

Jharkhand University of Technology
Ranchi, 834010



SYLLABUS

For
Bachelor of Computer Applications (BCA)

(Effective from 2024-25)

Department of Computer Science

Semester – I

PROFESSIONAL ENGLISH

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Objectives

This course focuses on preparing students to communicate verbally and non-verbally in an effective manner. The aim is to introduce students to communication in a professional environment. The application based modules sensitize students to the function of English language in their careers. It is instrumental in learners comprehending the role of technical English in communication.

- Introduce learners to language skills in their area of specialization.
- Enable them to enhance career prospects and employability through English language skills
- Help students gain understanding of language at the workplace
- To develop verbal and non-verbal skills in English communication

Course Outcomes

CO1: Comprehension and demonstration of language in the field of technology

CO2: Prepare individuals as Independent communicators

CO3: Illustrate professional requirements through language proficiency

Unit-1

Teaching Hours:

Foundation of Language

This unit undertakes to revise the foundation of language; the grammar section of language learning. Students will be reviewed the grammar aspects mentioned through task based activities

- Concept of time in language – reflective learning will be used to help students detect their grammatical errors in tenses and rectify.
- Degrees of comparison – using technical literature students can be engaged in apprehending degrees of comparison
- Direct and reported speech – to enable learners carry on a comprehensible conversation either spoken or written, in a business context
- Subject verb agreement – through worksheets and task based learning students will be familiarized to construct error free sentences

Unit-2

Teaching Hours:

Basics of English Language Learning

Learners will be acquainted with the basic of English language learning. They will be taught to identifying technical vocabulary from the general. Technical magazines prescribed by the institution that are subject specific can be used as teaching tools.

- Introduction to technical lexicon – help students identify jargon and technical terminologies. Assist them comprehend the significance of implementation with moderation through their subject literature.
- Internet lexis and contextualization – provide meanings accurately to ensure right

exercise of terms in a professional scenario through hands-on experience

- Circumstantial usage of diction – aid the comprehension of word usage as verbs and nouns based on the requirement. Differentiating the meanings of synonyms and their orientation in a text
- Integrating technical vocabulary in describing process and procedure – through prescribed texts students can be made to enhance their language by right integration of diction.

Mind mapping of textual diction and allied words – diagrammatically mapping of words based on their meaning, context and usage will re-emphasise the words in the minds of the learners.

Unit-3

Teaching Hours:

Types of reading

Having gained familiarity with technical and subject specific vocabulary, students will be introduced to the types of reading. The basic receptive skill will help students help students prioritise and eliminate content.

- Reading strategies – acquaint the learners with the functions and benefits of reading strategy in the academic and professional set-up
- Reading: skimming, scanning – introduce learners to the types of reading. The integral aspects of each method will be familiarized to the students. They can be given practice sessions through subject material provided
- Intensive and extensive reading – benefits and features of the two types of reading can be elaborated. To emphasize on the learner the difference, practice sessions with subject material can be carried out
- Summarizing – consolidation of key ideas can be carried out in the spoken and written format. Technical literature can be provided for the purpose

Unit-4

Teaching Hours:

Non-Verbal Communication

The ancillaries of speaking skill are in focus here. Prior to delving into the productive skill, the nitty gritty that enhance its effectiveness is made familiar to the learner. Classroom activities and vicarious learning through case studies and video clippings can be screened.

- Competence in non-verbal communication- create an awareness of the role of nonverbal communication in a professional set-up
- Functions of non-verbal communication – the various utilities of nonverbal communication can be elaborated to students with case studies
- Benefits of non-verbal communication – elucidate the advantages of non-verbal communication with reference to cultural distinctions
- Proxemics, Chronemics, Kinesics, Haptics, Gestures, Paralanguage - vicarious learning of these aspects of non-verbal communication can be carried out through video clippings of suitable material and print media

Unit-5

Teaching Hours:

Communication Strategies

The productive skills are finessed through identification and refining of the elements mentioned in this unit. They contribute to holistic presentation. Task based activities must be used to practise. Business Communication texts and worksheets will provide ample support. Nuances of Communication – communication in the work place requires knowing the dos and

don'ts of professional communication. An introduction to listening, speaking, reading and writing with reference to professional communication can be provided.

- Opening techniques
- Speech markers
- Fillers
- Turn taking
- Backchannelling
- Dealing with interruptions every element mentioned can be elaborated. Ample examples can be provided through audio visual media, it can be provided to them through demonstrations and verbal reinforcement language checklists can be provided to aid students understand implementation of the elements. A follow up through mock sessions must be carried out in groups

Unit-6

Teaching Hours:

Writing

Having dealt with speaking skill in the previous unit, the other productive skill; writing is taken into consideration here. The various forms of writing in an official context will be taught in form and content.

- Report writing – a corporate requirement is the ability to report on meetings and conferences. The format and requirements of a report writing can be taught to the students through samples and later they can be made to draft reports of their own and peer evaluated
- Note taking – corporate atmosphere calls for not taking at every step. Students need to be taught the framework of note taking. They can be given samples as reference. Later they can be made to listen to technical audio clips and provide the note taking carried out at an individual level.

Minutes – corporate life calls for being in attendance of numerous meetings. Taking down the minutes is a skill that is assumed to be possessed by one. The essentials of maintaining the minutes must be made conversant through illustrations. This can be emphasised by classroom activities of the same

Unit-7

Teaching Hours:

Small talk

Lastly students will be introduced to typical work scenarios through hands-on sessions.

- Small talk – the purpose and role of small talk must be taught to the students. They can be screened video clippings of the same. Mock sessions can be performed in the class. The key phrases and language used can be imparted through provision of language worksheets and skills checklists
- Meeting- types of meetings, hierarchy of most often featuring members, etiquette to be held at meeting and the duties to be performed can be taught implicitly. Chairing, setting the agenda, controlling the smooth functioning, participating, deliberating and diplomacy must be made clear. The key phrases and language used can be taught through language worksheets and skills checklists

Group discussion – group discussions are carried out at every level. Students must be familiarized with the basics of a group discussions. Agreeing, disagreeing, and being diplomatic are essentials to be imparted. The soft skills and language essentials most

commonly noted can be made comprehensible to the students. Vicarious learning and language charts can be used as learning tools.

Essential Reading / Recommended Reading

- [1] Driscoll, Liz. *Common Mistakes at Intermediate and How to Avoid Them*. CUP, 2008.
- [2] Carter, Ronald and Michael McCarthy. *Cambridge Grammar of English*. CUP, 2006.
- [3] Leech, Geoffrey, Jan Svartvik. *A Communicative Grammar of English*. Third Edition. New Delhi: Pearson Education, 2009.
- [4] Booher, Dianna. *E- Writing: 21st Century Tools for Effective Communication*. Macmillan, 2008.
- [5] Knapp .M. *Essentials of Non-Verbal Communication Theory* Rea. FL: Harcourt, 1995.

FOUNDATIONAL MATHEMATICS

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Description

This course aims at introducing the students into the world of Discrete Mathematics. It includes the topic like Mathematical Logic, Method of proofs, Mathematical induction, Permutations and combinations and Binomial coefficients. Also, this course emphasizes general techniques of problem solving and explores the creation of mathematical patterns.

Course Objectives: This course will help the learner to

COBJ1: understand and use the notions of Mathematical Logic.

COBJ2: give proofs for mathematical problems by using different methods of proofs.

COBJ3: prove the mathematical problems/statements by using Mathematical Induction.

COBJ4: use permutations, combinations, binomial coefficients for solving problems appropriate problems.

Learning Outcomes

CO1: Formulate and interpret statements presented and determine their validity by applying the rules and methods of propositional logic.

CO2: Reformulate statements from common language to formal logic using the rules of propositional and predicate calculus, and assess the validity of arguments.

CO3: Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments

CO4: Construct elementary proofs using ordinary and strong induction in the context of studying the properties of recursion

CO5: Apply basic counting principles including the pigeonhole principle and rules for counting permutations and combinations.

Unit-1

Teaching Hours:

Logic

Propositional Logic - Applications of Propositional Logic - Propositional Equivalences - Predicates and Quantifiers

Unit-2

Teaching Hours:

Methods of Proof

Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

Unit-3

Teaching Hours:

Counting

Mathematical Induction, The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients and Identities.

Text Books and Reference Books

[1] K. H. Rosen, *Discrete Mathematics and its Applications*, 7th ed., McGraw – Hill, 2012.

Essential Reading / Recommended Reading

[1] R.P. Grimaldi and B.V. Ramana, *Discrete and Combinatorial Mathematics*, An applied introduction, 5th ed., Pearson Education, 2007.

[2] D. S. Chandrasekharaiah, *Discrete Mathematical Structures*, 4th ed., India: PRISM Book Pvt. Ltd., 2012

[3] J. P. Tremblay and R. Manohar, *Discrete Mathematical Structures with Application to Computer Science*, Reprint, India: Tata McGraw Hill Education, 2008.

STATISTICS - I FOR BCA

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Objectives

This course introduces basics of statistics and statistical concepts and methods for collection, analysis and interpretation of data

Objectives of the course are

- To acquaint students with various statistical methods.
- To cultivate statistical thinking among students.
- To prepare students for future courses having quantitative components.

Course Outcomes

Upon successful completion of the course one should be able to CO1:

Understand and appreciate descriptive statistics.

CO2: Understand the concepts of probability and random variables.

Unit-1

Teaching Hours:

Introduction

Importance of Statistics - Primary and secondary data - data collection methods - Presentation of numerical and categorical data

Unit-2

Teaching Hours:

Concepts of central tendency and dispersion

Mean, median, mode and partition values-quartiles for grouped and ungrouped data - Range, quartile deviation, standard deviation and coefficient of variation for grouped data

Unit-3

Teaching Hours:

Probability

Random Experiment- Sample space and events - Probability – Rules - Conditional probability and Bayes theorem

Unit-4

Teaching Hours:

Random variable

Definition, types of random variables - probability functions - expectations and variance.

Unit-5

Teaching Hours:

Index Number

Laspeyres', Paasches' - Fishers price and quantity index numbers - Time reversal and factor reversal tests

Text Books and Reference Books

[1] Berenson and Levine, *Basic Business Statistics*, New Jersey, 6th edition, Prentice- Hall India, 1996.

Essential Reading / Recommended Reading

[1] D.C. Montgomery and G.C.Runger, *Applied Statistics and Probability for engineers*,
New Jersey, John Wiley and Sons, 3rd edition, 2003.

DIGITAL COMPUTER FUNDAMENTALS

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Objectives

This is an introductory course that provides required knowledge about digital fundamentals of computer. The course covers few topics like number systems, logic gates and flips flops. The course starts with an introduction to number systems and its applications in computers. The discussion about working of devices like encoders and decoders, multiplexers and de multiplexers are dealt with.

Course Outcomes

CO1: Ability to use math and Boolean algebra in performing computations in various number systems.

CO2: Simplification of Boolean algebraic expressions.

CO3: Ability to design efficient combinational and sequential logic circuit implementations from functional description of digital systems.

Unit-1

Teaching Hours:

Introduction to Number System and Codes

Number systems: Decimal numbers , Binary numbers : Counting in binary, The weighted structure of binary numbers, Octal numbers, hexadecimal numbers and their mutual conversions ,Binary arithmetic : Addition, subtraction, multiplication and division of binary numbers, 1's and 2's complement, signed numbers, arithmetic operations: addition, subtraction with signed numbers, 9's and 10's complement, BCD numbers, BCD addition, BCD subtraction, Gray code: Binary to Gray code conversion, Gray to Binary conversion, Weighted code : 8421 code and Non weighted codes : ASCII and EBCDIC.

Unit-2

Teaching Hours:

Boolean Algebra

Boolean operations and expressions, Laws and rules of boolean algebra, Demorgan's Theorem, Boolean expressions, Simplification of Boolean expression.

Unit-3

Teaching Hours:

Logic Gates

AND gate, OR gate, NOT gate, NAND gate, NOR gate , X-OR gate , X-NOR gate, The universal property of NAND gate and NOR gate, Realization of basic gates. Boolean expression for logic circuits, Karnaugh map SOP with examples.

Self-Learning:

Universal property of NOR gate

Unit-4

Teaching Hours:

Combinational Logic

Basic Adders: Half adder, Full adder, 4-bit Parallel adders, Subtractor : Half subtractor, Full subtractor Implementation using logic gates, Decoders: 4 bit decoder, BCD to decimal decoder, Encoder : Decimal to BCD encoder, Multiplexer : 4 to 1 multiplexer, Demultiplexer : 1 to 4 demultiplexer .

Unit-5

Teaching Hours:

Flip-flops

Latches: SR latch, Clocked flip-flops: SR flip-flop, D flip-flop, JK flip-flop, Positive edge triggered flip flops, Timing diagrams, Master slave JK flip-flop.

Unit-6

Teaching Hours:

Registers and Counters

Modes of operation of registers: SISO, SIPO, PISO, and PIPO, Asynchronous counters: Four bit ripple counter, Decade counter, Synchronous counters: Four bit synchronous counter, Decade counter.

Self-Learning

Introduction to RAM, SRAM, DRAM, ROM, PROM, EPROM, EEPROM

Text Books and Reference Books

[1] Floyd, Thomas L: Digital Computer Fundamentals, 11th Edition, Pearson International, 2015.

Essential Reading / Recommended Reading

[1] Malvino, Paul Albert, Leach, Donald P, Gautam Saha: Digital Principles And Applications, TMH ,8th Edition, 2015.

[2] Bartee, Thomas C: Digital Computer Fundamentals, 6 Edition, TMH, 2010.

INTRODUCTION TO PROGRAMMING USING C

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Objectives

The course provides students with a comprehensive study of C programming language. The course lectures stress the strengths of C, which provides the outcome of writing efficient, maintainable and portable code. Course includes few lab exercises to make sure the student has not only gained the knowledge but can also apply and execute it.

Objectives of the course are

- To study about algorithms, flowcharts and programs.
- To solve problems through logical thinking.

Course Outcomes

CO1: To clearly understand the logic of the problem.

CO2: To analyze the given problem and write the algorithm, flowchart.

CO3: To write structured C programs, this is the foundation of any programming language.

Unit-1

Teaching Hours:

Introduction to computers and programming

Evolution of Computers - Generation of Computers - Classification of Computers - Characteristics of Computers - Advantages of Computers - Block Diagram of a Digital Computer - Types of Programming Languages - Structured Programming - Algorithms and Flowcharts with Examples - Programming Logic.

Unit-2

Teaching Hours:

Introduction to C programming

History of C- Character set - Structure of a C program - constants, variables and keywords. Expressions – Statements – Operators – Arithmetic, Unary, Relational and logical, Assignment, Conditional. Library functions. Data Input and output – Single character input, getchar, getch, getc – Single character output putchar, putc, Formatted I/O scanf, printf, gets, puts.

Unit-3

Teaching Hours:

Control structures and arrays

Branching: condition: if, if.else, switch. Looping: while, do..while, for, nested control structures, break, continue statement, goto statement. Arrays: definition, processing, types - One and Two dimensional arrays. String, string operations, arrays of strings.

Unit-4

Teaching Hours:

Functions and Pointers

Functions: Definition, Accessing and prototyping, types of functions, passing arguments to functions, recursion, passing arrays to functions. Pointers: Definition, notation, applications, call by reference.

Unit-5**Teaching Hours:****Structures, Unions and Files**

Structures: Definition, Processing, user defined data type typedef - Unions – definition, declaration and accessing union elements. Enumerated Data type. Files: File opening in different modes, closing, reading and writing. fopen, fclose, fprintf, fscanf, getw, putw .

Unit-6**Teaching Hours:****Low level programming and C preprocessor**

Storage Structures: extern, register, static, auto. Bitwise Operations: AND, OR, exclusive OR, complement, right shift and left shift operators. Preprocessor: Types of C preprocessor directives. Macros- comparison with functions. File Inclusion. Command line Arguments.

Text Books and Reference Books

[1] Byron Gottfried, JitenderChhabra ,*Programming with C, 3rd Edition*. Tata McGraw-Hill, 2010

Essential Reading / Recommended Reading

- [1] Balagurusamy E., *Programming in ANSI C*, 6th Edition, Tata McGraw-Hill, 2012.
- [2] Deitel H M and Deitel P J, *C - How to Program*, 5th Edition, Prentice-Hall, 2006.
- [3] Smarajit Ghosh, *All of 'C'*, 2nd Edition, 2009.
- [4] M. T. Somashekara, *Problem Solving with C*, PHI, 2009

DIGITAL COMPUTER FUNDAMENTALS LAB

Total Lab Hours for Semester:

Max Marks:

Credits:

Course Objectives

This course offers an experimental view of hardware components, digital circuits and logic gates of a computer. Objective of the course is to understand the working principle and logic design of digital circuits.

Course Outcomes

CO1: Students will demonstrate an ability to identify the basic components to build digital circuits.

CO2: Students will be able to design efficient Combinational and Sequential logic circuits.

List of programs

1. Demonstration of the components of (i) Kindle (ii) iPad (iii) Smart Phone (iv) Laptops
2. Demonstration of the installation and discussion of the features of different Operating Systems. Eg: Mac, Unix, Ubuntu, Windows etc.
3. Verification of the truth tables of AND, OR & NOT gates.
4. Verification of the truth tables of NAND & NOR gates.
5. Verification of the truth table of XOR using NAND gates.
6. Verification of the truth table of Half Adder circuits using NAND gates.
7. Verification of the truth table of Full Adder circuits using NAND gates.
8. Verification of the truth table of D flip flop.
9. Verification of the truth table of JK flip flop.
10. Verification of the truth table of RS flip flop.
11. Binary To Gray Code and Gray Code to Binary Converter
12. Verification of the Function table of Binary Ripple Counter using JK FF.
13. Verification of the Function table of Decade Counter.
14. Verification of the Function table of Serial In Serial Out Shift Register using D FF.

C PROGRAMMING LAB

Total Lab Hours for Semester:

Max Marks:

Credits:

Course Objectives

To learn problem solving through procedural language programming technique and Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.

Course Outcomes

CO1: Read, understand and trace the execution of programs written in C language.

CO2: Write the C code for a given algorithm.

CO3: Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.

List of programs

1. To demonstrate the usage of operators and data types in C
 - a. Write a program to print the size of all the data types with its modifiers supported by C and its range.
 - b. Write a program to convert Fahrenheit to Celsius.

2. To demonstrate the usage of if, if-else
 - a. Write a program to check whether the given number is a Prime number or not.
 - b. Write a program to accept three numbers and find the largest and second largest among them.

3. To demonstrate the concept of while, do-while, for loops, break and continue
 - a. Write a program to print all prime numbers between any 2 given limits.
 - b. Write a program to print all the Armstrong numbers between any 2 given limits.

4. To demonstrate the concept of arrays and strings
 - a. Write a program to check whether a string is a Palindrome.
 - b. Write a program to check whether a given matrix is an Identity matrix or not.
 - c. Write a program to perform matrix multiplication.

5. To demonstrate the concept of switch-case
 - a. Write a program to count the different vowels in a line of text.
 - b. Write a program to accept two numbers and perform various arithmetic operations (+, -, *, /) based on the symbol entered.

6. To demonstrate the usage of functions and recursion
 - a. Write a program to find the roots of a quadratic equation
 - b. Write a recursive program to find the factorial of a number.

7. To demonstrate the concept of structures and unions
 - a. Create an employee structure and display the same.
 - b. Create a student database storing the roll no, name, class etc. Implement modify and search operations.

8. To demonstrate the concept of
 - a. Write a function to swap two numbers using pointers
 - b. Write a program to access an array of integers using pointers

9. To demonstrate the concept of File
 - a. Create a file and store some records in it. Display the contents of the same. Implement search, modify, and delete operations.

10. To demonstrate the concept of Bitwise operators and preprocessors
 - a. Perform the different bitwise operations (menu driven program) .The i/p and the o/p should be displayed in Binary form.
 - b. Write a program to include your own header file.

PYTHON PROGRAMMING - I

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Objectives

This course covers the basic programming paradigms associated with Python.

Course Outcomes

CO1: Demonstrate the use of built-in data types of Python

CO2: Demonstrate significant experience with python program

development environment CO3: Design functions and custom modules for given requirement.

Unit-1

Teaching Hours:

INTRODUCING PYTHON

Introduction, Python Fundamentals, Features of Python, Components of a Python Program, Understanding the interpreter.

Python basics:

Identifiers, Basic Types, Operators, Precedence and Associativity, Decision Control Structures, Looping Structures, Console input, output.

Unit-2

Teaching Hours:

PYTHON DATA TYPES: LISTS AND TUPLES

Lists: Accessing elements, Basic List operations, Built-in methods

Tuples: working with elements, Basic Tuple operation, Tuple methods and Type of Tuples.

Unit-3

Teaching Hours:

PYTHON DATA TYPES: SETS AND DICTIONARIES

Sets: Definition, Set Elements, Built-in methods, basic set operations, Mathematical Set operation, Variety of Sets.

Dictionaries: Defining a dictionary, accessing elements, basic operations, methods

Unit-4

Teaching Hours:

COMPREHENSIONS AND FUNCTIONS

Comprehensions: List Comprehensions, Set Comprehension, Dictionary

Comprehension. Functions: Defining a function, Types of arguments, unpacking arguments. Recursive functions.

Unit-5

Teaching Hours:

FUNCTIONAL PROGRAMMING

Lambda functions, Higher order functions, Map, Filter, Reduce, Using Lambda with map(),filter(),reduce()

Unit-6**Teaching Hours:**

MODULES, PACKAGES AND NAMESPACES :

Main module, built-in, custom modules, importing a module, packages Namespace, global(),locals(),Inner fucntions,scope.

Essential Reading:

1. Martin Brown, *Python:The Complete Reference*, McGraw Hill Publications,4th Edition March 2018.
2. Yashavant Kanetkar,Aditya Kanetkar, *Let Us Python*, BPB Publications ,4th Edition 2022.

Reference Books:

1. Zhang.Y ,*An Introduction to Python and Computer Programming*, Springer Publications,2016 **Web Resources:** [1. https://docs.python.org/3/tutorial/](https://docs.python.org/3/tutorial/)

LAB EXERCISES

UNIT – I	Implement Basic data types and operators.
UNIT – II	Implement Lists Implement Tuples
UNIT – III	Implement Dictionary Implement Set
UNIT – VI	Implement List, Set and Dictionary Comprehensions Implement Recursive function
UNIT -V	Implement Lambda function using map(), filter(),reduce().
UNIT – IV	Implement custom module.

SEMESTER – II

COMMUNICATIVE ENGLISH

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Objectives

This course focuses on making students understand the vitality of English as a tool in implementing and; interpreting technical and professional communication. The course aims at detecting and nurturing research skills through English for professional development. A holistic approach to recognize the fundamental role of language in technical communication is undertaken.

- Nurture an enquiring spirit through English language in Technical communication
- Enhance English implementation in English learning for professional purposes
- Encourage students towards autonomous learning through enhanced English comprehension that go beyond the classroom

Course Outcomes

CO1: Students will demonstrate better comprehension and interpretation of technical literature

CO2: Rudimentary research aptitude through language up-gradation will be initiated CO3: Learn the nuances of professional communication through English language

Unit-1

Teaching Hours:

Pronunciation

The most regularly used words in their field of knowledge, the most often committed mistakes and their right pronunciation will be given to the students. Applications available in this context can be made familiar to learners.

- Phonetics – students can be taught phonetics through phonetic apps that enable the student to relate the symbol with the sound. They can be taught to read and transcribe words to ensure ample understanding
- Commonly mispronounced words – technical vocabulary can be focused here. Audio sessions can be implemented to enable auditory retention
- Common errors in grammar – cooperative language learning will help students familiarize common errors and rectifications

Unit-2

Teaching Hours:

Technical literature

Students need to learn to read and study literature of their subject. Any form of literature in context to the subject can be taken and students can be involved in these chapters mentioned below

- Comprehensive questioning of procedural writings & Comprehension answering of procedural queries – through subject based literature students can be taught cognition and responding to the prescribed material through writing and speaking
- Issuing of instructions – instructions being an integral part of their area of expertise, students need to be made familiar with the sequencing and of ideas and brevity of language. This can be carried out through written and spoken format.

- Procedural instructions – a set of operating procedures for a piece of technical equipment can be carried out in through first through oral presentations and writing exercises
- Discussion of processes, errors or glitches – going beyond the usual, students must be acquainted with dealing the nitty-gritty of technical literature. They must be taught to spell out glitches or errors to enable smooth functioning

Unit-3

Teaching Hours:

Research Orientation

An integral part of in-depth learning involves research. In this unit research will be introduced to the students. The nuances of exploratory study and their approaches will be made familiar to the students

- Structure of the essay – students need to be familiarized on the format and elements that contribute to a holistic essay. Deconstruction of essays can be carried out through cooperative learning and deliberated.
- Topic sentence recognition – Technical English calls for detection of topic sentence recognition of any technical literature. Students can be taught on detecting keywords and significant concepts that will aid in the process
- Thesis statement identification – research publications are an integral part of technical writing. Students can be provided research articles and familiarized on the format and texture of a thesis statement
- Interpretation of data – quantitative study is entirely dependent on data analysis and interpretation. The language to be used in the process can be fine-tuned for the students through case studies of the same
- Comprehension, organization of ideas and execution of writing project proposal – once learners have been taught the elements of a research paper, they can be encouraged to work in groups and draft their own research paper integrating all the major elements.

Unit-4

Teaching Hours:

Analytical study

An extension of rudimentary research is present in this chapter. Students will be encouraged to analyse texts, interpret and rewrite them.

- Rhetoric analysis; a comparative analysis of two texts – in context to the literature prescribed, students must be enabled to make a detailed study of the texts and chart out differences and similarities.
- Critical analysis – students can be taught to scrutinise the text based on the context and produce a systematic response
- Paraphrasing – in a professional atmosphere data needs to be interpreted and paraphrased. Tasks with data analysis can be used to help students comprehend the implementation of paraphrasing in the written

Unit-5

Teaching Hours:

Official Correspondence

Productive skill; writing is nurtured in this chapter. A few elements of the same was handled in the first semester. Here students will further finesse their writing skills

- Official letter – the types and format of official letter can be imparted through examples. Students can be then asked to draft letters of their own. Etiquettes of letter writing, register, style and specific language phrases must be taught. H examples can be used to emphasise.
- Internet correspondence – the soft skills for corresponding through email, carbon copying, blind carbon copying, salutations, register, style, format and diction must be made familiar to the students,
- Resume writing – the organization of a resume along with the covering letter can be imparted to the learners through providing several samples. They can then be made to draft a resume with covering letter of their own.

Unit-6

Teaching Hours:

Speaking Skills

The previous semester dealt with a few productive oral skills. Furthering their productive expertise, speaking skills are taken into consideration. Students will be encouraged to demonstrate their skills under guidance of the teacher.

Interview – types of interviews can be elaborated to the learners. The essential language and skills required must be emphasised verbally and through case studies. Students can be encouraged to demonstrate the acquired knowledge through simulated sessions

- Presentations – the critical features and language checklists must be emphasised. Introducing the topic, linking, sequencing and dealing with questions must be mad familiar. The soft skills and paralinguistic aspects can be taught through examples. Group demonstrations must be mandatory
Conference – the soft skills and language finesse required must be made clear to the students. Checklists can be provided as learning aids. Chairing sessions, targeting issues, key language, and steering the meeting is required to be acquainted. Audio visual examples can be screened and re-emphasis through practice sessions can be carried out.

Recommended Reading

1. Day, R A. Scientific English: A Guide for Scientists and Other Professionals. 2nd ed. Hyderabad: Universities Press, 2000. .
2. Meenakshi Raman and Sangeetha Sharama . 2009. Technical Communication- Principles and Practice; - Oxford University Press,
3. Jay. Effective Presentation. New Delhi: Pearson, 2009.
4. English for Effective Communication. Oxford University Press, 2013.
5. Lynch, Tony. Study Listening. New Delhi. CUP, 2008.

BASIC DISCRETE MATHEMATICS

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Description: This course aims at introducing the students into the world of Discrete Mathematics. It includes the topic like Set Theory, Functions and Relations. They gain a historical perspective of the development of modern discrete mathematics and application of the same in the field of Computer Science.

Course objectives: This course will help the learner to

COBJ1: be proficient in the topics set theory, functions and relations.

COBJ2: enhance the problems solving skills in set theory, functions, relations, sequences, series and matrices.

Learning Outcomes

CO1: Demonstrate a working knowledge of set notation and elementary set theory, recognize the connection between set operations and logic.

CO2: Prove elementary results involving sets

CO3: Apply the different properties of injections, surjections, bijections, compositions, and inverse functions

CO4: Demonstrate the use of mathematical reasoning by justifying and generalizing patterns and relations

CO5: Determine when a relation is reflexive, symmetric, antisymmetric, or transitive, apply the properties of equivalence relations and partial orderings, and explain the connection between equivalence relations

Unit-1

Teaching Hours:

Set Theory and Theory of Functions

Sets, Set Operations, Functions

Unit-2

Teaching Hours:

Applications of Functions and Theory of Matrices

Sequences and Summations, Cardinality of Sets, Matrices

Unit-3

Teaching Hours:

Relations

Relations and Their Properties, Equivalence Relations, Partial Orderings

Text Books and Reference Books:

[1] K. H. Rosen, *Discrete Mathematics and its Applications*, 7th ed., McGraw – Hill, 2012.

Essential Reading / Recommended Reading

[1] R.P. Grimaldi and B.V. Ramana, *Discrete and Combinatorial Mathematics*, An applied introduction, 5th ed., Pearson Education, 2007.

[2] D. S. Chandrasekharaiah, *Discrete Mathematical Structures*, 4th ed., India: PRISM Book Pvt. Ltd., 2012

[3] J. P. Tremblay and R. Manohar, *Discrete Mathematical Structures with Application to Computer Science*, Reprint, India: Tata McGraw Hill Education, 2008.

STATISTICS - II FOR BCA

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Objectives

The course Statistics-II describes the concept of correlation and regression, probability distribution and testing hypothesis.

Objectives of the course are

- To acquaint students with various statistical methods.
- To cultivate statistical thinking among students.
- To prepare students for future courses having quantitative components.

Course Learning Outcomes

Upon successful completion of the course one should be able to

- Understand and analyze bivariate data with respect to their association.
- Apply different distributions at the appropriate situations.
- Apply various tests of hypothesis understand their interpretation.

Unit-1

Teaching Hours:

Correlation and Regression

Scatter diagram, Karl Pearson's and Spearman's' correlation coefficient - Regression and properties of regression coefficient

Unit-2

Teaching Hours:

Probability distributions

Discrete and continuous random variables - Probability mass and density functions - Expectation - Binomial, Poisson and normal distribution

Unit-3

Teaching Hours:

Sampling distribution and confidence interval

Sampling - Distribution and estimation - Parameter and statistic - chisquare t and F distributions definitions only Confidence interval Single means and difference known and unknown variances - Single proportion and difference of proportions

Unit-4

Teaching Hours:

Testing of Hypothesis

Types of hypothesis - Level of significance - Types of errors - Test for single mean and difference of means - Paired t test - Tests for proportions - Chi square test for independence of attributes

Text Books and Reference Books

- [1] Berenson and Levine, *Basic Business Statistics*, New Jersey, Prentice- Hall India, 6 ed. 1996.

Essential Reading / Recommended Reading

- [1] C.Montgomery and G.C.Runger, *Applied Statistics and Probability for engineers*,
rd
NewJersey,John Wiley and Sons, 3 ed. 2003.

OPERATING SYSTEMS

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Objectives

This course is an introduction to the concepts behind modern computer operating systems. Topics will include what an operating system does (and doesn't) do, system calls and interfaces, processes, resource scheduling and management (of the CPU, memory, etc.), virtual memory. Objectives of the course are

- To acquire the fundamental knowledge of the operating system architecture and its components
- To know the various operations performed by the operating system.

Course Outcomes

CO1: Upon completion of the course students will be able to:

CO2: Understand the basic working process of an operating system.

CO3: Understand the importance of process and scheduling.

CO4: Understand the issues in synchronization and memory management.

Unit-1

Teaching Hours:

Introduction and System Structures

Operating System Fundamentals; Computer System organization and architecture; Operating System structure and operations; Basics of process, memory and storage management and protection and security; Operating System services; User interface; System calls; System programs; Operating System structure; System boot.

Unit-2

Teaching Hours:

Process Management

Process concept; Process scheduling; Operations on processes; Inter Process Communication; Overview of Threads; Multi-threading models; Threading issues

Unit-3

Teaching Hours:

Process Synchronization

Need of synchronization; Critical section problems; Peterson's solution; Synchronization hardware; Mutex Locks; Semaphores, Classical problems of synchronization, Synchronization examples, Thread synchronization using mutex and semaphore.

Unit-4

Teaching Hours:

CPU Scheduling

CPU Scheduling concepts; Scheduling criteria; Scheduling algorithms; Overview of thread scheduling; Multi-processor scheduling

Unit-5**Teaching Hours:****Memory Management**

Overview; Swapping; Memory allocation; Segmentation; Paging, Structure of the page table

Unit-6**Teaching Hours:****Virtual Memory**

Overview; Demand paging; Copy on Write; Page replacement; Allocation of Frames; Thrashing

Self Learning

File system structure, Directory structure

Text Books and Reference Books:

[1] A. Silberschatz, P.B. Galvin and G. Gagne, Operating System Concepts.9th Edition, New Delhi: Wiley India, 2011.

Essential Reading/Recommended Reading

[1] Stalling William, Operating Systems: Internals and Design Principles. 7th Edition, Prentice Hall, 2011.

[2] Dietel et al, Operating System.3rd Edition. Pearson Education, 2004.

[3] A.S. Tanenbaum, Modern Operating Systems.3rd Ed, Prentice Hall, 2007.

DATA STRUCTURES

Total Teaching Hours for Semester:

Max Marks:

Credits:

Course Objectives

Data Structure is considered as one of the fundamental paper towards a more comprehensive understanding of programming and application development. Student is expected to work towards a sound theoretical understanding of Data Structures and also compliment the same with hands on implementing experience.

Objectives of the course are

- To be able to practically implement the data structures like stack, queue, array etc.
- To understand and implement different searching and sorting techniques.

Course Outcomes

CO1: Understand the need for Data Structures when building application.

CO2: Appreciate the need for optimized algorithm.

CO3: Able to walk through insert and delete for different data structures.

CO4: Ability to calculate and measure efficiency of code.

CO5: Appreciate some interesting algorithms like Huffman, Quick Sort, and Shortest Path etc.

CO6: Able to walkthrough algorithm.

CO7: Improve programming skills.

Unit-1

Teaching Hours:

Arrays

Introduction to data structures- Arrays and Structures: Abstract Data Type, Array in C, Dynamically Allocated Arrays, Structures, Unions, Internal Implementation of Structures, Self-Referential Structures, Polynomial Representation, Polynomial Additions.-sparse matrix

Unit-2

Teaching Hours:

Searching and String

Linear Search, Iterative Binary Search, Recursions, Recursive Binary Search, String Abstract Data Type, String in C, Pattern Matching.

Unit-3

Teaching Hours:

Stacks and Queues

Stacks- stacks using dynamic arrays- queues – circular queue using dynamic arrays- Evaluation of Expressions, Evaluating Postfix Expressions, Infix to Postfix

Unit-4

Teaching Hours:

Linked Lists

Pointers, Using Dynamically Allocated Storage, Singly Linked Lists, Dynamically Linked Stacks and Queues, Polynomials, Representing Polynomials as Singly Linked Lists, Adding Polynomials, Erasing Polynomials, Polynomials as Circularly Linked Lists, Doubly Linked Lists.

Unit-5**Teaching Hours:****Trees**

Introduction, Terminology, Representation of Trees, Binary Trees, Abstract Data Type, Properties of Binary Trees, Binary Tree Representations, Binary Tree Traversals Binary Search Trees: Introduction, Searching a Binary Search Tree, Inserting an Element, Deleting an Element, Height of Binary Search Tree

Unit-6**Teaching Hours:****Sorting techniques and Graphs**

Introduction, Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort. Graphs— Introduction-Definition-representation-Depth first search-Breadth first search

Text Books and Reference Books:

[1] Horowitz Sahni Anderson-Freed, *Fundamental of Data Structures in C*, Universities Press, Reprint 2009.

Essential Reading / Recommended Reading

- [1] Yashwant Kanetkar, *Data Structures Through C*, 9th Edition, BPB Publication 2010.
[2] Tremblay J.P and Sorenson P.G: *An Introduction to Data Structures with Applications*,
2nd Edition, 2002, TMH.

OPERATING SYSTEM LAB

Total Lab Hours for Semester:

Max Marks:

Credits:

Course Objectives

This lab introduces basic commands in LINUX and helps students in familiarizing the concepts of operating system through various commands related to operating system activities.

Course Outcomes

CO1: To make students able to implement various LINUX commands.

CO2: Students will also be able to implement different process related commands.

List of programs

1. To study the execution of various file/directory handling commands.
2. To study the various commands operated in vi editor in LINUX.
3. To study the various File Access Permission and different types of users in LINUX
4. To study about process related commands.
5. To study about the commands related to memory allocation of variables for a process.
6. To study about commands for viewing system calls.
7. To study about commands used for debugging.
8. Write a program to demonstrate basic operations of a process.
9. Write a program to create a Zombie process and an orphan.
10. Write a program to demonstrate a one-way pipe between two processes.
11. Write a program to illustrate a two way pipe between two processes.
12. Write a program to demonstrate a one-way communication between two processes using FIFO
13. Write a program to demonstrate a two-way communication between two processes using FIFO
14. Demonstrate process synchronization using semaphore.
15. Demonstrate the basic operations of thread.
16. Demonstrate thread synchronization using mutex.
17. Demonstrate thread synchronization using semaphore.

DATA STRUCTURES LAB

Total Lab Hours for Semester:

Max Marks:

Credits:

Course Objectives

The course is designed to provide a practical exposure on data structure and its applications.

Course Outcomes

Upon completion of the course

CO1: Students acquire the knowledge to build the logic and develop a solution for a problem statement.

List of programs

1. Strings:

- a) Write a menu driven program to compare, concatenate, copy strings and find the length of a string.
- b) Write a menu driven program to find the index of a pattern in a given string and to extract a substring.

2. Arrays

- a) Write a program to insert and delete an element(s) in one dimensional array.
- b) Write a program to insert and delete an element(s) in two dimensional arrays.

3. Sparse Matrix

- a) Write a menu driven program to read a sparse matrix of integer values and to search the sparse matrix for any element specified by the user.
- b) Write a program to print the appropriately triple < row, column, "value" > that represents the elements in the sparse matrix.

4. Searching Techniques:

- a) Write a program to implement Linear Search with sentinels
- b) Write a program to implement Binary Search using recursion

5. Sorting techniques:
- a) Write a menu driven program to implement insertion sort
 - b) Write a menu driven program to implement selection sort.
 - c) Write a menu driven program to implement quick sort using recursion
 - d) Write a menu driven program to implement merge sort using recursion.

6. Singly linked list:

- a) Write a menu driven program to implement singly linked lists creation, insertion and deletion

7. Stack:

- a) Write a menu driven program to implement different operations on a stack using an array and linked list.

8. Queue:

- a) Write a menu driven program to implement different operations on a queue using an array and linked list.

9. Binary search trees:

- a) Write a menu driven program to create a binary search tree and to perform Insertion and different types of traversal

10. Graphs:

- a) Write a menu driven program to implement breadth first search (bfs)
- b) Write a menu driven program to implement depth first search (dfs)

STATISTICS TOOL LAB

Total Lab Hours for Semester:

Max Marks:

Credits:

Course Objectives

The course is designed to provide a practical exposure on data structure and its applications.

Course Outcomes

Upon completion of the course

CO1: Students acquire the knowledge to build the logic and develop a solution for a problem statement.

List of programs

1. Calculate mean, median, mode and display results in proper format.
2. Calculate the product and sum of two vectors.
3. Calculate Range, quartile deviation, standard deviation and coefficient of variation for grouped data.
4. Partition values-quartiles for grouped and ungrouped data and display formatted results.
5. Data Base Creation (including vector, matrix, data frames).
6. Graphical representation (Bar, Pie, Line, Histogram, Scatter).
7. Cross tabulation and Descriptive Statistics.
8. Implement Correlation.
9. Perform simple Regression and show results in chart.
10. Testing of hypothesis for single mean.
11. Testing of hypothesis for comparison of means.
12. Chi-square test for independence of attributes.