SHIV NADAR
UNIVERSITY
CHENNAI

School of Engineering

Department of Computer Science and Engineering

B. Tech
Computer Science and Engineering (IoT)

SYLLABUS

SEMESTER 1

COMMUNICATIVE ENGLISH

L	T	P	C
2	1	0	3

COURSE OBJECTIVES:

- To help learners develop the basic **reading** skills as required for academic purposes
- To help learners develop the **writing** abilities as required in academic contexts
- To help learners develop their **listening** skills, which will enable them to listen to lectures and comprehend them by asking questions and seeking clarifications
- To help learners develop their **speaking** skills and speak fluently in real contexts
- To help learners develop **vocabulary**, as required in academic contexts
- To help learners gain the expertise required in **grammar** for them to function well in academic contexts

SHARING INFORMATION RELATED TO ONESELF/FAMILY & FRIENDS: 12

Reading: Short comprehension passages, Practice in skimming, scanning and predicting
Writing: Completing sentences, Developing hints
Speaking: Introducing oneself, Exchanging personal information
Listening: Listening comprehension of short texts, including formal and informal conversations
Language Development: Asking and answering - Wh- Questions and Yes/No questions
Vocabulary Development: Prefixes and Suffixes, Polite Expressions

GENERAL READING AND FREE WRITING: 12

Reading: Reading short narratives and descriptions from newspapers including dialogues and conversations
Writing: Paragraph writing (topic sentence, main ideas, organization, cohesive devices)
Listening: Telephonic conversations, short presentations and TV news
Speaking: Sharing information of a personal kind, Greeting, Taking leave
Language development: Prepositions, Conjunctions, Clauses
Vocabulary development: Guessing meanings of words in context

GRAMMAR AND LANGUAGE DEVELOPMENT: 12

Reading: Short texts and longer passages (close reading)
Writing: Understanding text structure (Use of reference words and discourse markers, coherence markers, reordering jumbled sentences)
Listening: Listening to TED talks and longer texts, product description, and narratives from different sources
Speaking: Asking about routine actions and expressing opinions, Making short presentations

Language development: Degrees of comparison, Pronouns, Direct vs indirect speech
Vocabulary development: Idioms and phrases, Single word substitutes, Adverbs.

READING AND LANGUAGE DEVELOPMENT: 9

Reading: Reading longer texts and different types of texts (journalistic, literary)
Writing: Letter writing (informal or personal letters), E-mails (conventions of personal email)
Listening: Listening to dialogues or conversations and completing exercises based on them
Speaking: Speaking about oneself, Speaking about one's friend, Role-plays
Language development: Tenses (simple and continuous)
Vocabulary development: Synonyms, Antonyms, Phrasal verbs

EXTENDED WRITING:

Reading: Longer academic texts including comparison and contrast ones
Writing: Brainstorming, developing an outline, and identifying main and subordinate ideas, Dialogue writing, Writing short essays
Listening: Listening to talks and lectures
Speaking: Participating in conversations and short group discussions
Language development: Modal verbs, Perfect and perfect continuous tenses
Vocabulary development: Collocations, Fixed and semi-fixed expressions

TOTAL PERIODS: 45

COURSE OUTCOMES:

On successful completion of this course, the learners will be able to

- Apply reading strategies to comprehend articles of a general kind (ex. magazines and newspapers)
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English
- Comprehend conversations and short talks (formal and informal)
- Write short general essays and personal letters and emails

TEXT BOOK:

1. Board of Editors, "Using English: A Course Book for Undergraduate Engineers and Technologists", Orient BlackSwan Limited, 2015.

LINEAR ALGEBRA

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

The objective of this course is to enable the student to

1. Find the basis and dimension of vector space
2. Obtain the matrix of linear transformation
3. Find the eigenvalues and eigenvectors of the transformations
4. Find orthonormal basis of inner product space
5. Perform matrix decomposition and to find least square approximation

VECTOR SPACES: **9**

Semigroup - Group - Ring - Field (Definitions and examples) - Vector Space: Subspace - Linear Independence and Dependence-basis and dimension

LINEAR TRANSFORMATION: **9**

Linear Transformation - Range Space and Null Space - Rank and nullity - Dimension Theorem

EIGEN VALUES AND EIGEN VECTORS: **9**

Matrix representation of linear transformation - Eigenvalues and Eigenvectors of Linear Transformation

INNER PRODUCT SPACES: **9**

Inner product and Norms-properties - Orthogonal, Orthonormal Vectors - Gram Schmidt Orthonormalization process

MATRIX DECOMPOSITION: **9**

QR decomposition - Singular Value Decomposition - Least square approximations

TOTAL PERIODS: 45

COURSE OUTCOMES:

After the completion of the course the student will be able to

1. Find the basis and dimension of vector space
2. Obtain the matrix of linear transformation
3. Find the eigenvalues and eigenvectors of linear transformations
4. Find orthonormal basis of inner product space
5. Apply matrix decomposition in engineering and find least square approximations to the system of equations

TEXT BOOK:

1. Friedberg A.H, Insel A.J. and Spence L, Linear Algebra, Prentice Hall of India, New Delhi, 2004.

PROGRAMMING IN C

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To develop C programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions, pointers and structures
- To perform input/output and file handling

C PROGRAMMING BASICS: **12**

Introduction to C programming: fundamentals - structure of a C program - compilation and linking processes - Constants, Variables, Data Types - Expressions using operators in C - Managing Input and Output operations - Decision Making and Branching - looping statements - solving simple scientific and statistical problems

ARRAYS AND STRINGS: **10**

Arrays - Initialization - Declaration - One dimensional and Two dimensional arrays - Strings: String operations - String Arrays - Simple programs: sorting, searching, matrix operations

FUNCTIONS AND POINTERS: **8**

Function: Definition of function - Declaration of function - Pass by value - Pass by reference - Recursion - Pointers: Definition - Initialization - Pointers arithmetic - Pointers and arrays

STRUCTURES AND UNION: **8**

Introduction - need for Structure data type - Structure definition - Structure declaration - Structure within a structure - Union - Programs using Structures and Unions - Storage classes - Preprocessor directives - Simple programs: singly linked list, doubly linked list

FILE HANDLING AND ADDITIONAL FEATURES IN C: **7**

Console input output functions - disk input output functions - data files - Additional Features in C: command line arguments, bit wise operators, enumerated data types, type-casting

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

- Develop simple applications in C using basic constructs
- Design and implement applications using arrays and strings
- Develop and implement applications in C using functions and pointers
- Develop applications in C using structures

TEXT BOOK:

1. Kernighan, B.W and Ritchie, D. M, “The C Programming language”, 2nd edition, Pearson Education, 2006

ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- To find and implement scientific, technological, economic and political solutions to environmental problems
- To study the interrelationship between living organisms and the environment
- To appreciate the importance of the environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value
- To study the dynamic processes and understand the features of the earth‘s interior and surface
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management

ENVIRONMENT AND ECOSYSTEMS: 6

Definition, scope and importance of Environment - Need for public awareness - Concept of an Ecosystem - Structure and function of an Ecosystem - producers, consumers and decomposers - Energy Flow in the Ecosystem - Ecological succession - Food chains, Food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the a) Forest Ecosystem, b) Grassland Ecosystem, c) Desert Ecosystem, d) Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries)

ENVIRONMENTAL POLLUTION: 6

Definition - causes, effects and control measures of: a) Air Pollution, b) Water Pollution, c) Soil Pollution, d) Marine Pollution, e) Noise Pollution, f) Thermal Pollution, g) Nuclear Hazards - Soil waste management: causes, effects and control measures of municipal solid wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides - Field study of local polluted site - urban/rural/industrial/agricultural

NATURAL RESOURCES: 7

Forest Resources: Use and over-exploitation, deforestation, case studies - Timber Extraction, mining, dams and their effects on forests and tribal people - Water resources: use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams, benefits and problems - Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: world food problems, changes caused by

agriculture and overgrazing, fertilizer-pesticide problems, water logging, salinity, case studies - Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies - Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification - role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles, field study of local area to document environmental assets - river/forest/grassland/hill/mountain

SOCIAL ISSUES AND THE ENVIRONMENT: 6

From unsustainable to sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Environmental ethics: issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies - Environment Protection Act - Air (prevention and control of pollution) Act - Water (prevention and control of pollution) Act - Wildlife Protection Act - Forest Conservation Act - Enforcement machinery involved in environmental legislation - Central and State Pollution Control Boards - Public awareness

HUMAN POPULATION AND THE ENVIRONMENT: 5

Population growth, variation among nations - Population explosion - Family Welfare Programme - Environment and Human Health - Human Rights - Value Education - HIV/ AIDS - Women and Child Welfare - Role of Information Technology in Environment and Human Health - Case studies

TOTAL PERIODS: 30

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

- Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world
- Identify the major sources, effects and monitoring of air and water pollutants
- Appreciate that one can apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes

TEXT BOOKS:

1. Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, Pearson Education, 2nd edition, 2004.
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, 1st edition, 2017.

DIGITAL DESIGN AND MICROPROCESSOR

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To provide an in-depth knowledge of the design of digital circuits
- To understand the Architecture of 8086 microprocessors
- To learn the design aspects of I/O and Memory Interfacing circuits
- To interface microprocessors with supporting chips
- To study the Architecture of 8051 microcontrollers
- To design a microcontroller based system

INTRODUCTION TO DIGITAL DESIGN: 9

Number systems: Decimal, Binary, Octal and Hexadecimal - Conversion from one system to another - Floating point representation of numbers - Arithmetic operation: 1's complement, 2's complement - Introduction to Digital Circuits - Advantages and Disadvantages of Digital circuits over Analog circuits - Logic gates - Truth tables

BOOLEAN ALGEBRA AND MINIMIZATION TECHNIQUES: 9

Introduction to basic law of Boolean Algebra - Mixed logic - Multilevel gating networks - Sum of products and Product of sum - Simplification of four variable Boolean equations using Karnaugh maps - Quine-McClusky method

8086 SYSTEM BUS STRUCTURE: 9

8086 signals - Basic configurations - System bus timing - System design using 8086 - I/O programming - Introduction to Multiprogramming - System Bus Structure - Multiprocessor configurations - Coprocessor, Closely coupled and loosely Coupled configurations - Introduction to advanced processors

I/O INTERFACING: 9

Memory Interfacing and I/O interfacing - Parallel communication interface - Serial communication interface - D/A and A/D Interface - Timer - Keyboard /display controller - Interrupt controller - DMA controller - Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller

MICROCONTROLLERS: **9**

Architecture of 8051 - Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming

TOTAL PERIODS: 45

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Understand and execute programs based on 8086 microprocessors
- Design Memory Interfacing circuits
- Design and interface I/O circuits
- Design and implement 8051 microcontroller based systems

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", 6th Edition, Pearson Education, 2017.

2. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

To impart knowledge on

- Electric circuit laws, single and three phase circuits and wiring
- Working principles of Electrical Machines
- Working principle of Various electronic devices and measuring instruments

ELECTRICAL CIRCUITS: **9**

Basic Circuit Components - Ohms Law - Kirchoff's Law - Instantaneous Power - Inductors - Capacitors - Independent and Dependent Sources - Steady State Solution of DC circuits - Nodal analysis, Mesh analysis: Thevinin's Theorem, Norton's Theorem, Maximum Power transfer theorem - Linearity and Superposition Theorem

AC CIRCUITS: **9**

Introduction to AC circuits - Waveforms and RMS value - Power and Power Factor - Single Phase and Three-Phase Balanced Circuits - Three Phase Loads: Housing Wiring, Industrial Wiring, Materials of Wiring

ELECTRICAL MACHINES: **9**

Principles of operation and characteristics of DC machines - Transformers (single and three phase) - Synchronous machines - three phase and single-phase induction motors

ELECTRONIC DEVICES & CIRCUITS: **9**

Types of Materials - Silicon & Germanium- N type and P type materials - PN Junction -Forward and Reverse Bias - Semiconductor Diodes - Bipolar Junction Transistor - Characteristics - Field Effect Transistors - Transistor Biasing - Introduction to operational Amplifier: Inverting Amplifier, Non-Inverting Amplifier - DAC - ADC

MEASUREMENTS & INSTRUMENTATION: **9**

Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric - Hall effect and Mechanical Classification of instruments - Types of indicating Instruments - multimeters – Oscilloscopes - three-phase power measurements - instrument transformers (CT and PT)

TOTAL PERIODS: 45

COURSE OUTCOMES:

Ability to

- Understand electric circuits and working principles of electrical machines
- Understand the concepts of various electronic devices
- Choose appropriate instruments for electrical measurement for a specific application

TEXT BOOK:

1. Leonard S Bobrow, “Foundations of Electrical Engineering”, Oxford University Press, 2013

PROGRAMMING IN C LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To develop programs in C using basic constructs
- To develop applications in C using strings, pointers, functions, structures
- To develop applications in C using file processing

SUGGESTIVE LIST OF EXPERIMENTS:

1. Compiling and Executing C Programs in Linux Environment
2. Programs using I/O Statements and Expressions
3. Programs using Decision making statements
4. Programs using looping statements
5. Programs using 1D Arrays
6. Programs using 2D Arrays
7. Programs using Strings
8. Programs using Functions
9. Programs using Recursion
10. Programs using Pointers
11. Programs using Structures and Unions
12. File handling

TOTAL PERIODS: 30

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

- Develop C programs for simple applications making use of basic constructs, arrays and strings
- Develop C programs involving functions, recursions, pointers, and structures
- Design applications using sequential and random access file processing

DIGITAL DESIGN AND MICROPROCESSOR LAB

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To Introduce ALP concepts, features and Coding methods
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

SUGGESTIVE LIST OF EXPERIMENTS:

1. 8086 Programs using kits and MASM
2. Counters and Time Delay Peripherals and Interfacing Experiments
3. Traffic light controller
4. Stepper motor control
5. Digital clock
6. Key board and Display
7. Printer status
8. A/D and D/A interface and Waveform Generation 8051 Experiments using kits and MASM
9. Basic arithmetic and Logical operations
10. Square and Cube program, Find 2‘s complement of a number

TOTAL PERIODS: 30

COURSE OUTCOMES:

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

- Write ALP Programmes for fixed and Floating Point and Arithmetic operations
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051
- Explain the difference between simulator and Emulator

SEMESTER 2

ENGLISH FOR ENGINEERS

L	T	P	C
2	0	1	3

COURSE OBJECTIVES:

- Develop strategies and skills to enhance their ability to read and comprehend texts in engineering and technical contexts
- Foster their ability to write convincing job applications and effective reports
- Develop their speaking skills to make technical presentations, participate in group discussions
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization
- To help learners develop vocabulary, as required in engineering contexts
- To help learners gain the expertise required in grammar for them to function well in engineering contexts

INTRODUCTION: **9**

Listening- Listening to product descriptions, talks mostly of a scientific/technical nature and completing information-gap exercises; Speaking -Describing a product; Asking for and giving directions
Reading - Reading descriptions, short technical texts from journals- newspapers
Writing- purpose statements - extended definitions - writing instructions - checklists- recommendations; note-making and note-taking
Vocabulary Development- technical vocabulary, avoiding jargon
Language Development -subject verb agreement - compound words.

READING AND WRITING TECHNICAL TEXTS: **9**

Listening- Listening to longer technical talks and completing exercises based on them
Speaking- describing a process; making enquiries
Reading - reading longer technical texts- identifying the various transitions in a text- paragraphing
Writing- interpreting charts, graphs; writing formal letters/emails including complaints
Vocabulary Development- vocabulary used in formal letters/emails and reports
Language Development- impersonal passive voice, numerical adjectives.

BECOMING INDEPENDENT USERS OF LANGUAGE FOR TECHNICAL CONTEXTS: 9

Listening- Listening to classroom lectures/ talks on engineering/technology
Speaking - introduction to technical presentations
Reading - longer texts both general and technical, practice in speed reading
Writing-Describing a process, use of sequence words; compare and contrast paragraphs
Vocabulary Development- sequence words- Misspelled words
Language Development- embedded sentences

LANGUAGE FOR JOB-PREPAREDNESS: 9

Listening- Listening to documentaries and making notes
Speaking - mechanics of presentations
Reading - reading for detailed comprehension
Writing- email etiquette - job application - cover letter -Résumé preparation (via email and hard copy)- analytical essays and issue-based essays
Vocabulary Development- finding suitable synonyms-paraphrasing
Language Development- clauses- if conditionals

ADVANCED READING AND WRITING: 9

Listening- TED/Ink talks
Speaking -participating in a group discussion
Reading- reading and understanding technical articles
Writing- Writing reports- minutes of a meeting- accident and survey
Vocabulary Development- verbal analogies
Language Development- reported speech

TOTAL PERIODS: 45

COURSE OUTCOMES:

On successful completion of this course, the learners will be able to

- Read technical texts and write area- specific texts effortlessly
- Listen and comprehend lectures and talks in their area of specialization successfully
- Speak appropriately and effectively in varied formal and informal contexts
- Write reports and winning job applications

TEXT BOOK:

1. Sudarshana, N.P. and Savitha, C, “English for Engineers”, Cambridge University Press, 2018.

PROBABILITY AND STATISTICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To provide the fundamental concepts of probability and random variable
- To learn different statistical methods needed for data analysis
- To introduce some standard distributions applicable to engineering
- To understand the basic concepts in two dimensional random variables
- To understand the basic concepts of random processes which are widely used in IT fields

PROBABILITY THEORY: **10**

Probability: Axioms, laws of probability, total probability - Bayes' Theorem - random variables - distribution functions: mass and density functions

STATISTICAL AVERAGES: **9**

Mathematical expectation of a random variable - properties of expectation - median - mode - variance - Kurtosis - skewness - moments - Moment Generating function

PROBABILITY DISTRIBUTIONS: **11**

Bernoulli - Binomial - Poisson - Multinomial - Uniform - exponential and Gaussian distributions - central limit theorem (for independent and identically distributed random variables)

TWO-DIMENSIONAL RANDOM VARIABLES: **9**

Joint distribution - marginal distribution - conditional distribution - joint density function - marginal density function - conditional density function - covariance - correlation and regression lines

RANDOM PROCESSES: **6**

Definition - Classification - Stationary Process - Markov Processes and Markov chain

TOTAL PERIODS: 45

COURSE OUTCOMES:

After the completion of this course, students will be able to:

- Understand the fundamental concepts of probability and random variable
- Apply the various statistical methods needed to analyze the given data
- Have knowledge of standard distributions which can describe real life phenomenon
- Understand the basic concepts two dimensional random variables and apply in engineering applications
- Apply the concept of random processes in data analysis

TEXT BOOK:

1. Gupta, S.C. and Kapoor, V.K., "Fundamentals of Mathematical Statistics", 11th Edition., (Reprint), Sultan Chand and Sons, 2007.

ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Enable the students to

- Understand the characteristics of sound; production and applications of ultrasound
- Develop an understanding of quantum mechanical concepts and their theories
- Explain the theories of physics of semiconductors
- Describe the principle of laser action and their production
- Analyse the propagation of light through optical fibres and losses in fibre optic communication

ACOUSTICS: 4

Classification: Music & Noise - Characteristics of Sound Pitch/Frequency, Loudness/Intensity - decibel scale - Weber-Fechner law - Loudness Curves - Quality/Timbre

ULTRASONICS: 5

Production: Magnetostriction and Piezoelectric methods - Detection: Piezoelectric, Acoustic grating - Non-Destructive Testing - Pulse echo system - Reflection and transmission modes - Modes of data presentation - A, B and C scan displays - Sonogram

QUANTUM PHYSICS: **9**

Planck's theory (derivation) - Deduction of Wien's displacement law and Rayleigh-Jeans law from Planck's theory - Properties of Matter waves - wave particle duality - Schrödinger's wave equation - Time-independent and time-dependent equations - Physical significance of wave function - Particle in a one dimensional box and extension to three dimensional box - Degeneracy of electron energy states - Quantum free electron theory - Density of states - Fermi-Dirac statistics - Free electron concentration in metals

SEMICONDUCTORS: **9**

Classification of semiconductors based on doping and band gap - Intrinsic semiconductor - Concept of hole - Carrier concentration derivation - Fermi level and its variation with temperature

- Electrical conductivity - Band gap determination - Extrinsic semiconductors - Carrier concentration derivation in n-type and p-type semiconductors - Variation of Fermi level with temperature and impurity concentration

LASERS: 9

Interaction of Radiation with Matter - Spontaneous and stimulated emissions - Einstein's A and B coefficients - Conditions for Laser action - Population inversion - Active medium - pumping schemes - Optical resonant cavity - Light Amplification -Types of lasers - Nd: YAG, CO_2 and Semiconductor lasers - Homo junction & hetero junction laser

FIBRE OPTICS: 9

Principle and propagation of light in optical fibres - Numerical aperture and Acceptance angle, Types of optical fibres (material, mode & refractive index) - Losses in fibres - Attenuation, dispersion - Fibre Optical Communication system (Block diagram) - Active and passive sensors - pressure, strain, displacement

TOTAL PERIODS: 45

COURSE OUTCOMES:

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

- Describe the characteristics of sound and Ultrasonics production and applications
- Explain the basic quantum mechanical concepts and their applications
- Analyse the physics of semiconductors
- Elucidate the principle and working of different type of lasers
- Explicate the principle, propagation and losses in fibre optic communication

TEXT BOOK:

1. M. N. Avadhanulu, P. G. Kshirsagar , "A text book of Engineering Physics" , S. Chand & Co. Ltd. Revised Edition 2014

COMPUTER ORGANIZATION AND ARCHITECTURE

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To make students understand the basic structure and operation of digital computer
- To understand the hardware-software interface
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations
- To expose the students to the concept of pipelining
- To familiarize the students with hierarchical memory system including cache memories and virtual memory
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces

PROCESSOR FUNDAMENTALS: **9**

Computer Components - Performance Metrics - Instruction set architecture - Various addressing modes - Instruction execution in ALU - Simple data path

COMPUTER ARITHMETIC: **12**

Representing unsigned and signed integer numbers - Floating point system - Integer addition and subtraction - Adders: Ripple carry adder, Carry Look Ahead adders - Integer multiplication and division - High-Radix Multipliers and High-Radix Dividers - Redundant number systems - Residue number systems

MEMORY SYSTEMS: **9**

Memory hierarchy - Cache Memory: Organization, Design - Virtual Memory concepts

INTERCONNECTIONS AND PERIPHERALS: **6**

Interconnection structures, Bus - PCI, Mesh, Hyper cube, Ring, Star - I/O Interface Systems: Keyboard, Monitor, Mouse, Bluetooth, USB, Flash

ILP ARCHITECTURES: **9**

Pipelining - Hazards in pipelining - Super pipelining - Super scalar - VLIW - Combining super scalar and VLIW with pipelining

TOTAL PERIODS: 45

COURSE OUTCOMES:

On successful completion of this course, the students will be able to

- Explain processor fundamentals
- Design arithmetic and logic unit
- Evaluate performance of memory systems
- Extend the learning to parallel processing architectures
- Explain interconnection structures

TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, “Computer Organization”, McGraw Hill Education, Fifth Edition, 2011.

INTRODUCTION TO INTERNET OF THINGS + LAB

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- Introduce evolution of internet technology and need for IoT
- Understand IoT architecture and various protocols and software
- Train the students to build IoT systems using sensors, single board computers and open source IoT platforms

INTRODUCTION: **10**

Introduction to Internet of Things - Definitions and characteristics of IoT - Physical Design of IoT - Things in IoT - Logical Design of IoT - IoT Functional Blocks - IoT Communication Models - IoT Communication APIs

EMBEDDED SYSTEMS: **7**

Components of Embedded Systems - Micro-Controller Architecture and Properties - Installing and Setting up the Arduino development environment - Blinky Sketch - A walk through -Arduino Sketches - Classes - Sketch Structure - Pins

ARDUINO: **10**

Arduino Shields - Hands-on working with GPIOs: Analog I/O - Memory Usage - Micro controller peripherals usage - Timers - Counters - Interrupts and its sources - Communication protocols I : UART SPI, I2C, CAN - Interfacing IoT sensors and Actuators - Debug applications using Arduino IDE

RASPBERRY PI: **10**

Overview of Raspberry Pi (RPi) hardware platform - Peripherals on RPi - Setup and Install Raspbian OS on RPi - Overview of Linux OS and its sub-systems - Process - Memory Management - Multi-Threading - IPC - Linux CLI and important commands

IOT IN INDIAN SCENARIO: **8**

IoT in Indian scenario - IoT and Aadhar - IoT and health services - IoT for financial inclusion - IoT for rural empowerment - Challenges in IoT applications - Connectivity challenges - Mission Critical applications

TOTAL PERIODS: 60

SUGGESTIVE LIST OF EXPERIMENTS:

1. Explore different communication methods with IoT devices
2. Develop simple application - testing infrared sensor - IoT Applications - using Arduino
3. Develop simple application - testing temperature, light sensor - IOT Application - using open platform/Raspberry Pi
4. Deploy IOT applications using platforms

TOTAL PERIODS: 15

COURSE OUTCOMES:

On successful completion of this course, the students will be able to

- Explain the application areas of IOT
- Understand the IoT Architecture, software and hardware requirements
- Deploy IoT applications on hardware platforms.

TEXT BOOK:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things: A Hands-On Approach”, Orient Blackswan Private Limited, First Edition, 2015.

PROGRAMMING IN PYTHON

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- To solve algorithmic problems
- To compose programs in Python using iteration and recursion
- To construct programs in Python using functions
- To handle file operations using Python

DATA, EXPRESSIONS, STATEMENTS, CONDITIONALS: 8

Data and types: int, float, boolean, string, list - variables - expressions - statements - simultaneous assignment - precedence of operators - comments - in-built modules and functions - Conditional: boolean values and operators, conditional (if), alternative (if-else), case analysis (if-elif-else)

ITERATION, FUNCTIONS, STRINGS: 8

Iteration: while, for, break, continue, pass - Functions: function definition, function call, flow of execution, parameters and arguments, return values, local and global scope, recursion - Strings: string slices, immutability, string functions and methods, string module

CONTAINERS: 8

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, nested lists, list comprehension - Dictionaries: operations and methods, looping and dictionaries, reverse lookup, dictionaries and lists, dictionary comprehension - Tuples: tuple assignment, tuple as return value, tuple operations

FILES AND EXCEPTION HANDLING: 6

Files: Text files, reading and writing files, format operator, file names and paths - command line arguments - Exceptions: try-catch, types of exception handling

TOTAL PERIODS: 30

COURSE OUTCOMES:

After the completion of this course, students will be able to:

- Think logically to solve programming problems using Python
- Understand and develop simple Python programs using conditionals and loops
- Decompose a program into functions
- Represent compound data using Python lists, tuples, dictionaries
- Perform input/output with files

TEXT BOOK:

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Shroff/O'Reilly; 2nd edition, 2016.

ENGINEERING PHYSICS LAB

L	T	P	C
0	0	4	2

COURSE OBJECTIVE:

• To determine the physical, electrical and optical properties of materials

LIST OF EXPERIMENTS:

1. Determination of velocity and compressibility of the given liquid - Ultrasonic interferometer
2. Determination of Planck's Constant
3. Determination of specific resistance of the given wire - Carey Foster Bridge
4. Determination of Energy bandgap of the given semiconductor - Band Gap of Semi-Conductor
5. Determination of grating element / average size of the particles of a given powder sample using laser
6. Determine the numerical aperture, acceptance angle & losses in fibres of the given optical fibre cable

TOTAL PERIODS: 30

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

- Determine ultrasonic velocity in a medium and associated material properties
- Use principles of dual nature of light to determine universal constants and observe photoelectric effects
- Determine electrical properties of metals and semiconductors like specific resistance of a conductor and bandgap of semiconductors
- Determine Wave length of Semiconductor Lasers or size of grating elements
- Characteristics of Optical Fibres like Numerical Aperture and Acceptance Angle

PROGRAMMING IN PYTHON LAB

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To solve problems using algorithms and flowcharts
- To write, test, and debug simple Python programs
- To develop and execute programs using Python programming constructs

SUGGESTIVE LIST OF EXERCISES:

1. Use Linux shell commands, use Python in interactive mode, and an editor
2. Write simple programs (area of a geometric shape, simple interest, solve quadratic equation, net salary)
3. Write programs using conditional statements (leap year, maximum of 2 numbers, maximum of 3 numbers, simple calculator, grade of the total mark)
4. Develop programs using loops and nested loops (gcd, prime number, integer division, sum of digits of an integer, multiplication table, sum of a series, print patterns, square root using Newton's method)
5. Develop programs using functions (sine and cosine series, Pythagorean triplets)
6. Develop programs using recursion (efficient power of a number, factorial, Fibonacci number)
7. Develop programs using strings (palindrome, finding substring) without using in-built functions
8. Develop programs using lists and tuples (linear search, binary search, selection sort, insertion sort, quicksort)
9. Develop programs using nested lists (matrix manipulations)
10. Develop simple programs using dictionaries (frequency histogram, nested dictionary)
11. Develop programs using Files (read and write files)
12. Develop programs to perform any task by reading arguments from the command line

TOTAL PERIODS: 30

COURSE OUTCOMES:

After the completion of this course, students will be able to:

- To write, test, and debug simple Python programs
- To implement Python programs with conditionals and loops
- Use functions for structuring Python programs
- Represent compound data using Python lists, tuples, and dictionaries
- Read and write data from/to files in Python