise, Coding, Digital Formats. Decoding, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation and Demodulation techniques.

UNIT III

Digital Communication: Time Division Multiplexing (TDM), Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK). Multiple Access Techniques: Concept of Frequency Division Multiple Access (FDMA), Code Division Multiple Access (CDMA).

UNIT IV

Fiber Optics: Structure of optical fibers, classification of optical fibers, light propagation through an optical fiber, acceptance angle and numerical aperture, Fiber losses, calculation of fiber losses, optical fiber cable, step index fiber, graded index fiber, and modes of propagation ,light detectors.

UNIT V

Satellite communication: Introduction, need, satellite orbits, advantages and disadvantages of geostationary satellites. Satellite visibility, satellite system – space segment, block diagrams of satellite sub systems, up link, down link, cross link, transponders (C- Band), effect of solar eclipse, path loss, ground station, simplified block diagram of earth station, Fundamental of microwave and its applications.

TEXT BOOKS:

1. Kennedy, Electronic communication system, McGraw-Hill
2. Srinivasan K S, Digital communication, ,Tata McGraw-Hill
3. Martine S Roden, Analog and Digital Communication systems
4. William L, Electronic Communication Systems, *Schweber*

REFERENCE BOOKS:

1. Venkatraman S K, Digital communication, S.Chand
2. Roddy and Coolen, Communication electronics
3. Anil K Maini, Varsha Agarwal, Satellite Communication, Wiley publication

SEMESTER IV
CORE PAPER 7 (A) - PROGRAMMING IN C

SUBJECT CODE	THEORY	MARKS : 60 INTERNAL : 15 EXTERNAL : 45

CREDITS : 2

COURSE OBJECTIVES

1. To understand the different types of variables and operators in C programming and their use in different types of operations.
2. To understand the decision making and looping structures in C and use it in program implementations.
3. To understand the purpose of functions in C.
4. To understand how data storage and access in arrays in C.
5. To learn file operations and data manipulations using pointers in C.

COURSE OUTCOME

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

1. Implement programs using Functions, Pointers and Structures in C language
2. Implement files and perform file operations.
3. Perform the execution of programs written in C language.
4. Identify the C code for a given algorithm.

UNIT I

C fundamentals Character set – Identifier and keywords – data types – constants – variables – declarations – expressions – statements – arithmetic, unary, relational and logical, Assignment and conditional operators – Library functions

UNIT II

Data input output functions – Simple C Programs – flow of control – if, if-else, while, do-while, for loop, nested control structures – switch, break and continue, go to statements – comma operator

UNIT III

Functions – definition – proto-types – passing arguments – recursions, storage classes – automatic, external, static, register variables – multi-file programs

UNIT IV

Arrays – defining and processing – passing arrays to functions – multi dimension arrays – arrays and string . Structures – user defined data types – passing structures to functions – self referential structures – unions – bit wise operations

UNIT V

Pointers – declarations – passing pointers to functions – Operation in Pointers – pointer and arrays – arrays of pointers – structures and pointers. Files – creating, processing, opening and closing a data file.

TEXT BOOKS

Balaguruswamy E, Programming in ANSI C, TMH Publishing Company Ltd 1995

REFERENCE BOOKS

1. Kernighan B W and Ritchie D M, The C Programming Language, 2nd Edition, PHI

2. Schildt H, C The Complete Reference, 4th Edition, TMH Pub. Co. Ltd, New Delhi
3. Gothfried B S, Programming in C, 2nd Edition, TMH Pub. Co. Ltd, New Delhi
4. Kanetkar Y, Let us C, BPB Publication, New Delhi

SEMESTER IV
CORE PAPER 7 (B) - PROGRAMMING IN C PRACTICAL

SUBJECT CODE	PRACTICAL (INTERNAL)	MARKS : 40 INTERNAL : 10 EXTERNAL : 30

CREDITS : 1

(Atleast six experiments should be done for the examination)

1. Addition of N number of data‟s
2. Factorial of a Number
3. Fibonacci Series
4. Palindrome of a String
5. Temperature Conversion
6. Armstrong of a Number
7. Largest of a Number
8. Smallest of a Number
9. Ascending order
10. Descending order
11. Matrix Addition
12. Matrix Subtraction

SEMESTER IV
CORE PAPER 8 - MICROPROCESSOR – INTEL 8085

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES

1. To know the microprocessor as a programmable digital system element.
2. To illustrate some basic concepts of microprocessors through the use of assembly language programming.
3. To develop an in-depth understanding of the operation of microprocessors and machine language programming & interfacing techniques.
4. To design simple interfaces to Intel-8085.
5. To Comprehend the various peripheral interface circuits that are necessary for the operation of Intel-8085.

COURSE OUTCOME

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

1. Describe the architecture of 8085 microprocessor
2. Analyze assembly language programmes
3. Implement programme efficiency using various addressing modes
4. Perform Interfacing of memory & various I/O devices with 8085 microprocessor

UNIT I

Introduction of 8085 Microprocessor: Architecture of 8085 microprocessor - Pin details of 8085 – Instruction cycle – machine cycle – T-state -Timing diagrams for Op-code Fetch Cycle Memory Read, Memory Write, I/O Read, I/O Write -Interrupts and its types.

UNIT II

Instruction set of 8085 : Data transfer-Arithmetic-Logical-Branching-Machine control-Addressing modes- Stack –Subroutine - Time delay using register and register pair.

Programming Exercises : Addition and Subtraction(8-bit and 16-bit), Multiplication, Division,

Largest, Smallest, Block transfer, Ascending order and Descending order (all 8-bit data), Binary to BCD, BCD to Binary, Binary to ASCII, ASCII to Binary, BCD to ASCII, ASCII to BCD (all 8-bit data)

UNIT III

Memory : Primary memory –Secondary memory-RAM- ROM- EPROM-EEPROM-Interfacing Memory- 2K X 8, 4K X 8 ROM, RAM to 8085, Interfacing an I/O Devices using Memory Mapped I/O and I/O Mapped I/O – Difference between I/O mapped and Memory Mapped I/O.

UNIT IV

Peripheral Devices : Programmable peripheral interface (Intel 8255), Programmable timer/counter (Intl 8253/8254), programmable Keyboard and Display Interface (Intel 8279)

UNIT V

Microprocessor Applications : Analog to Digital Converter (ADC) - Digital to Analog converter (DAC) - Stepper Motor - Traffic light controller - Temperature controller.

TEXT BOOKS

1. Ramesh S. Gaonakar, Microprocessor Architecture, Programming and Application with the 8085-Penram International Publishing, Mumbai.
2. Ram, Fundamentals of microprocessors and microcomputers-Dhanpat Rai Publications, New Delhi
3. Vijayendran, Fundamentals of microprocessor-8085 – S. Viswanathan publishers, Chennai.

REFERENCE BOOKS

1. Mathur A P, Introduction to Microprocessors., (3rd edn., Tata McGraw, New Delhi, 1995.
2. Leventhal L A, Microprocessor Organisation and Architecture, Prentice Hall India.

SEMESTER IV
ALLIED 4 - BASIC PHYSICS II

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES

1. To provide basic principles and fundamentals of Physics.
2. To understand What is Physics and the different fields of Physics.
3. To understand the tools and methods that Physicists use range from balance scales to Ultrasonics, laser beam emitters.
4. To understand the fundamental laws and their applications in measuring many physical quantities.
5. To prepare students for careers where Physics principles can be applied to the development of Technology

COURSE OUTCOME

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

1. Define the basic concepts behind Optics, Nuclear Properties and Radio Activity
2. Describe the basics in Laser
3. Implement the applications of Fibre Optics

UNIT I

Optics : Interference – Newton‟s rings – Measurement of wavelength and radius of curvature by Newton‟s rings with theory – Diffraction – Elementary theory of formation of spectra by transmission grating (normal incidence) – Determination of wavelength – Polarization – Optical activity – Brewster‟s law – Determination of specific rotatory power – Half shade polarimeter – Uses of polarized light.

UNIT II

Modern Physics : Photo electricity: Photoelectric emission – Einstein‟s theory – Millikan‟s experiment – Photoelectric cell – Photovoltaic cell – Photoconductive cell.

Nuclear Physics : Properties of nuclei – size, charge, mass & spin – Binding Energy – Nuclear fission and fusion – liquid drop model – Semi empirical mass formula – Shell model – magic numbers.

Radio Activity : Natural radioactivity – Artificial radioactivity – Radio isotopes – Uses of radio isotopes – Nuclear reaction – Q value of a reaction.

UNIT III

Laser Physics : Introduction- Principle of spontaneous emission and stimulated emission. Population inversion, pumping. Eienstein‟s A and B coefficients-derivation. Types of Lasers- Ruby Laser, Nd-YAG, Semiconductor lasers-Applications of lasers.

UNIT IV

Fiber Optics : Introduction – Principle and structure of optical fibers – Propagation of light through optical fibers – types of optical fibers – Optical fiber communication system (block diagram)

UNIT V

Fiber Optic Sensors – Medical Applications of Optical fibers- Endoscope- Engineering Applications of Optical fibers- Telecommunications-Computer Networks- Cable television – Advantages.

TEXT BOOKS

1. Brijal and Subramanian-Text book of optics ,S.Chand & Company.
2. Mr. Kamalakkannan and Jayraman..Allied Physics
3. R. Murugeshan- Modern Physics, S.Chand & Co.
4. Dr. Arumugam M, 2nd edition, 2002 -Engineering Physics, , Anuradha Publications.
5. Agarwal. G.P. , 3rd Edition , 2002- “Fiber-Optic Communication Systems” ,John Wiley & Sons

REFERENCE BOOKS

1. Thiagarajan-Laser Physics.
2. Gaur & Gupta- Engineering physics .
3. Dr. Arumugam-Bio Medical Instrumentation - Anuradha Publications.
4. Keiser. G. “Optical fiber communications”, 4th Edition Tata McGraw-Hill, New Delhi, 2008

WEBSITES

1. Khan academy.org
2. NPTEL

SEMESTER IV
PAPER II - CORE PRACTICAL V

SUBJECT CODE	PRACTICAL	MARKS : 100 INTERNAL : 40 EXTERNAL : 60

CREDITS : 3

(Atleast six experiments should be done for the examination)

1. Addition & Subtraction (8 & 16-bits)
2. Multiplication & Division (8 – bit)
3. Square and Square root
4. Largest & Smallest number in the given array.
5. Ascending & Descending order.
6. Binary to ASCII & ASCII to Binary, BCD to ASCII & ASCII to BCD.
7. Binary to BCD and BCD to Binary.
8. Block Move or Data Transfer.

SEMESTER IV
ALLIED - BASIC PHYSICS PRACTICAL

SUBJECT CODE	PRACTICAL	MARKS : 100 INTERNAL : 40 EXTERNAL : 60

CREDITS : 2

(At least Seven experiments should be done for the Examination)

1. Young‟s Modulus by non-uniform bending – pin and microscope (Thickness and Breadth may be given)
2. Young‟s Modulus by uniform bending – Optic Lever and Telescope (Thickness may be given)
3. Rigidity modulus by Torsional pendulum
4. Surface tension and interfacial surface tension by drop weight. (Density of water = 1000, Density of Kerosene=800)
5. Comparison of viscosities of liquids using un graduated burette. (Density of water = 1000, Density of Kerosene=800)
6. Thermal conductivity of a bad conductor by Lee‟s disc method
7. Melde‟s string – frequency of a vibrator
8. Sonometer – determination of AC frequency
9. Spectrometer – i-d curve
10. Spectrometer – grating at normal incidence – determination of wavelength of mercury spectrum (Number of lines of grating may be given)
11. Newton‟s rings – Wavelength of sodium light

REFERENCE BOOKS

1. Srinivasan M.N. and Others, A text book of practical Physics, Sultan Chand and Sons, New Delhi
2. Srinivasan M.N., Allied Practical Physics, Sultan Chand and Sons, New Delhi

SEMESTER V
CORE PAPER 9 - MICROCONTROLLER

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES

1. To familiarize with different types of microcontroller
2. To know 8051 microcontroller in detail
3. To learn programming and Interfacing with 8051 microcontroller
4. To develop an in-depth understanding of the operation of microcontroller and interfacing techniques
5. To understand and use various IO devices such as keypads, stepper motor, A to D

COURSE OUTCOME

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

1. Describe the architecture of 8051 microcontroller
2. Describe the operation of microcontroller
3. Implement the machine language programming
4. Demonstrate keyboard, display, stepper motor, ADC & DAC interfaces

UNIT I

Introduction to Microcontroller – comparison of Microcontroller & Microprocessor – 8051 Architecture – Block diagram – 8051 Pin details- Memory Organization– Counter and Timers – Serial Communication – Interrupts.

UNIT II

8051 Instruction set – Addressing Modes – Data Transfer, Aritmatic, Logical, Branching Instructions, Bit level Instructions

UNIT III

Programming Exercise (8 Bit) : Addition, Subtraction, Multiplication, Division, Data Transfer, Largest/Smallest Number, Ascending/Descending Order-Basic Time Delay

UNIT IV

Interfacing : Keyboards – Displays – ADC & DAC – Stepper motor.

UNIT V

Embedded systems: Block Diagram-Uses Von Neumann and Harvard Architecture – Introduction to CISC and RISC

TEXT AND REFERENCE BOOKS

1. Kenneth J Ayala, The 8051 Microcontroller: Architecture, Programming and Applications, West Publishing company
2. Mazidi, E. and Mazidi, F., The 8051 Microcontroller and Embedded systems, Prentice – Hall of India (2004) 2md ed.
3. Jack Ganssle and others, Embedded Hardware, Elsevier Inc

SEMESTER V
CORE PAPER 10 - ELECTRICAL AND ELECTRONICS INSTRUMENTATION

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES

1. To introduce the basic concepts related to the operation of Electrical and Electronics Measurement Instruments
2. To study the basics of design of analog and digital circuits used in electronic instrumentation
3. To understand basic electronic instrument terminology
4. To understand the proper application of electronic instruments

COURSE OUTCOME

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

1. Categorize DC and AC indicating instruments
2. Recognize various AC and DC bridges
3. Recognize the basic features of oscilloscope and different types of oscilloscopes
4. Identify the complete knowledge of various electronics instruments/transducers to measure the physical quantities in the field of science and technology.

UNIT I

DC indicating Instruments: PMMC Galvanometer (D‟ Arsonal Movement) – Principle, Construction and Working –– Conversion of Galvanometer into Ammeter, Voltmeter and Ohmmeter (Series and Shunt Types) – Multimeter – Loading Effect.

AC indicating Instruments: Electrodynamometer – Principle, Construction and Working – Merits and Demerits – Rectifier Type Instruments – Watt-hour Meter.

UNIT II

DC Bridges: Wheatstone bridge – Determination of resistance – Kelvin Double Bridge - Determination of resistance.

AC Bridges: Maxwell‟s Bridge – Determination of Self-Inductance – Wien‟s Bridge – Determination of Frequency – Schering‟s Bridge – Determination of Capacitance

UNIT III

Oscilloscopes: Block Diagram – Deflection Sensitivity – Electrostatic Deflection – Electrostatic Focusing – CRT Screen – Measurement of Waveform frequency, Phase difference and Time Intervals – Sampling Oscilloscope – Storage Oscilloscopes (Introduction).

UNIT IV

Instrumentation Amplifiers and Signal Analyzer: Instrumentation amplifier – Electronic Voltmeter – Digital Voltmeter– Block Diagram of Function Generatior – Wave analyzer – Fundamentals of Spectrum Analyzer.

UNIT V

Transducers and Display Devices: Strain Gauge – Unbonded Strain Gauge – LVDT – Resistance Thermometer – Thermocouple – Photoelectric Transducer – Seven Segment Display – LCD.

REFERENCE BOOKS

1. Electronic Instrumentation and Measurement Techniques – W.D. Cooper & A.D. Helfrick, Prentice Hall of India.
2. A course in Electrical and Electronic Measurements and Instrumentation – A.K. Sawhney, Dhanpat Rai and Sons.
3. Electronic Instruments & Measurements – P.B. Zbar, McGraw Hill International.
4. J.B. Gupta, „ A course in Electronic and Electrical Measurements‟, S.K. Kataria& sons, Delhi, 2013.

SEMESTER V

CORE PAPER 11 - ANTENNAS THEORY AND RADAR SYSTEM

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES:

1. To provide the basic knowledge about the fundamentals of antenna.
2. To describe the electromagnetic radiation with application to antenna theory and design.
3. To make the students understand the radio wave propagation phenomena in modern communication systems.
4. To understand the applications of the electromagnetic waves in free space.
5. To understand the advanced topics in digital television and High definition television.
6. To study the analysis and synthesis of Radar Navigation, Tracking, Radar receivers.

COURSE OUTCOME

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

1. Define the concept of Antenna parameters and types.
2. Explain the fundamental concepts of television transmission, reception and scanning methods.
3. Define the fundamental concepts of Wave Propagation.
4. Describe the working principles of latest digital TV and HDTV, LED and OLED.
5. Recognize the concept of RADAR,

UNIT I

Fundamentals of Antenna : Antenna parameters – Gain and directivity – Efficiency – Effective length – Bandwidth – Beam width – Radiation resistance – Polarization – Grounded and ungrounded antenna‟s – Effects of antenna height – Radiation Patterns

UNIT II

Types of Antennas : Microwave antenna‟s – Parabolic antenna – Horn antenna‟s – Lens antenna – Discone antenna – Rhombic antenna.

UNIT III

Wave Propagation : Electromagnetic radiation – Propagation of Waves – Surface wave propagation – sky wave propagation – space wave propagation – Tropospheric scatter propagation – Virtual height – MUF – skip distance – Ionospheric abnormalitics.

UNIT IV

Elements of TV system : Block Diagram of Picture transmission and reception – Sound transmission and reception – Synchronization – Colour television Transmission & Reception (Block Diagram) – Image continuity – Number of Scanning lines – Scanning – Sequential – Interlaced Scanning – Introduction to HDTV, LED TV, OLED TV.

UNIT V

Radars : Principle, Maximum Unambiguous Range, Radar Waveforms, Radar Block Diagram and Operation, Radar Frequencies, Uses.

TEXT BOOKS

1. Srinivasan. K.S., Analog Modulation & Systems
2. Srinivasan. K.S. Digital Communication
3. Bakshi K.A,., Bakshi A.V., Bakshi U.A., Antenna & wave propagation, (Technical publications 2009)
4. Gulati R. R., Monochrome and Colour Television (Wiley Eastern, New Delhi, 1995).

REFERNCE BOOKS:

1. Raju G.S.N., (2004) Antenna & wave propagation, Pearson education India.
2. Grob B., Basic Television and Video Systems,, McGraw Hill.
3. Veera Lakshmi A., Srivel R., (2010) Television And Video Engineering (Ane Books India,)
4. Introduction to RADAR systems -Merrill I.Skolnit,Second Edition - Mcgraw Hill,1981

SEMESTER V
PAPER II - CORE PRACTICAL VI

SUBJECT CODE	PRACTICAL	MARKS : 100 INTERNAL : 40 EXTERNAL : 60

CREDITS : 3

(Atleast Eight experiments should be done for the examination)

1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Largest Number
6. Smallest Number
7. Block Transfer
8. Ascending Order
9. Descending Order

SEMESTER VI
CORE PAPER 12 - COMPUTER NETWORKS

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES

1. To learn the definition and basic terminology of Computer Networks
2. To learn the different types of Computer Networks
3. To know the application of computer networks in different fields
4. To know Multiplexing, transmission media and signals
5. To learn the functioning of OSI model and describe the responsibilities of each layer
6. To know about the individual components and functioning of the internet
7. To learn the hardware components used in the networking

COURSE OUTCOME

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

1. Explain the OSI Reference Model
2. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies

3. Describe the functions of Physical, Data Link, Network layers in OSI model
4. Define the transport, session and presentation layers

UNIT I

Introduction to Computer Networks : User of Network – Network structure – The OSI reference model concepts – layers of the OSI model

UNIT II

The Physical Layer : Different types transmission medium – CODEC – switching techniques – channel allocation methods – ALOHA protocol – LAN protocol (any one) – IEEE standards 802.3 (Ethernet), 802.4 (token ring), 802.5 (token bus)

UNIT III

The Data Link Layer : Design issues – concept of framing – different methods – error detection and correction (single error correction and cyclic redundancy check)

UNIT IV

The Network Layer : Design issues – Internal organization of network layer – congestion control algorithm, leaky bucket algorithm and token bucket algorithm – Dijikstra routing algorithm

UNIT V

Repeaters, bridges, routers and gateways – brief introduction to the transport layer, session layer, presentation layer – basic concepts of internet – WWW

TEXT BOOKS

1. Andrew S Tenenbaum, Computer Networks, Prentice Hall of India
2. Stallings W, Data and Computer Communications, Printice Hall of India
3. Behrouz and Forouzan, Introduction to data communications and networking, McGrawh Hill

WEBSITES

1. Khan academy.org
2. NPTEL
3. http://wwww.electronicsteacher.com
4. http://www.science-ebooks.com
5. http://www.abcofelectronics.com
6. www.ocw.mit.edu
7. www.academic.earth

SEMESTER VI
CORE PAPER 13 - REAL TIME EMBEDED SYSTEM

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES

1. To familiarize with Arduino as IDE, programming language & platform.
2. To provide knowledge of Arduino boards and basic components.
3. Develop skills to design and implement various smart system application.
4. To gain knowledge about Raspberry Pi
5. To learn the basics of Internet of Things and IOT based applications

COURSE OUTCOME

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

1. Explain Arduino environment and its applications
2. Design Smart systems applications
3. Implement circuits using Arduino
4. Perform Raspberry Pi using the programming language Python
5. Analyze the IOT based applications

UNIT I

EMBEDDED SYSTEM DESIGN: BASICS

Introduction to embedded systems - Components of embedded system-Advantages and applications of embedded systems-Different Microcontroller Architectures (CISC, RISC, ARISC)-Introduction to ARDUINO-Types of Arduino boards- Architecture and Pin configuration.

UNIT II

ARDUINO TECHNIQUES AND PROGRAMMING

Arduino IDE Setup and Installation. Introduction to Embedded C- Program structure - Data types-Variables and constants - Operators-Control Statements-Arrays-Library Functions. Programming in Arduino: Analog and Digital value read- Temperature and Humidity Sensor - Ultrasonic sensors-Flame sensors-Heart beat rate sensors-Light Sensitive sensor. Arduino Output displays-Serial monitor and plotter, LED blink, LCD Display.

UNIT III

RASPBERRY PI

History of Raspberry Pi-Different Models of Raspberry Pi-Applications of Raspberry Pi-Architecture and Hardware specifications- Basic Linux commands on Raspberry Pi - Creating, editing, and saving files on Raspberry Pi-Creating and running Python programs.

UNIT IV

RASPBERRY PI PYTHON PROGRAMMING TECHNIQUES

Variables, Keywords, Operators and Operands- Data Types in Python - Flow Control, Condition Statement - Loops, Importing Libraries - Functions, Classes - Python and Hardware Access-LED Blinking using Python Raspberry Pi library- Temperature sensing using temp sensor-Motion detection using Raspberry Pi.

UNIT V

IOT DESIGN USING ARDUINO AND RASPBERRY PI

Introduction to IoT-Introduction to Node MCU ESP8266- Interfacing of Arduino with ESP8266-IOT using Thing Speak-Sending sensor data to IOT cloud-Build IoT project weather forecast - IoT Applications based on Raspberry Pi-Installing and configuration IoT Framework-GPIO Control over Web Browser-Creating Custom Web Page for interfacing light emitting diodes (LEDs), switch, buzzer-Raspberry Pi sensor interfacing.

BOOKS FOR STUDY:

1. M. Schmidt, Arduino: a quick-start guide. Dallas: The Pragmatic Bookshelf, 2015.
2. T. Igoe, Making things talk. San Francisco, CA: OReilly Media, 2017.
3. Adith Jagadish Boloor, Arduino by Example. Birmingham: Packt Publishing Limited, 2015.
4. M. McRoberts, Beginning Arduino. Berkeley, CA: Apress, 2013.
5. Aaron Asadi, Raspberry Pi for beginners: all you need to know to get started with Raspberry PI. Bournemouth, Dorset: Future Publishing, 2017.
6. M. E. Soper, Expanding Your Raspberry Pi: Storage, printing, peripherals, and network connections for your Raspberry Pi. Berkeley, CA: Apress, 2017.
7. T. L. Warner, Hacking Raspberry Pi. INpolis, IN: Que, 2014.
8. W. Donat, Learn Raspberry Pi programming with Python: learn to program on the worlds most popular tiny computer. New York: Apress, 2018

BOOKS FOR REFERENCE:

1. T. Pan and Y. Zhu, Designing embedded systems with Arduino a fundamental technology for makers. Singapore: Springer, 2018.
2. J. Nussey, Arduino for dummies. Hoboken, NJ: Wiley, 2018.
3. R. Grimmett, Raspberry Pi robotics projects get the most out of Raspberry Pi to build enthralling robotics projects. Birmingham: Packt Publ., 2015.
4. S. Monk, Programming the Raspberry Pi, Second Edition: Getting Started with Python. McGraw-Hill Education, 2015.
5. S. McManus and M. Cook, Raspberry Pi for dummies. Hoboken, NJ: John Wiley & Sons, Inc., 2017.
6. W. W. Gay, Mastering the Raspberry Pi. Berkeley, CA: Apress, 2014.

WEBSITES:

https://www.arduino.cc/en/Tutorial/HomePage?from=Main.Tutorials
https://www.tutorialspoint.com/arduino/index.htm
https://www.raspberrypi.org/
https://projects.raspberrypi.org/en/

WEBINARS:

https://www.udemy.com/course/arduino-workshop-step-by-step-guide/
https://www.youtube.com/watch?v=1R3fqSFCAjM
https://www.youtube.com/watch?v=d8_xXNcGYgo&list=PLGs0VKk2DiYx6CMdOQR_hmJ2NbB4mZQn-
https://www.udemy.com/course/a-rookies-guide-to-raspberry-pi/
https://www.youtube.com/watch?v=xiR14tSfc-U&list=PLPK2l9Knytg67nkvpnnl81ossAHfOgmqU

SEMESTER VI
CORE PAPER 14 - BIOMEDICAL INSTRUMENTATION

SUBJECT CODE	THEORY	MARKS : 100 INTERNAL : 25 EXTERNAL : 75

CREDITS : 4

COURSE OBJECTIVES

1. To enable the students to learn about bio-potentials and medical instruments
2. To enable students to know various instruments used for diagnostics and treatment.
3. To introduce an fundamentals of transducers as applicable to physiology
4. To explore the human body parameter measurements setups

COURSE OUTCOME

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

1. Describe the origin of biopotentials and explain the role of biopotential electrodes;
2. Design and operate biopotential amplifiers
3. Describe common biomedical signals and distinguish characteristic features
4. Measure biomedical information
5. Demonstrate the position of biomedical instrumentation in modern hospital care
6. Explain the Physiological assist devices and Computer Applications

UNIT I

Basic Physiology : Cells and their Structures - Transport of Ions through Cell Membrane - Resting and Excited State Transmembrane Potential - Action Potential - Propagation of Bioelectric Potential – Piezo electric and Ultrasonic Transducers.

UNIT II

Bio-potential Recording : Basic Electrode Theory - Micro electrodes, skin electrodes, needle electrodes – pH electrode – Blood gas electrode. ECG - EEG - EMG - ERG - different lead systems - their waveforms.

UNIT III

Measurement of Biological Parameters & Treatment : Measurement of heart beat rate - measurement of temperature - Sphygmomanometer - – Blood Gas analysers, pH meter - blood flow meters EM and plesthsmographic technique – Applications of LASER in Medicine

UNIT IV

Diagnostic Equipments & Biotelemetry : X-ray Imaging - Radio Fluoroscopy - Image Intensifiers - Angiography - Endoscopy – Diathermy – Shortwave, microwave & Ultrasonic Diathermy. BIOTELEMETRY AND PATIENT SAFETY: Need for Biotelemetry - Elements of Telemetry System – Applications of Telemetry in Patient care.

UNIT V

Physiological assist Devices : Need for Pacemakers - Pacemaker Parameters and Circuits - Different Modes of Operation - DC Defibrillator - Ventilators - Dialysis – Hemodialysis -. **Computer**

Applications : Computerized Axial Tomography (CAT) Scanner - MRI – Ultrasonography - Computer Based Patient Monitoring System.

TEXT BOOKS

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education Asia, New Delhi, 4th Education, 2001
2. Leslie Cromwell., Fred J. Webell, Erich A. Pfeffer."Bio-medical Instrumentation and Measurements", Prentice Hall of India, New Delhi, 1990
3. Arumugam. M, "Biomedical Instrumentation", Anuradha Agencies Publishers, Chennai, 1992

REFERENCE BOOKs

1. Khandpur, "Handbook on Biomedical Instrumentation", Tata McGraw Hill Company, New Delhi, 1989
2. John G Webster, Ed., "Medical Instrumentation Application and Design", Third Edition, John Wiley & Sons, Singapore, 1999

SEMESTER VI
PAPER II - CORE PRACTICAL VII

SUBJECT CODE	PRACTICAL	MARKS : 100 INTERNAL : 40 EXTERNAL : 60

CREDITS : 3

(Atleast eight experiments should be done for the examination)

Interfacing with 8085

1. DAC
2. ADC
3. Traffic light interface
4. Clock Program
5. Flashing LED
6. Stepper Motor

Interfacing with Arduino

7. Blinking of an LED
8. LCD
9. IR Sensor
10. Gas Sensor
11. Heart beat sensor
12. Stepper motor.

(SEMESTER V/VI) - ELECTIVES
ELECTIVE 1 : SENSOR TECHNOLOGY

CREDITS : 5

COURSE OBJECTIVES

1. To acquire the knowledge about Sensors, Transducers fundamentals and its applications in biomedical instrumentation.
2. To make students aware about the measuring instruments and the methods of measurement and the use of different transducers
3. To make students familiar with the constructions and working principle of different types of sensors and transducers

COURSE OUTCOME

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

1. Explain the working principle of sensors
2. Identify appropriate sensors for various applications
3. List type of sensors

UNIT I

Measurements and Sensing Fundamentals : Measurements - Significance - Concept of Direct and Indirect Measuring Methods - Static and Dynamic Characteristics of Sensors - Mechanical, Thermal and Electrical Dynamic Models of Sensor Elements - Advantages of Sensors - Classifications of Transducers - Primary and Secondary Transducers - Characteristics of Transducers.

UNIT II

Transducers and Primary Sensing Elements : Introduction, Quartz Sensors, Strain Gauge Sensors: Strain-Gauge Based Measurements, Strain Gauge Sensor Installations, Sensor Types and Technologies, Introduction to temperature sensor, types and technologies, applications of temperature Sensors.

UNIT III

Measurement of Non-Electrical Quantities : Measurement of pressure: using electrical transducers as secondary transducers - Low pressure: Pirani gauges - Measurement of linear velocity (moving magnet type) - Measurement of angular velocity (D.C. Tachometer generators and Digital methods) - Measurement of vibrations – Seismic transducers - Measurement of liquid level - Measurement of thickness - Measurement of Humidity - Gas analyzer.

UNIT IV

Signal Conditioners : Capacitive and Inductive Displacement Sensors, Introduction to Capacitive and Inductive Sensors, Capacitive and Inductive Sensor Types, Selecting and Specifying Capacitive and Inductive Sensors, Comparing Capacitive and Inductive Sensors, Applications

UNIT V

Optical, Position and Biosensors : Photosensors, Contact and Non-contact Position Sensors, Linear and Rotary Position and Motion Sensors, Biosensors: Overview of Biosensor, Applications of Biosensors, Origin of Biosensors, Bioreceptor Molecules, Transduction Mechanisms in Biosensors, Application Range of Biosensors.

TEXT BOOKS

1. Sawnney A K, A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai & Co., 2005
2. Kalsi H S, Electronics Instrumentation, 2nd Edition,TMH, 2004.
3. Dr, Arumugam M, Biomedical Instrumentation, 2nd Edition, Anuradha Publications.

REFERENCE BOOKS

1. Waltenegus Dargie, Christian Poellabauer, Fundamentals of wireless sensor networks, John Wiley & Sons Ltd
2. Ian R Sinclair, Sensors and Transducers, 3rd Edition, Newnes
3. William C Dunn, Introduction to Instrumentation, Sensors and Process Control, Artech House, Inc.
4. Jacob Fraden, Handbook of Modern sensors - Physics, Designs & applications, Springer, 2004
5. Donald P. Eckman, Industrial Instrumentation, CBS Publishers, 2004.

ELECTIVE 2 : MOBILE COMMUNICATION

COURSE OBJECTIVES

1. To understand the basic cellular system concepts.
2. To identify the requirements of mobile communication
3. To learn the basic principles of the modern mobile and wireless communication systems

COURSE OBJECTIVES

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

1. Explain the basic physical and technical settings functioning of mobile communications systems
2. Define the basic principles of mobile communication system
3. Describe the development and implementation of mobile communication systems
4. Recognize the mobile system specification

UNIT I

Modern Telecommunication Systems: Telephone communication Electronics: manual and automatic switching networks - Overview of early systems of Strowger, Crossbar and Stored program switching - Exchanges: analog and digital exchanges - speech digitization and transmission - traffic engineering, numbering plan, - WLL, radio paging services.

UNIT II

Cellular Communication : Concept of cellular mobile communication-Cell and Cell splitting, frequency bands used in cellular communication, absolute RF channel numbers, frequency reuse, roaming and hand off, authentication of the SIM Card of the subscribers, IMEI numbers, concept of data encryption, architecture (block diagram)of cellular mobile communication network.

UNIT III

GSM : Channels and Services 8HrsTraffic and Logical Channels in GSM, GSM time hierarchy, GSM burst structure, Description of call setup procedure, Handover mechanism in GSM, Security in GSM. Data transmission in GSM:Data Services, SMS, HSCSD, GPRS, EDGE. Multiple Access Techniques-TDMA.

UNIT IV

Satellite access, TDMA, FDMA, CDMA concepts, comparison of TDMA and FDMA,GPS-services like SPS & PPS .Mobile IP,OSI model, Wireless LAN requirements -Concept of Bluetooth, Wi-Fi and WiMax.

UNIT V

Evolution of Mobile Technologies : LTE basics, LTE frame structure, LTE Design parameters with Standardization and Architecture of LTE. Overview of Networks : Comparison of4G and 5G technology.

REFERENCE and TEXT BOOKS

1. ThiagarajanVishwanathan,Telecommunication, PHI
2. Lee W C Y, Mobile Cellular Telecommunications,.McGraw Hill.
3. Christopher Cox, LTE, WILEY

ELECTIVE 3 : INDUSTRIAL ELECTRONICS

COURSE OBJECTIVES

1. To familiarize students to the principle of operation, design and applications of Thyhristor
2. To learn the triggering mechanism and commutation
3. To understand the basic operation of Invertors
4. To know the applications of LASER, Ultrasonics and Radar

COURSE OUTCOME

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

1. Explain the principle and application of Thyristor
2. Implement the triggering mechanism in various applications
3. Describe the basic operation of Invertors
4. Analyze the applications of LASER, Ultrasonics and Radar in various fields

UNIT I

Thyristors and their Operations: Principles and operations of SCR – Voltage amplifier gate characteristics of SCR – Characteristics of two transistor models – Thyrister construction – Rectifier circuit using SCR – GTO – Operation and characteristics of DIAC – TRIAC – Silicon Controlled Switch – Silicon Unilateral Switch – Silicon Bilateral Switch – Light activated SCR

UNIT II

Turn On/Off Mechanism: Types of turn on methods: AC gate triggering: R triggering – RC triggering – DC gate triggering – Pulse triggering – Types of turn off methods: Natural commutation – Forced Commutation: Self Commutation – Complimentary commutation – Auxiliary commutation – External pulse commutation – Line commutation – Thyristor rating

UNIT III

Invertors: Types of invertors – Single phase bridge inverter – Mc Murray impulse communication inverter – Single phase half bridge voltage source inverter – Single phase full bridge voltage inverter – Step down choppers – Step up choppers – Chopper classification

UNIT IV

Choppers: Introduction – Basic chopper classification – Basic chopper operation – Control strategies – Chopper configuration – Thyristor chopper circuits – Jones chopper – Morgan chopper – A.C. chopper – Source filter – Multiphase choppers

UNIT V

Industrial Applications: Automatic Street light - Single Phase Inverter - DC Choppers (Step up and Step down) - R and RC Triggering - External Pulse Commutation - DC motor controller and Light Dimmer - Time delay circuit – Application of LASER in industry – Ultrasonic application – Radar application

REFERENCE and TEXT BOOKS

1. Harish C Rai, "Power Electronic Devices, Circuits, Systems and Applications", Gac Gotia Publication Pvt. Ltd., 1st Edition, 1998
2. Ramamourthy "Thyrister and their applications" East-West Publishers, 2nd Edition
3. Shamir K Datta "Power Electronics and Controllers" PHI, 3rd Edition
4. Singh M D and Khanchandani K B "Power electronics", Tata McGraw – Hill publishing company limited
5. Adolph Blicher, Thyristor Physics, Springer-Verlag

ELECTIVE 4 : CONSUMER ELECTRONICS

COURSE OBJECTIVES

1. To familiarize with microwave ovens and types
2. To learn the concepts in washing machines, airconditioners and refrigerators
3. To understand the working of facsimile machine, xerographic copier and calculators
4. To know ATM, set top box and digital cable TV
5. To familiarize with online ticketing and electronic fund transfer

COURSE OUTCOME

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

1. Explain the functions of microwave oven
2. Perform electronic fund transfer and online ticketing
3. Describe the working of Airconditioner and Refrigerator
4. Define the basics behind facsimile machine, calculators and digital clocks

UNIT I

MICROWAVE OVENS: Microwaves (Range used in Microwaves 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 - 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 and networks - Barcode Scanner and decoder - Electronic Fund Transfer - Automated Teller Machines (ATMs) - SetTop boxes - Digital cable TV - Video on demand.

REFERENCE and TEXT BOOKS

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

WEBSITES

1. Khan academy.org
2. NPTEL
3. http://www.electronicsteacher.com
4. http://www.science-ebooks.com
5. http://www.abcofelectronics.com

ELECTIVE 5 : MICROWAVE AND FIBEROPTIC COMMUNICATION SYSTEMS

COURSE OBJECTIVES

2. To study the principles of generation, transmission and application of microwaves
3. To explore the optical communication systems techniques and compare with other methods of transmission
4. To study the properties and design of oscillator and amplifier
5. To understand the concepts of multi-mode and single-mode
6. To understand how fiber-optic communication systems work
7. To understand the applications of Radar

COURSE OUTCOME

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

1. Define the principles of generation, transmission and applications of microwave
2. Demonstrate the design of oscillator and amplifier
3. Describe the working of fiber-optic communication system
4. List the applications of Radar

UNIT I

INTRODUCTION TO MICROWAVES: Introduction – Maxwell‟s equation – Amperes law – Faradays law – Gauss law – Wave equation – Types of wave guides – TE and TM modes – Propagation of TM waves in rectangular wave guide – TM modes in rectangular wave guides.

UNIT II

MICROWAVE AMPLIFIERS AND OSCILLATORS: Microwave tubes: - Two cavity Klystron – Multi cavity Klystron – Reflex Klystron – Traveling wave tube (TWT) – Backward wave Oscillator (BWO) – Magnetron – Applications.

UNIT III

MICROWAVE DEVICES: Microwave transistors – Gallium Arsenide (GaAs) metal semi - conductor FET – Varactor Diode – PIN diode – Scotty diode – Tunnel diode – Gunn diode – IMPATT diode – TRAPATT diode – BARITT diode – Maser principle – Applications.

UNIT IV

RADAR: Introduction – Block diagram – Classification – Radar range equation – Factors affecting the range of a radar receivers – Line pulse modulator – PPI (Plane Position Indicator) – Moving Target Indicator (MTI) – FM CW Radar- Applications.

UNIT V

OPTICAL FIBER COMMUNICATION: A basic fiber optic system – Frequencies – Fiber optic Cables – Refraction – Numerical Aperture – Graded index cables – Single mode – Multi mode – Cable Constructions – Cable losses – Connectors – Light Sources – Light Detector – Systems Components – Advantages and Disadvantages.

REFERENCE and TEXT BOOKS

1. Kennedy, Davis, Electronic Communication Systems, Tata McGraw Hill Publishing Company Limited, III edition.
2. Robert J Schoenbeck, Electronic Communications Modulation and Transmission, PHI,1999
3. Kulkarni M, Microwaveand Radar Engineering, 2nd Edition, Umesh Publications
4. Samuel Y.Liao, Microwave Devices and Circuits, 2nd Edition, PHI Private Limited
5. Anikh Singh, Principles of Communication Engineering, 2nd Edition, S.Chand & Company Limited

WEBSITES

6. Khan academy.org
7. NPTEL
8. http://www.electronicsteacher.com
9. http://www.science-ebooks.com
10. http://www.abcofelectronics.com

ELECTIVE 6 : THEORY OF ROBOTICS AND AUTOMATION

COURSE OBJECTIVES

1. To understand the concepts, types of robots and automation.
2. To impart fundamental theory of various components and parts of robots
3. To provide the basics and advance theory concepts in Automation using PLC,SCADA and DCS
4. To be aware of the basic components and systems in Automotive Electronics.
5. To develop skills in design and programming robots for automation using Arduino.

COURSE OUTCOME

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

1. Explain concepts, types and various components of robots
2. Describe the basics of Automation and exposure to PLC,SCADA and DCS
3. Define the basic theory and comfort & safety systems in Automotive Electronics.
4. Recognize programming knowledge to build up applications in robots.

UNIT I

Basic Theory of Robotics and Parts History of Robotics - Definition and Basics of Robotics - Laws and knowledge base of Robotics

Types : Industrial Robot - Fixed, Mobile Robots, Autonomous and Unmanned Robot - Manipulators - pitch, yaw, joints, speed of motion and payload - Sensors – End effectors - Motors and Grippers for Robots.

UNIT II

Electronic control and Programming for Robots Introduction to Robot Programming Languages - VAL programming and commands for simple program - **Controllers for Robot action and programming:** Arduino Uno board and Raspberry Pi board – **Programming tools:** Arduino IDE and ROS.

UNIT III

Introduction to Automation theory Introduction to Automation - Laws and Principles - Types – Circuits – Electric and Electronic Controls - Programmable Logic Controller (PLC): Introduction, definition, block diagram - Introduction to SCADA and DCS - Introduction to Artificial Intelligence (AI) and machine learning. **Case study:** Robot in industrial and medical automation.

UNIT IV

Fundamentals of Automotive Electronics Development of automotive electronics - batteries and charging - ignition system - Electronics fuel system - Engine control unit - Sensors and Actuators - Brushless D.C motors - lighting - instrumentation - Infineon MCU - wiring – Network protocols: CAN, LIN & A^2B Bus.

UNIT V

Simple & Smart Robot design using Arduino: Line followers - Obstacle avoidance - pick and

place robot - RF, Bluetooth & IoT based design - **Comfort & safety Applications**: Anti lock braking (ABS), central locking, Electric window and power steering, Air bag system, keyless entry.

TEXT BOOKS

1. Industrial Automation and Robotics by A.K. Gupta, S.K. Arora, University of science press, 2013.(Unit I & III)
2. Arduino Programming: Step-by-step guide to mastering Arduino hardware and software by Mark Torvalds, Second Edition, 2018. (Unit II & V)
3. Automotive Electrical & Electronics, A. K. Babu, Khanna Book publ, 2016. (Unit IV&V).
4. Industrial Automation Using PLC SCADA & DCS by R.G.Jamkar, Global Education Ltd.
5. Industrial Robotics by P.Jaganathan, 3rd Edition, Lakshmi Publications (Unit I & II)

REFERENCE BOOKS

1. Automobile Electrical & Electronic Systems, Tom Denton, 3rd edition, Elsevier, 2004.
2. Robotics and Automation Hand book by Thomas R. Kurfess, CRC Press, 2005.
3. Automotive Electronics Handbook, Ronald K. Jurgen, McGraw Hill Professional, 1999
4. Industrial Automation with SCADA : Concepts, Communications and Security by K S Manoj, Laxmi Publications Pvt Ltd; 3rd edition, 2007.
5. Distributed Automotive Embedded Systems by Ronald K.Jurgen, SAE International.

WEBSITES

1. https://www.arduino.cc.
2. https://www.openrobotics.org
3. https://www.instructables.com/id/Simple-Smart-Robot-Using-Arduino/.

ELECTIVE 7 : PROGRAMMING IN C++

COURSE OBJECTIVES

1. To introduce the concepts of Object Oriented Programming language.
2. To learn the object oriented concepts of C++ .
3. To handle exceptions in C++
4. To learn and program the concepts of Files, Templates, Containers and Iterators

COURSE OUTCOME

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

1. Implement the object oriented concepts using C++
2. Describe polymorphism, inheritance and virtual functions in C++.
3. Perform exceptions that arise in a C++ program.
4. Implement applications using files, templates, containers and iterators.

UNIT I

Basics of C++ : Introduction to OOPs concepts - C++ Programming features - Data Types - Control Structures - Arrays and Strings - Functions - Pointers - This Pointer

UNIT II

Oriented Programming Fundamentals: Class - objects - Constructors - Copy constructors - Destructors - static members – constant members – member functions

UNIT III

Polymorphism and Inheritance: Polymorphism - Function Overloading - Operator Overloading - dynamic memory allocation - Nested classes - Inheritance.

UNIT IV

Object Oriented Programming Advanced Concepts: Virtual functions - Abstract Classes - Exception Handling – C++ Stream classes - Formatted IO

UNIT V

Files and Templates: File classes and File operations - Templates - Class Template - Function Template - Standard Template Library - Containers - Iterators

TEXT AND REFERENCE BOOKS

1. Balagurusamy, Object Oriented Programming with C++ , Tata McGraw-Hill Education
2. Ira Pohl, Object oriented Programming using C++, Benjamin/Cummings Publishing Company
3. Herbert Schildt, The Complete Reference C++, 4th Edition, McGraw-Hill Osborne Media

ELECTIVE 8 : SOLAR TECHNOLOGY

COURSE OBJECTIVES

1. To understand basic terminology in solar technology
2. To learn the use of solar cells in various applications
3. To gain knowledge about storage systems

COURSE OUTCOME

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

1. Explain the technical and physical principles of solar cells
2. Analyze the and advantages and disadvantages of photo-voltoic conversion
3. Compare different solar energy systems

UNIT I

Solar radiation: Properties of sunlight. Absorption by the atmosphere. Calculation of solar irradiance at surfaces. movement over the day, shadowing effects,

UNITII

Photovoltaic Cell. Advantages & disadvantages of photo-voltaic conversion. Use of solar cell in various instruments. Photo-voltaic array & its connections, arrangements of array according to the voltage. Module & its connections. Faults & their effects in photo-voltaic cell, array & module (connection of cell, connection of array, connection of module)

UNIT III

Solar Photovoltaic energy conversion and utilization - solar power generation systems - off-grid systems - grid connected systems - power control and management systems - economics of solar photovoltaic systems - World Energy Requirement - Energy and Role of Photovoltaic,

UNIT IV

Types of PV Installation, Common Systems type, GRID-TIED System, Hybrid Systems, Photovoltaic in Energy Supply, atmospheric effects, seasonal effects, environmental effects on standard test conditions, Solar PV production and cost.

UNIT V

Electrical Storage: Battery technology, Batteries for Photovoltaic systems, DC – DC converters, Charge Controllers, DC – AC inverters; single phase, three phase, MPPT.

TEXT AND REFERENCE BOOKS

1. Solar Photovoltaic; Chetansingh solanki; PHI, Learning private ltd., New dehli (2018)
2. Non-conventional Sources of Energy , G.D Rai, Khanna Publishers, Delhi (2012)
3. Solar Power Hand Book, Dr. H. Naganagouda (2014)
4. Renewable Energy Technologies; A Practical Guide for Beginners, Chetan Singh Solanki, PHI School Books (2008)
5. Renewable Energy Sources and Emerging Technologies, Kothari D.P. and Signal K.C New Arrivals –PHI; 2 Edition (2011)
6. Solar Electricity Handbook; Michael Boxwell; Greenstream publishing ltd, UK-2011