1st SEMESTER BCA			
	SUB CODE		**SUB NAME**
MAJOR	CORE-I	PAPER-1	Problem Solving Using C Programming
	CORE-I	PAPER-2	Introduction To Python Programming
MINOR	CORE-II		Digital Logic
	MULTI DISCIPLINARY-I		Computer Fundamentals
	AEC-I		Odia/Hindi
	VAC-I		Environmental Studies And Disaster Management

Core I (PAPER-1)

Semester I
Problem Solving using C Programming

Course Objectives:
- To learn the C programming language to solve different scientific and business problems
- To learn how to design and write effectively codes using various programming constructs available in the C programming language

Learning Outcomes:

Upon completion of this course, students will be able to:
- Gain knowledge about different data types and operators in C language
- Learn the use of various control structures and array
- Learn the use of pointers, functions, and storage classes
- Write programs using structures, union, and files

Unit I:

Introduction: Introduction to Programming Language, Introduction to C Programming, Keywords & Identifiers, Constants, Variables, Input and Output Operations, Compilation and pre-processing, Data types: Different data types, Data types qualifier, modifiers, Memory representation, size and range, Operators: Operators (Arithmetic, Relational, Logical, Bitwise, Assignment & compound assignment, Increment & Decrement, Conditional), Operator types (unary, binary, ternary). Expressions, Order of expression (Precedence and associativity)

Unit II:

- Decision Control structures & Loops: Decision Making and Branching statements (Simple IF, IF…ELSE, Nested IF… ELSE, ELSE … IF ladder), Selection control

structure (Switch Statement). Looping statements (FOR, WHILE, DO…WHILE), break, continue and GOTO statements

- Array: Concept of Array, Array Declaration, types of arrays (one and multiple dimension), Character Arrays and Strings, limitation of array.

Unit III:

- Pointers: Concept of Pointer (NULL pointer, wild pointer, dangling pointer, generic pointer), Pointer Expressions, Accessing the Address of a Variable, Declaring Pointer Variables, Initializations of Pointer Variable, accessing a Variable through its Pointer, Pointer arithmetic, Pointer representation of array, Array of Pointers, Accessing Sting using Pointer.
- Function: Types of Function, Function Declaration, Function Definition, Function Call, Recursive Function, Dynamic Memory Management functions, String handling function (strlen, strcmp, strcpy, strncpy, strcat, strstr).
- Storage class: Types (auto, register, static, extern), scope rules, declaration and definition.

Unit IV:

Structure and Union: Defining, Declaring, Accessing, Initialization Structure, nested structure, self-referential structure, bit-field, Arrays of Structures, Structures and Functions, structures and pointers, Unions, difference between structure and union, structure within union. File: File Management in C, Defining and Opening a File, File opening modes (read, write, append), Closing a File, File operations, Error handling during I/O Operations, sequential and random access files. Command line arguments.

Text Books:
- ✓ *Programming in ANSI C by E. Balagurusamy, TMH*
- ✓ *Let us C by Yashavant Kanetkar, BPB Pubs.*
- ✓ *The C Programming Language by B. Kernighan & Dennis Ritchie, PHI.*

Reference Books:
- ✓ *C: How to Program by Paul Deitel, Harvey Deitel, Prentice Hall.*
- ✓ *Programming using C by P.C. Sethi & P.K. Behera, Kalyani Publisher.*

BCA 1.1 Lab: Problem Solving using C Programming

1. Write a Program to find greatest among three numbers.
2. Write a Program to all arithmetic operation using switch case.
3. Write a Program to print the sum and product of digits of an integer.
4. Write a Program to reverse a number.

5. Write a Program to compute the sum of the first n terms of the following series
$$S = 1+1/2+1/3+1/4+……$$
6. Write a Program to compute the sum of the first n terms of the following series
$$S = 1-2+3-4+5…………….$$
7. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.

8. Write a function to find whether a given number is prime or not. Use the same to generate the prime numbers less than 100.
9. Write a Program to compute the factors of a given number.
10. Write a program to swap two numbers.
11. Write a Program to print a triangle of stars as follows (take number of lines from user):
   *
   ***
   *****
   ****
12. Write a Program to perform following actions on an array entered by the user:
   a) Print the even-valued elements
   b) Print the odd-valued elements
   c) Calculate and print the sum and average of the elements of array
   d) Print the maximum and minimum element of array
   e) Remove the duplicates from the array
   f) Print the array in reverse order
   The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.
13. Write a Program that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
14. Write a program that swaps two numbers using pointers.
15. Write a program in which a function is passed address of two variables and then alter its contents.
16. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main( ) function.
17. Write a program to find sum and average of n elements entered by the user. To write this program, allocate memory dynamically using malloc( ) / calloc( ) functions.
18. Write a menu driven program to perform following operations on strings:
   a) Show address of each character in string
   b) Concatenate two strings without using strcat function.
   c) Concatenate two strings using strcat function.
   d) Compare two strings
   e) Calculate length of the string (use pointers)
   f) Convert all lowercase characters to uppercase
   g) Convert all uppercase characters to lowercase
   h) Calculate number of vowels
   i) Reverse the string
19. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
Write a program to copy the content of one file to other.

Core I (PAPER-2)

Introduction to Python Programming

Course Objectives:

1. To gain a solid understanding of basic programming concepts of Python.
2. To understand and write programs using Python.
3. Apply Python programming skills to develop practical, real-world applications and projects.

Learning Outcomes:
Upon completion of this course, Students will be able to learn:
- Basics of Python construct.
- Basics of decision making and looping, use of list, set, tuples and dictionary
- Creation and use of functions
- Object-oriented concepts, handling exceptions, operations on files

Unit I:
- Introduction to Python, getting started with Python, Python Basics: Identifiers, Keywords, Python types, basic types, mutable and immutable types, Integer & float ranges, Variable type & assignment, Arithmetic Operators, Precedence & Associativity, Conversions, built-in functions, modules, container types, comments & indention, multi-lining.

- Strings: Introduction, Accessing String elements, Properties, built-in functions, Methods, Conversions, Comparisons. Console I/O: I/O operations, formatted printing.

Unit II:
- Decision Control Instruction: Logical operators, Conditional Expressions, all () & any (), receiving input, pass statement. Repetition Control Instruction: types, usage of loops, break & continue, else block of a loop.
- Lists, Sets, Tuples, Dictionaries: creating, accessing, and looping-in each type. Applying basic operations, using built-in functions and methods on each type, possible data structure / mathematical operations on each type. Comprehensions on List, Set, and dictionary.

Unit III:
Functions: built-in and user-defined functions, invoking functions, unpacking arguments. Recursive function, iteration vs recursion. Lambda functions, map, filter, reduce function.
Modules and Packages: Main module, importing a module, packages, programs using modules and packages.

Unit IV:
- Classes & Objects: Programming paradigms, public and private members, declaring classes, creating objects, class variables, methods, operator overloading, containership, features and types of inheritance.

- Exception Handling: Introduction, handling exception, user-defined exceptions, else block, finally block. File Input/Output: Opening a file, modes of opening a file, operations: reading, writing. Use of *with* keyword.

Text Book:
- ✓ *Let us Python by Yashavant Kanetkar & Aditya Kanetkar, BPB Pub.*

Reference Books & e-Resources:

- ✓ *Python Programming: Using Problem Solving Approach by Reema Thareja, Oxford University Press*
  https://docs.python.org

BCA 2.1 Lab: Introduction to Python Programming

1. Write a program to demonstrate the usage of various arithmetic operators.
2. Write a program that will convert various temperatures.
   3. a. Fahrenheit to Centigrade
   4. b. Centigrade to Fahrenheit
5. Write a program that will find the roots of a quadratic equation: $ax^2 + bx + c = 0$
6. Write a program that demonstrate the usage of various String functions.
7. Write a program that will ask you to enter your name, through keyboard, and perform following operations
   8. a. Find the middle name
   9. b. Find the last name (using string slicing)
   10. c. Re-write the name with surname first.
11. Write a program to find out whether the integer entered by the user, through the keyboard, is even or odd number.
12. Find out the youngest among Shyam, Dugu and Ishan whose ages are entered by the user through keyboard.
13. Given three points (x1, y1), (x2, y2), (x3, y3), write a program to check all the three points fall on one straight line.
14. Write a program to demonstrate basic operations on the list.
15. Write a program to demonstrate stack and queue operations using a list of numbers.
16. Write a program to ask the data of five students that contain name, roll number, age. Sort the list based on roll number of the Student. [Note: Use list of lists].
17. Write a program to demonstrate basic operations on the tuple.
18. Store the data about the shares held by the user as tuples containing the following information about shares: share name, cost price, number of shares, selling price. Write a program to determine:
   a. total cost of the portfolio
   b. total amount gained or lost
19. Write a program to demonstrate basic operations on the set.
20. Write a program to demonstrate basic operations on the dictionary.
21. Create a dictionary to store data (name, roll number) of N students. The key will be the roll number of the student and the value contains the data of the student (in a list). Write a program that asks the user to enter a name of a Student, search it in the dictionary and print the data of the Student if it is available otherwise display an appropriate message.

22. Write a program to demonstrate basic comprehensions on list, set and dictionary.
23. Write a program to find the factorial value of a number entered by the user using function.
24. Write a program to find the factorial of a number using recursion.
25. Write a program to showcase use of Lambda functions, map, filter, reduce function.
26. Create a Python class called "Student" that encapsulates various attributes of a student. Implement methods within the class to perform operations utilizing these attributes.
27. Write a program to demonstrate both Static and Dynamic Polymorphism in Python.
28. Write a program to demonstrate exception handling mechanisms for various types of exceptions.
29. Write a program to read texts from a file and write them into another file.

CORE-II

MINOR
DIGITAL LOGIC

OBJECTIVES
- To understand different methods used for the simplification of Boolean functions and binary arithmetic.
- To design and implement combinational circuits, synchronous & asynchronous sequential circuits.
- To study in detail about Semiconductor Memory Systems.

Unit-1
Character Codes, Decimal System, Binary System, Decimal to Binary Conversion, Hexadecimal Notation, Boolean Algebra, Basic Logic Functions: Electronic Logic Gates, Synthesis of Logic Functions, Minimization of Logic Expressions, Minimization using Karnaugh Maps, Synthesis with NAND and NOR Gates, Tri-State Buffers

Unit-2
Arithmetic: Addition and Subtraction of Signed Numbers, Addition/ Subtraction Logic Unit, Design of Fast Adders: Carry-Lookahead Addition, Multiplication of Positive Numbers, Signed-Operand Multiplication: Booth Algorithm, Fast Multiplication: Bit-Pair Recodng Multipliers, Carry-Save Addition of Summands, Integer Division, Floating-Point Numbers and Operations: IEEE Standard for Floating-Point Numbers, Arithmetic Operations on Floating-Point Numbers, Guard Bits and Truncation, Implementing Floating-Point Operations.

Unit-3
Flip-Flops, Gated Latches, Master-Slave Flip-Flops, Edge-Triggering, T Flip-Flops, JK Flip-Flops. Registers and Shift Registers, Counters, Decoders, Multiplexers, Programmable Logic Devices (PLDs), Programmable Array Logic (PAL), Complex Programmable Logic Devices (CPLDs), Field-Programmable Gate Array (FPGA), Sequential Circuits, UP/ DOWN Counters, Timing Diagrams, The Finite State Machine Model, Synthesis of Finite State Machines.

Unit-4
Memory System: Semiconductor RAM Memories, Internal Organization of Memory Chips, Static Memories, Asynchronous DRAMS, Synchronous DRAMS, Structure of Large Memories, Memory System Considerations, RAMBUS Memory. Read-Only Memories: ROM, PROM, EPROM, EEPROM, Flash Memory, Speed, Size, and Cost of Memory. Secondary Storage: Magnetic Hard Disks, Optical Disks, Magnetic Tape Systems.

Text Books: 1. Carl Hamacher, Z. Vranesic, S. Zaky: Computer Organization, 5/e (TMH)

Reference Books: 1. M. Morris Mano: Digital Logic and Computer Design, Pearson

PRACTICAL: DIGITAL LOGIC LAB

1. Introduction to Xilinx software (VHDL) **Write the VHDL code for**
2. Realizing all logic gates.

3. Combination Circuit.
4. ADDER.
5. SUBTRACTOR.
6. MUX. 7. DE-MUX.
8. Encoder.
9. Decoder.
10. PAL.
11. PLA.
Write the VHDL program for the following Sequential Logic Circuits
12. Flip Flops.
13. Shift Registers.
14. Counters.

MULTIDISCIPLINARY
Computer Fundamentals

Course Objectives:

- Introduce number systems and data representation
- Understand functional units and components of computer
- Introduce the emerging technologies

Learning Outcomes:

Upon completion of this course, students will be able to:
- Understand the basic organization of a computer and the number system
- Learn about the working of commonly used input-output and memory devices
- Understand the role of Operating system and Computer Networks
- Know about some of the emerging computing technologies and web services

UNIT-1:

Computer Basics: Simple Model of a Computer, Characteristics of Computers, Hardware and Software, working of a Computer, Stored Program Concept, Problem Solving with computer: Flowchart, Algorithms, Programming,
Computer Software: Introduction to computer software, classification of computer software, system software, application software, firmware, middleware

UNIT-2:

Input/output Units: Input devices, Output devices, Computer Memory: Introduction, Read Only Memory, Serial Access Memory, Cache memory, primary memory, secondary storage devices, magnetic tapes, hard disks, SSD, optical drives, USB flash drivers, Memory cards, Mass storage devices, Memory Hierarchy.

UNIT-3:

Operating Systems: Definition, Batch Operating System, Multiprogramming Operating System, Time Sharing Operating System, Multiprocessing Operating System. Services of OS. Computer Networks: Concepts of Networking-LAN, WAN, MAN, Network topologies. Internet and the World Wide Web.

UNIT-4:

Emerging Computing Environments: Peer to Peer Computing, Grid computing, distributed computing, Cloud Computing: Introduction, cloud services, cloud deployment models.
Email, video conferencing, e-Learning, e-Banking, UPI, e-commerce, e-Governance, social networking, emerging computer applications.

Text Book:

- ✓ *Fundamentals of Computers by V Rajaraman 6th edition PHI Learning Private Limited*

ସାମର୍ଥ୍ୟବର୍ଦ୍ଧକ ପାଠ୍ୟକ୍ରମ

Ability Enhancement Course (AEC)

ପରିଶୁଦ୍ଧ ଭାଷା ଓ ଲିଖନ ଧାରା

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ସାହିତ୍ୟର ଶିକ୍ଷଣ ଓ ଅଧ୍ୟୟନ କ୍ଷେତ୍ରରେ ଭାଷାର ପରିଶୁଦ୍ଧତା ନିତାନ୍ତ ଆବଶ୍ୟକ । ସାହିତ୍ୟକର୍ମ ବାହିରେକ ବିଭିନ୍ନକ୍ଷେତ୍ରରେ ନିର୍ଭୁଲଭାଷା ବ୍ୟବହାର ହେବା ବାଞ୍ଛନୀୟ । ଭାରତର ସମ୍ବିଧାନସ୍ୱୀକୃତ ଭାଷାମାନଙ୍କ ମଧ୍ୟରେ ଓଡ଼ିଆଭାଷାର ସ୍ଥାନ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ । ଶିକ୍ଷାର୍ଥୀମାନେ ନିର୍ଭୁଲ ଭାଷା ପ୍ରୟୋଗକ୍ଷେତ୍ରରେ ଯେପରି ସମର୍ଥ ହେବେ, ସେଥିନିମିଶ ଏହି ପାଠ୍ୟପଦ୍ଧତି ପରିକଳ୍ପିତ । ବିଭିନ୍ନ ପ୍ରତିଯୋଗିତାମୂଳକ ତଥା ପ୍ରାକ୍ଶାସନିକ ସେବାମୂଳକ ନିଯୁକ୍ତି ହେବାପାଇଁ ସମ୍ମୁଖୀନ ହେଉଥିବା ପରୀକ୍ଷାନିମିତ୍ତ ମଧ୍ୟ ଏହା ଶିକ୍ଷାର୍ଥୀଙ୍କୁ ସାହାଯ୍ୟ କରିବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି):

୧ମ ଏକକ: କ) ଶବ୍ଦ ଗଠନରେ ଶୁଦ୍ଧତା

ଖ) ରୂଢ଼ିର ଅର୍ଥ ଅବଗତି

ଗ) ରୂଢ଼ିର ପ୍ରୟୋଗବିଧି ଶିକ୍ଷା

୨ୟ ଏକକ: କ) ବାକ୍ୟର ଗଠନରୀତି ଶିକ୍ଷା

ଖ) ବିଭିନ୍ନ ପ୍ରକାର ବାକ୍ୟ ସମ୍ପର୍କରେ ଧାରଣା

ଗ) ନିର୍ଭୁଲ ବାକ୍ୟଲିଖନ ବିଦ୍ୟା

୩ୟ ଏକକ: କ) ବୃହତ୍ ଅନୁଚ୍ଛେଦକୁ ସଂକ୍ଷିପ୍ତ କରିବାର କୌଶଳ

ଖ) ବିଷୟଗତ ଶୀର୍ଷକ ନିର୍ଦ୍ଧାରଣ କଳା

ଗ) ଅନୁଚ୍ଛେଦରୁ ବିଭିନ୍ନ ପ୍ରଶ୍ନର ଉତ୍ତର ପ୍ରଦାନ

୪ର୍ଥ ଏକକ: କ) ସ୍ୱୟଂଲିଖନ ଜ୍ଞାନ

ଖ) ଫିଚର୍ ପ୍ରସ୍ତୁତି

ଗ) ନିର୍ଭୁଲ ପତ୍ରଲିଖନ ଓ ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି କଳା

ପାଠ୍ୟ ବିଷୟ

ପ୍ରଥମ ଏକକ: (କ) ଶବ୍ଦର ସଂଜ୍ଞା, ଶୁଦ୍ଧ ଶବ୍ଦ ଓ ବର୍ଣ୍ଣାଶୁଦ୍ଧି

(ଖ) ରୂଢ଼ିର ଅର୍ଥ ଓ ପ୍ରୟୋଗ ବିଧ

ଦ୍ୱିତୀୟ ଏକକ: ବାକ୍ୟ ଗଠନରୀତି ଓ ପ୍ରକାର ଭେଦ

ତୃତୀୟ ଏକକ: ଅନୁଚ୍ଛେଦ ସଂକ୍ଷେପଣ, ଶୀର୍ଷକ ନିର୍ଦ୍ଧାରଣ ଓ ପ୍ରଶ୍ନୋତ୍ତର

ଚତୁର୍ଥ ଏକକ: ନିର୍ଭୁଲ ଲିଖନ ପଦ୍ଧତି, ସ୍ୱୟ ଲିଖନ, ଫିଚର୍, ପତ୍ର ଲିଖନ, ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି

ସହାୟକ ଗ୍ରନ୍ଥସୂଚୀ (Book of reference) :

୧. ସର୍ବସାର ବ୍ୟାକରଣ - ଶ୍ରୀଧର ଦାସ, ଗ୍ରନ୍ଥ ମନ୍ଦିର, କଟକ ।

୨. ସାରସ୍ୱତ ବ୍ୟାବହାରିକ ବ୍ୟାକରଣ - କୃଷ୍ଣଚନ୍ଦ୍ର ପ୍ରଧାନ, ସତ୍ୟ ନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର ।

୩. ବୃହତ ଓଡ଼ିଆ ବ୍ୟାକରଣ- ତ୍ରିଲୋଚନ ଦେହେରୀ, ଗୋବିନ୍ଦ ଚନ୍ଦ୍ର ଲେଙ୍କା, ଫ୍ରେଣ୍ଡସ୍ ପବ୍ଳିଶର୍ସ, କଟକ ।

୪. ଆଧୁନିକ ଓଡ଼ିଆ ବ୍ୟାକରଣ- ଧନେଶ୍ୱର ମହାପାତ୍ର, କିତାବ୍ ମହଲ, କଟକ ।

୫. ସାଧାରଣ ଓଡ଼ିଆ ବନାନ ଶୁଦ୍ଧି- ଓଡ଼ିଆ ଭାଷା ପ୍ରତିଷ୍ଠାନ, ଭୁବନେଶ୍ୱର ।

୬. ଗଣମାଧ୍ୟମ ଓ ଗଣଯୋଗାଯୋଗ – ଶିଶିର ଦେହେରୀ, ଫ୍ରେଣ୍ଡସ୍ ପବ୍ଳିଶର୍ସ, କଟକ ।

୭. ଯୋଗାଯୋଗ ମୂଳକ ମାତୃଭାଷା – ଦିବ୍ୟସିଂ ନାରାୟଣ ସାମଲ, ସତ୍ୟନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର, କଟକ ।

୮. ଯୋଗାଯୋଗର ଭାଷା – ସୁଧୀର ଚନ୍ଦ୍ର ମହାନ୍ତି, ପ୍ରାଚୀ ପ୍ରକାଶନ, କଟକ ।

୯. ନିର୍ଭୁଲ ଲେଖାର ମୂଳସୂତ୍ର, ନୀଳାଦ୍ରି ଭୂଷଣ ହରିଚନ୍ଦନ, କିତାବ ମହଲ, କଟକ ।

୧୦.ଓଡ଼ିଆ ଭାଷା ବ୍ୟାକରଣ ସୌରଭ, ଚନ୍ଦ୍ରଶେଖର ପତି, ଓଡ଼ିଶା ବୁକ୍ ଏମୋରିୟମ୍, କଟକ ।

ନମୁନା ପ୍ରଶ୍ନ (Sample Questions) :

୧. ଶବ୍ଦ କାହାକୁ କୁହାଯାଏ ? (୧ ମାର୍କ)

୨.ପର୍ବତର ଦୁଇଟି ପ୍ରତିଶବ୍ଦ ଲେଖ । (୨ ମାର୍କ)

୩.ବାକ୍ୟର ପ୍ରକାରଭେଦ ଦର୍ଶାଅ। (୫ ମାର୍କ)

୪.ତୁମ ମହାବିଦ୍ୟାଳୟରେ ଏକ ଶିକ୍ଷକ ନିଯୁକ୍ତିପାଇଁ କୌଣସି ସମ୍ବାଦପତ୍ରରେ ଓଡ଼ିଆ ଭାଷାରେ କିପରି ବିଜ୍ଞାପନ ଦିଆଯିବ,

ତାହାର ଏକ ନମୁନା ଲେଖ । (୮ ମାର୍କ)

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SEMESTER-I

AEC

प्रयोजनमूलक हिंदी

UNIT - I

प्रयोजनमूलक हिंदी :

प्रयोजनमूलक हिंदी का स्वरूप और परिभाषा, प्रयोजनमूलक हिंदी के भेद, प्रयोजनमूलक हिंदी की विशेषताएँ, प्रयोजनमूलक हिंदी की समस्याएँ और संभावनाएँ

UNIT - II

राजभाषा हिंदी की संवैधानिक स्थिति:

राजभाषा समिति, 1957, राजभाषा के संबंध में राष्ट्रपति के आदेश, 952, 1955, 1960, राजभाषा अधिनियम 1963, राजभाषा अधिनियम 1967, राजभाषा अधिनियम 1976

UNIT - III

कार्यलयी हिंदी:

हिंदी के विविध रूप : राजभाषा, राष्ट्रभाषा, संपर्क भाषा, संचार भाषा, मातृभाषा, सर्जनात्मक भाषा राष्ट्रभाषा और राजभाषा में अंतर, मानक हिंदी

कार्यालयी हिंदी के प्रमुख प्रकार्य

आलेखन: परिभाषा, स्वरूप, विशेषता, प्रारूप

टिप्पण: परिभाषा, स्वरूप, विशेषता, प्रारूप

पत्रलेखन, पल्लवन, संक्षेपण

पारिभाषिक शब्दावली : पारिभाषिक शब्दावली का स्वरूप एवं महत्त्व पारिभाषिक शब्दावली निर्माण के सिद्धांत, पारिभाषिक शब्दावली के भेद, ज्ञान-विज्ञान के विभिन्न क्षेत्रों में प्रयुक्त कुछ निर्धारित पारिभाषिक शब्दाबली

UNIT – IV

हिंदी में कंप्यूटर का अनुप्रयोग:

कंप्यूटर का परिचय, कंप्यूटर की संरचना, कंप्यूटर के प्रकार, कंप्यूटर की उपयोगिता, हिंदी में शब्द संसाधन, हिंदी में डाटा संसाधन, वेब पब्लिशिंग, वेब पेज डिजाइनर

इंटरनेट :

इंटरनेट स्वरूप और विकास इंटरनेट : कार्यप्राणाली, इंटरनेट के संपर्क उपकरणों का परिचय, इंटरनेट एक्सप्लोटर, इंटरनेट की अनुप्रयुक्तता।

लिंक, ई-मेल, ब्राउजिंग, अपलोडिंग, डाउनलोडिंग, न्यू मीडिया, वेब पत्रकारिता, ब्लागिंग, इंटरनेट रिलै चैट, हिंदी के प्रमुख इंटरनेट पोर्टल।

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पाठ्य पुस्तक:

1. प्रयोजनमूलक हिंदी-   प्रो. राधाकांत मिश्र,

    डॉ. अमूल्य रत्न महांती,

    प्लैनेट वी, हिंदी बुक सेंटर, बादामबाड़ी, कटक

VAC
Environmental Studies
&
Disaster Management

SEMESTER-I
For Under Graduate Compulsory Courses for Arts, Science and Commerce

FULL MARK-100 (Credit-3)

Unit 1: Multidisciplinary nature of environmental studies   (8Period)
Definition, scope and importance
Need for public awareness
Environmental Pollution
Definition
• Cause, effects and control measures of:-
a.   Air pollution
b.   Water pollution
c.   Soil pollution
d.   Marine pollution
e.   Noise pollution
f.   Radiation pollution

Unit 2: Natural
Resources: (8Period)

Renewable and non-renewable resources:
Natural resources and associated problems.
a.   Forest resources: Use and over-exploitation, deforestation, case studies.
        Timber extraction, mining, dams and their effects on forest and tribal people.
   b.   Water resources : Use and over-utilization of surface and ground water,
        floods, drought, conflicts over water, dams-benefits and problems.
   c.   Mineral resources : Use and exploitation, environmental effects of extracting
        and using mineral resources, case studies.
   d.   Food resources : World food problems, changes caused by agriculture and
        Overgrazing, effects of modern agriculture, fertilizer-pesticide problems,
        waterlogging, salinity, case studies.
   e.   Energy resources : Growing energy needs, renewable and non-renewable
        energy sources, use of alternate energy sources. Case studies.
Biodiversity:-
Introduction-Definition; Biogeographically classification of India
India as a mega diversity nation. Hot sports of biodiversity, Threats to biodiversity.
Endangered and endemic species of India. Conservation of biodiversity. In Situ and Ex-so
conservation of biodiversity

Unit-3: Disaster Management   (8 Period)

1. **Disaster Management:** Types of disasters (natural and Man-made) and their causes and effect)
2. **Vulnerability Assessment and Risk analysis:** Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves, Desertification and Lighting)
3. **Institutional Framework:** Institutional arrangements for disaster management (National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), Disaster Management Act, 2005, District Disaster Management Authority (DDMA), National Disaster Response Force(NDRF) and Odisha Disaster Rapid Action Force(ODRAF)
4. **Preparedness measures:** Disaster Management cycle, Early Warning System, Pre-Disaster and Post-Disaster Preparedness, strengthening of SDMA and DDMA, Community Preparedness for flood cyclone, heat waves, fire safety, lightening and snake biting. Stakeholders participation, Corporate Social Responsibility (CSR)
5. **Survival Skills:** Survival skills adopted during and after disaster (Flood, Fire, Earthquake, Cyclone and Lightening), Disaster Management Act-2005, Compensation and Insurance

Unit 4: Social Issues and the Environment   (6 Period)

A.

a.   Environmental Ethics: Issues and possible solutions.
b.   Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies
   c. Environment Protection Act
d.   Air(Preservation Control of Pollution) Act
e.   Water(Preservation Control of Pollution) Act
f.   Wildlife Protection Act
g.   Forest Conservation Act
h.   Solid waste management Cause, effect and Control Measure of Urban and Industrial waste
        (Role of each individual in conservation of Natural resources and prevention of pollution)
   B. Human Population and the Environment
        Population Ecology: Individuals, species, population, community
        Human population growth, population control method
        Urbanisation and its effect on society

Unit 5: Field work   (15 Periods of 30 hrs)
   • Visit to an area to document environmental assets: river/forest/flora/fauna, etc.
   • Visit to a local polluted site- Urban/Rural/Industrial/Agricultural
   • Study of common plants, insects, birds and basic principles of identification.
   • Study of simple ecosystems-pond, river, Delhi Ridge ,etc.

BSc. BCA 2ND SEMESTER (NEP 2020)

SUBJECT CODE	SUBJECT NAME
MAJOR-P-3	Data Structures
MAJOR-P-4	OPPS Using C++
MINOR-2-P-2	Probability and Statistics
MDC-2	Environmental Education
AEC-2	English
SEC-1	Analytical Thinking & Logical Reasoning

SEMESTER-II
Core-III   **Data Structures**

Course Objectives:
- To understand different ways of organizing data in computer's memory.
- To learn different operations on data structures.
- To explore different applications of data structures.

Learning Outcomes:
Upon completion of this course, students will be able to:
1. Learn about data structures and the use of array
2. Create linked lists and perform insertion/deletion operations on them
3. Represent Stack and Queue in the memory and learn their applications
4. Learn the use of various non-linear data structures and their applications

Unit-I:

Introduction to Data Structures: Definition, Concepts, Classification of Data Structures.
Array: Introduction, One-Dimensional Array, Memory representation, Operations: Traversing, Searching, Insertion, Deletion, Merge. Two-Dimensional Array & Memory Representation, Multidimensional Array. Linear Search versus Binary Search, Sorting: Selection Sort, Bubble Sort.

Unit-II:

Linked Lists: Definition, Single Linked List, Memory representation, Operations: Traversing, Searching, Insertion, Deletion and Merge. Double Linked List, Operations: Insertions, Deletion. Circular, Double Circular Linked list, Operations: Traversing, Insertion. Applications of Linked List, Sparse Matrix and Polynomial representations.

Unit-III:

Stack: Definition, Representation: Array and Linked List representations, Operations: PUSH, POP, STATUS. Applications: Evaluation of Arithmetic Expressions: Notations, Infix to Postfix Conversion, Evaluation of Postfix expression. Recursion (Factorial and Fibonacci), Tower of Hanoi.

Queues: Definition, Representation: Array and Linked List representations, Operations: Enqueue, Dequeue. Structures of Queue: Circular, Deque and Priority Queue. Applications of Queue

Unit-IV:

Trees: Definition, Terminologies, Binary Tree: Properties, Representations (Linear and Linked List representations). Operations: Traversal (Inorder, Preorder, Postorder), Search. Introduction to Binary Search Tree, AVL tree, M-Way Search Tree. Applications of Trees.

Graph: Definition, Terminologies, Representations (Set, Linked List, Matrix), Operations: Traversal (BFS, DFS). Applications of Graphs.

Text book:

Classic Data Structure, D. Samanta, PHI, 2/ed.

Reference Books:

- ✓ *Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Pubs.*
- ✓ *Sastry C.V., Nayak R, Ch. Rajaramesh, Data Structure & Algorithms, I. K. International*
- ✓ *Publishing House Pvt. Ltd, New Delhi.*

Core III - Lab: Data Structures

Write a C Program for the followings

1. To search an element and print the total occurrences in the array.

2. To insert and delete elements into/from appropriate position in an array.

3. To perform Binary Search.

4. To perform Bubble sort.

5. To perform Selection sort.

6. To implement linear linked list and perform operations such as traverse, search, insert, delete, and reversing the list.

7. To implement circular linked list and perform operations such as node insert and delete.

8. To implement double linked list and perform operations such as node insert and delete.

9. To represent a Sparse Matrix using linked list.

10. Polynomial representation using linked list.

11. Array and Linked list implementations of Stack and perform operations such as push, pop and status.

12. Linked list implementation of Queue and perform operations such as enqueue and dequeue.

13. Linked list implementation of Circular Queue.

14. To implement a Binary Search Tree.

15. To perform tree traversal operations.

16. To implement adjacency matrix for a given graph.

17. To perform BFS and DFS traversal.

Core IV

Object Oriented Programming using C++

Course Outcomes:
- To know about the Object-Oriented Programming concepts.
- To write object-oriented programs using C++ constructs

Learning Outcomes:
Upon completion of this course, students will be able to:
- Understand OOPs concepts as a programming style
- Use class/objects in programs and functions of different types
- Learn the concept of inheritance and overloading of functions and operators

Unit I:

- Principles of Object-Oriented Programming: Object-Oriented Programming (OOP) Paradigm, Basic Concepts of OOP, Benefits of OOP, Characteristics of OOPS, Object Oriented Languages, Applications of OOP.
- Introduction to C++, Difference between C & C++, Tokens, Data types, Operators, structure of C++ Program, C++ statements, Expressions and Control Structures.
- Functions in C++: Argument passing in function, Inline Functions, Default Arguments, Const. Arguments, Friend function.

Unit II:

- Classes and Objects: Defining Member Functions, Making an outside Function Inline, Nested Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions.
- Constructors & Destructors: Constructors, Parameterized Constructors, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, DynamicConstructors, Destructors.

Unit III:

- Inheritance: Basics of Inheritance, Type of Inheritance, Virtual Base Classes, Abstract Classes, Member Classes, Nesting of Classes. Polymorphism: Pointers, Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions, Function Overloading, Operator Overloading.

Unit IV:

- Managing Console I/O Operations: C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators.
- Files: Classes for File Stream Operations, Opening and Closing a File, Detecting end-of-file, File Modes, File Pointers and their Manipulations, Sequential Input and Output Operations, Updating a File: Random Access, Error Handling during File Operations, Command-line Arguments

Text Books:

✓ *E. Balgurusawmy, Object Oriented Programming with C++, 4/e (TMH).*
✓ *Bjarne Stroustroup, Programming - Principles and Practice using C++, 2/e, Addison-Wesley*

Reference Books:

✓ *Paul Deitel, Harvey Deitel, "C++: How to Program", 9/e. Prentice Hall.*
✓ *Herbtz Schildt, C++: The Complete reference, McGrawHill.*

Lab: Object Oriented Programming using C++

1. Write a Program for Swapping of two numbers.
2. Write a Program to find sum of four numbers using default argument passing.
3. Write a Program to find square and cube of a number using inline function.
4. Write a Program to find the factorial of a number.
5. Write a Program to find reverse of a number.
6. Write a program to find sum of four numbers using default argument passing inmember function.
7. Write a Program to find area of circle, triangle and rectangle using functionoverloading.
8. Write a program to distinguish the properties of static and non-static ata members.
9. Write a program to show the method of accessing static private member function.
10. Write a program to show the ways of calling constructors and destructors.
11. Write a program to perform ++ operator overloading using member function.
12. Write a program to perform ++ operator overloading using friend function.
13. Write a program to perform + operator overloading for two complex number addition.
14. Write a program to perform + operator overloading for string concatenation.
15. Write a program to perform single inheritance.
16. Write a program to perform multiple inheritance.
17. Write a program to create an integer array using new operator and find the sum andaverage of array elements.
18. Write a program to implement virtual destructor.
19. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
20. Write a program to Copy the contents of one file to other.

Probability and Statistics

Objective: The objective of the course is to expertise the student to the extensive role of

statistics in everyday life and computation, which has made this course a core course in all

branches of mathematical and engineering sciences.

Expected Outcome: The students shall learn probability and statistics for various random

variables, multivariate distributions, correlations and relations. He shall learn law of large

numbers and shall be able to do basic numerical calculations.

UNIT-I

Probability: Introduction, Sample spaces, Events, probability of events, rules of probability, conditional probability, independent events, Bayes's theorem, Probability distributions and probability densities: random variables, probability distributions, continuous random variables, probability density functions, Multivariate distributions, joint distribution function, joint probability density function, marginal distributions, conditional distributions, conditional density, The theory in practice, data analysis, frequency distribution, class limits, class frequencies, class boundary, class interval, class mark, skewed data, multimodality, graphical representation of the data, measures of location and variability. Population, sample, parameters

UNIT-II

Mathematical Expectation: Introduction, expected value of random variable, moments, Chebyshev's theorem, moment generating functions, product moments, moments of linear combinations of random variables, conditional expectations, the theory in practice, measures of location, dispersion

UNIT-III

Special probability distributions: Discrete Uniform distribution, binomial distribution, Negative binomial, geometric, hypergeometric, poisson, multinomial distribution, multinomial. Special probability densities; Uniform distribution, gamma, exponential, gamma, chi-square, beta distribution, normal, normal approximation to binomial, bivariate normal, Functions of random variables, distribution function technique, transformation technique-one variable, several variables, moment generating function technique,

UNIT-IV

Sampling distributions: population distribution, random sample, sampling distribution of mean, Central Limit theorem, Sampling distribution of the mean: finite populations, chi-square, t, F distributions, regression and correlation: Bivariate regression, regression equation, Linear regression, method of least squares.

BOOKS RECOMMENDED:

1. Irwin Miller and Marylees Miller, *John E. Freund's Mathematical Statistics with Applications*

(8thEdition), Pearson, Asia, 2014.

BOOK FOR REFERENCES:

l. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, *Introduction to Mathematical Statistics,* Pearson

Environmental Education

Course Learning Outcomes (CLOs)

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

- Understand the natural environment, different cycles related to Ecology & Ecosystem.
- Identity different causes of Environmental Pollution, Climate Change and need for Sustainable   Development.
- Acquire comprehensive knowledge about Population Ecology, population Growth and Public Health.
- Learn about Environmental Movements and Laws.
- Acquire the knowledge about State pollution Control Board and Central pollution Control Board.

Unit-I: Introduction to Environment

Learning Outcomes
  LO: Understand basic concepts of Environment , Ecology, Eco-System and Biodiversity.

- The Environment: Atmosphere, Hydrosphere, Lithosphere, Biosphere.
- Ecology, Ecosystem, major eco-system, Biogeochemical Cycle (Carbon Cycle, Nitrogen Cycle).
- Biodiversity-Values and Services, Global Environmental Issues.

Unit-II: Climate Change and Sustainable Development

Learning Outcomes
  LO: Identify factors of pollution and climate change.
  LO: Learn basics of wild life conservation and Sustainable Development Goals.
- Environment Pollution: Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, Thermal Pollution, Radiation Pollution.
- Climate Change, causes and consequences, Natural Resources: Conservation of Natural Resources,Soil Erosion and Conservation.
- Management and Conservation of Wildlife, Sustainable Development and its Goals.

Unit-III: Population and Public Health

Learning Outcomes

LO: *Understand the correlation between population growth and issues of public health.*
LO: *Learn how to manage pandemic in modern times.*
- Population dividend and population liability.
- Population Ecology: Individuals, Species, role of different sector in managing health disaster.
- Population Growth and Control, Community, Urbanization and its effects on Society.
- Communicable Diseases, Non-Communicable Diseases, Transmission and its effects.

Unit-IV: Environmental Movements and Environmental Laws

Learning Outcomes

LO: *Trace environmental movements of India.*
LO: *Understand functions and role of Pollution Control Boards and know the basic laws of India relating to environment.*

- Environmental Movements in India: Grass root Environmental movements in India, Role of women, Environmental Movements in Odisha.
- State Pollution Control Board, Central Pollution Control Board.
- Environmental Laws: Water Act, 1974, Air Act, 1981, The Wildlife (Protection) Act,1972, Environment Protection Act 1986.

Sample Questions

1. What is meant by environment? (1 Mark)
2. Write any two causes of noise pollution. (2 Marks, Within 50 words))
3. Discuss the causes and consequences of climate change (5 Marks, Within 300 words))
4. Critically reflect on the importance and purpose of SDGs with reference to the contemporary society.(8 Marks, 500 to 800 words).

Transaction Mode:

Workshop, ICT-Lab Learning, Lecture method, Seminar, Team teaching, Tutoring, Peer group discussion, Mobile teaching, Self-learning, Collaborative learning, Co-operative learning.

Practical/ Activities

Each student is required to submit Practical/Project report/Assignments selecting any one of the following:

1. Investigation of Major sources of micro- plastic pollutants in urban habitats.
2. Detection and characterisation of major water pollutants in river water.
3. Impact of growing urbanisation on wildlife habitat.

* It will be evaluated by both internal and external examiners.

Text Books

- ✓ *Anubha Kaushik and CP Kaushik, "Perspectives in Environmental Studies", 5th edition,*
- ✓ *2016.*
- ✓ *Benny Joseph, "Environmental studies", 2nd edition, McGraw Hill Education, 2015.*
- ✓ *Basics of Environmental Studies by Dr. N. S. Varandani, Books India Publications.*

✓ *Disaster Management by MukeshDhunna, Vayu Education of India, Delhi Publication.*

Reference Books

✓ *Dr. M. Chandrasekhar, "A Text book of Environmental Studies", HI-TECH publications,2006.*
✓ *Dr. M. Anji Reddy, "A Text book of environmental science and Technology", B S Publications, 2008.*
✓ *Dr. K. Mukkanti, "A Text book of Environmental Studies", S.CHAND and Company Ltd, 2009.*
✓ *EHILRS and ST, "Text book of Municipal and Rural Sanitation", M.S Hill, 1998.*

English

Introduction

This Course aims at providing students familiarity with all components of language learning; listening, speaking, reading, writing, grammar and vocabulary which will eventually help in development of communication skills. This is an activity-based, goal-oriented, functional course, which aims to make the students able and efficient communicators by helping them to be self-reflexive about English. This course has a predefined context of being supportive and complementary to the core courses in various disciplines. Therefore, unlike most other courses in English Communication on offer, it does not seek to build facile fluency that passes off as communicative competence. Rather, it intends to equip the students with the relevant skills of presentation and expression needed in the academic as well as in the professional domains. While reading skills exercises are meant to promote the acquisition of analytical and comprehension skills, writing skills exercises are centred on sentence construction, paragraph development and précis writing. In this course there is ample scope to build the speaking and listening skills of students with an emphasis on interactive learning and articulation.

Course Objectives

- Develop in students the required knowledge, skills, and judgement around human communication that facilitate their ability to work collaboratively with others.
- Enable the students to understand and practise different techniques of communication. Through this course, they will familiarise themselves with different types of communication. Enhance the employability of students by developing in them the required skills of communication in English, so as to enable them to: 2 i. Speak correctly, intelligibly and fluently as well as to listen and comprehend accurately when spoken to, so as to be able to communicate effectively and with confidence in a variety of social, academic and work-related situations; ii. Read and comprehend accurately the various kinds of written texts which they may be expected to deal with;

iii. Write effectively in a number of different genres (forms) of writing, relevant to social, academic and work-related needs;

- Develop interpersonal skills and the attitudes required for effective functioning in

different social and work-related situations.

- Provide cognitive and cultural enrichment through exposure to a variety of humanistic learning experiences. General Pedagogical Principles 1. Instruction will essentially be activity-based. Each session will provide a variety and range of activities, pitched at different levels of linguistic competence. Group activities will be encouraged. The links between theory and practice will constantly be exemplified and highlighted. Theoretical inputs will be provided, as far as possible, in a non-technical manner. 2. Periodical tests may be conducted to assess skills and application of theoretical principles and not recalling information from memory. The skills of Listening and

Speaking may be tested through oral examinations in the classes, depending on time and scope. 3. An inventory of available software, including audio/ audio-visual materials should be made, and the use of such materials be standardised across all colleges. If necessary, software tailored to the requirements of the program should be produced in collaboration with appropriate agencies. 4. Although portions of selected texts will be used to develop the skills, a teacher is free to use material recommended by the experts. 5. The course cannot be effectively implemented unless all instructors are properly oriented. It should be ensured that orientation programs are organised before the curriculum is implemented. Handbooks must be produced and made available to all instructors. 3 6. Workshops for the development of instructional materials by members of college faculties should be organised periodically, as a part of on-going orientation.

Attention

The course drives away the myth that communicative competence in a language is honed, built and effectively practiced by learning and mastering the grammar, phonetics of a language or appropriating the accent and structures of the native tongue. Rather it is an adaptation with equal blend of the first language and the context in collaboration with the foreign tongue achieved by suitable use of texts from literature. So the teachers as well as students are advised to use as much literary texts as possible from the texts prescribed and other sources for providing an exposure to the students to be aware of the truth that literature enables skilful communication. The examination questions will be set according to the texts and topics prescribed.

Unit-I

English Language and Communication: Introduction (9 hours)

I. Communication, its importance and factors that determine communication (sender, receiver, channel, code, topic, message, context, feedback, barriers) models of communication, the information gap principle: given and new information; information overload, redundancy and cliches, the importance of audience and purpose ii. Types of communication: horizontal, vertical, interpersonal, lateral and grapevine iii. Verbal and nonverbal communication, body language and its manifestations in different cultures, written and oral communication, bias-free communication, political correctness. iv. Styles of Communication: formal, informal and semi formal Note: The topics listed above should be introduced briefly in the theory classes. The reflections of the students' understanding may be assessed by the facilitator through exercises. The teacher/facilitator can refer to the books recommended under 'prescribed readings' for teaching and exercise purposes. He/she can refer to valid and recognised web-resources and additional titles from renowned publishing houses for the same purpose.

Texts

- ✓ Communicative English OSHEC Publication. Chapters: Unit-I
- ✓ Literature and Art of Communication by Asima Ranjan Parhi, Madhusmita Pati, Subhra Prakash Das and Shakina Mohol, Cambridge University Press, 2019.
- ✓ The International Encyclopedia of Communication. Malden, MA: Blackwell Publishing. (ebook) 4

Suggested Readings

- ✓ A Cognitive Approach to Language Learning. Oxford University Press Donsbach, Wolfgang. (2008).
- ✓ 'Prospect of Electronic Media as Curriculum in Non-Native Contexts', by Parhi and Dutta in I-Manager's Journal on English Language Teaching, 4(2)2014. https://files.eric.ed.gov. pdf
- ✓ 21st CenturyCommunication: A Reference Handbook. Thousand Oaks, Calif: SAGE Reference. (e-book)
- ✓ Written and Spoken Communication in English published by Orient Blackswan
- ✓ Indian English through Newspapers, A R Parhi, Concept, New Delhi, 2008.
- ✓ An Introduction to Professional English and Soft Skills by Das et al
- ✓ *Communicative Competence.* T T Panigrahi*, Notion Press, India, Singapore and Malaysia
- ✓ Soft Skills for Your Career, by Kalyani Samantaray. OUP
- ✓ An Anthology of English Prose 1400–1900 Cambridge University Press 2015.

Unit-II

English Language and Communication: Listening and Speaking (9 hours)

I. Types of listening (active and passive), listening to respond (how, when and why), empathic listening and interactive listening ii. Speaking to communicate effectively: fluency, accuracy. intelligibility and clarity iii. Style of speaking in various situations:formal, informal and semi-formal, tentative and cautionary, simple and plain English iv. English pronunciation: vowel and consonant sounds, diphthong, IPA, syllable division and primary stress in words, stress shift, sentence rhythm and weak forms, contrastive stress in sentences, intonation: falling and rising tones, varieties of spoken Englishes: Standard Indian, American and British (R.P.); 'Neutral English' , newspapers, ad captions and their contribution to the shaping of Indian English as a standard language

Note: This unit does not go deep into phonetics. The objective is to train students to refer to a Learners' Dictionary to find out the correct pronunciation of words. Students will be introduced to phonemic transcription using IPA symbols in theory classes and further practice will be provided during exercises/practices.

The teacher/facilitator will include simple questions on phonemic transcription and the marking of stress in words and sentences. The teacher/facilitator can refer to the books recommended under both 'Texts' and 'Suggested Readings' for teaching and exercise purposes. He/she can refer to valid and recognised webresources and additional titles from renowned publishing houses for the same purpose.

Texts

- ✓ Communicative English OSHEC publication. Chapter-Unit I
- ✓ The Sound of English by www.pronunciationstudio.com
- ✓ 'Towards the Anti-Canon: A Brief Focus on Newspaper English in India', SHSS (Studies in Humanities and Social Sciences, UGC Care), Ed. T.R. Sharma, IIAS (Indian Institute of Advanced Study), Shimla, Vol. XIII, No.1, Summer 2006, pp.143-155. http://14.139.58.200, iias.ac.in.journals Asima Ranjan Parhi.

Suggested Readings

- ✓ The Sounds of English Around the World: An Introduction to Phonetics and Phonology Cambridge University Press
- ✓ "Listening in the Language Classroom", pp. 58 - 76 DOI: https://doi.org/10.1017/CBO9780511575945.006, Cambridge University Press, Print publication year: 2009
- ✓ An Introduction to Professional English and Soft Skills by Das et al.
- ✓ Teaching the Spoken Language. Cambridge University Press Speaking. Oxford University Press
- ✓ *Communicative Competence.*Notion Press, India, Singapore and Malaysia
- ✓ Exploring Spoken English. Cambridge University Press English Conversation. Oxford University Press
- ✓ **The English Language in India: From Racial-Colonial to Democratic",** *EJBS (The European Journal of Behavioural Sciences)* **3 (1): page:8-16, Dec. 2020. DOI-10.33422/ejbs.v3i1.302**

Unit-III

English Language and Communication: Reading and Writing (9 hours)

I. Reading methods and techniques: fluency, accessing meaning, levels of competence, skimming and scanning, global and local reading, silent reading and reading aloud ii. Reading texts to understand literal, metaphorical and suggested meanings (essays, poems and stories), identifying the tone (admiring, accusatory, ironical, sympathetic, ambiguous and neutral etc.) of the writer iii. Writing process: brainstorming, pre-writing, writing and post writing, coherence, cohesion, style, iv. Writing short texts: paragraph writing; writing longer texts: literary writing, academ
II. ic writing and media writing

Note: This unit will focus on the basic principles of reading and writing as forms of communication. The teacher/facilitator may use reading material from literary texts, media writings, non-fiction prose and other written discourses. He/she needs to adopt caution in selecting the reading materials. Reading and writing are related activities. The insights gained through training in reading can be utilised for effective writing. The teacher/facilitator must refer to the chapters and topics from the books recommended under 'Prescribed Texts' for teaching and exercise purposes. From which questions will be set for the examination. He/she can refer to valid and recognised web-resources and additional titles from renowned publishing houses for the same purpose.

Prescribed Pieces/Texts

- ✓ *Communicative English* OSHEC Publication. Chapters:Unit-III
- ✓ From *The Winged Word,* David Greene, Macmillan.1974 and *Melodious Songs and Memorable Tales,* 2015:
- ✓ 'Daffodils' by William Wordsworth, 'When we two Parted' by Lord Byron, 'The Last Ride Together' by Robert Browning, "Self Portrait" by A K Ramanujan.
- ✓ From *The Widening Arc*. Kitab Bhavan, 2016, A R Parhi, S Deepika, P Jani :
- ✓ 'No Learning without Feeling' by Claire Needell Hollander and 'The Empty Page' by Steven Harvey, 'George V High School' by Dinanath Pathy

Suggested Readings

- ✓ The Oxford Essential Guide to Writing Oxford University Press 2000.
- ✓ An Introduction to Professional English and Soft Skills Das et al
- ✓ The Classic Guide to Better Writing: Step-by-Step Techniques and Exercises to Write Simply, Clearly and Correctly Oxford University Press, 1996
- ✓ Ways of Reading: Advanced Reading Skills for Students of Literature Routledge. 2007.
- ✓ 'Semantic Excess or New Canons? Exploring the Print Media', Journal of Media and Communication, 2010. Research Gate https://www.researchgate.net.237. A R Parhi
- ✓ An Anthology of English Prose 1400–1900Cambridge University Press 2015

Unit-IV

I. English Language and Communication: Grammar and Vocabulary (9hours) i. Grammar for meaning, multiplicity of meaning, grammar in communication ii. Stative and dynamic verbs, modals and auxiliaries, tense and time reference, aspect,voice, modality, negation, interrogation; reported questions and tag questions, complex noun phrases, concord phrasal verbs. iii. Sentence structure: simple, compound and complex, clauses, types of sentences:statement, questions, exclamations,commands iv. Functions of language,usage-oriented vocabulary, neutral vocabulary Note: The teaching of grammar and vocabulary in this unit need to be connected to communication teaching. Teachers/Instructors may select other areas of grammar for review depending on the needs. They will identify the grammatical errors commonly made by their students in speech as well as writing.

The remediation of these errors may require some explanations of grammar. Instructors should use many grammar and vocabulary related exercises and through them will provide all the grammatical information needed to explain the errors that are identified. The teacher/facilitator can refer to the books recommended under 'suggested readings' for teaching and exercise purposes. He/she can refer to valid and recognised web-resources and additional titles from renowned publishing houses for the same purpose.

Texts

- ✓ Communicative English OSHEC publication. Chapters: Unit-III Communicative Grammar of English by Geoffrey Leech. Routledge publications, 2002
- ✓ Oxford Practical English Usage (International Edition 2016) by Michael Swan

Suggested Readings

- ✓ The Widening Arc, Kitab Bhavan, Asima R Parhi, S Deepika, P Jani, 2016.
- ✓ Writing Skills Remapping: An Anthology for Degree Classes Orient Blackswan
- ✓ An Anthology of English Prose 1400–1900 Cambridge University Press 2015

Scheme of Evaluation

- ✓ Midterm test: 20 marks

5x1=5 (short answer, short notes, comprehension questions)
5x1=5 (Analytical, perspective-based and critical-analysis questions)
5x2=10 (activity/practice/reports/case studies/response papers/assignments etc.)

The teacher will have the flexibility of conducting internal examinations or assess the students' learning outcomes through activities, short projects, case studies etc. from all 20 marks/ in parts

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Final Examination: 80 marks

Unit1: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Unit 2: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Unit 3: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Unit 4: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Analytical Thinking and Logical Reasoning

Course Objectives

- To cover various forms of reasoning including deductive, inductive, and abductive, and integrate these with critical thinking skills.

- To explore logical sequences, coding-decoding, and arrangements as key elements of logical reasoning.

- To delve into complex logical reasoning constructs such as alphanumeric series, reasoning analogies, and calendars.

- To engage with arguments involving two or more premises and utilize connectives effectively.

Learning Outcomes

- To be acquainted with using facts, evidence, rules, and principles to draw valid conclusions and make sound judgments
- Able to practice pattern recognition, spatial reasoning, and decision-making as fundamental components of analytical reasoning

- Able to apply logical reasoning to practical scenarios involving cause and effect, dices, directions, and visual reasoning

- Able to master logical constructs such as statements and assumptions, conclusions, and syllogisms

Unit-I: Analytical Reasoning
Deductive Reasoning, Inductive Reasoning, Abductive Reasoning, Critical Thinking, Pattern Recognition- Data, Sequences, Structures, Logical Reasoning, Spatial Reasoning, Causal Reasoning, Decision Making.

Unit-II: Basic Logical Reasoning Concepts
Logical Sequence Series- patterns and sequences in reasoning. Coding- Coding decoding. Arrangements-Seating arrangements and data arrangement. Blood Relations-problems related to blood relations. Input and Output Patterns. Binary Logic Problems

Unit-III: Logical Reasoning
Alphanumeric series, Reasoning Analogies, Calendars, Cause and Effect, Clocks, Cubes and cuboids, Data Sufficiency, Decision Making, Deductive Reasoning/Statement Analysis, Dices, Directions, Mirror and Water Images,

Unit-IV: Logical Statements
Two premise argument. More than two premise argument using connectives. Statement and Assumptions. Statement and Conclusions. Syllogism.

BCA 3RD SEMESTER (NEP 2020)

SUBJECT CODE	SUBJECT NAME
MAJOR-P-5	Data Base Management System
MAJOR-P-6	Computer Organization & Architecture
MAJOR-P-7	Operating Systems
MINOR-2-P-2	Discrete Mathematics
MDC-3	Professional Writing
VAC-2	Ethics & Values

SEMESTER-III

Core-V   **Data Base Management System**
Course Objectives:
- To understand the database concepts for efficient storage and retrieval of data.
- To learn about database design and transaction processing

Learning Outcomes:
Upon completion of this course, students will be able to:
- Build data models using entity relationship concepts
- Design databases by systematically applying the normalization process
- Create relational database tables and perform various operations using SQL
- Learn issues relating to database transactions and approaches to deal with them

Unit I:

Introduction to Database and Database Users, Database System Concepts and Architecture: data Models, schema, and instances, Conceptual Modeling and Database Design, Entity Relationship (ER) Model: Entity Types, Entity Sets, Attributes, Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, ER Naming Conventions. Enhanced Entity-Relationship (EER) Model.

Unit II:

Relational data Model and SQL: Relational Model Concepts, Basic SQLs, SQL Data Definition and Data types, Constraints in SQL, Retrieval Queries in SQL, INSERT, DELETE, UPDATE Statements in SQL, Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Binary Relation: JOIN and DIVISION.

Unit III:

Database Design Theory and Normalization: Functional Dependencies, Normal Forms based on Primary Keys, Second and third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

Unit IV:

Transaction Processing Concepts: Transaction and System Concepts, Properties of Transactions, Recoverability, Serializability, Concurrency Control Techniques, Locking techniques for Concurrency Control, Concurrency Control based on Time-Stamp Ordering.

Text Books:
- ✓ *Fundamentals of Database Systems, 6th edition, Ramez Elmasri, Shamkant B. Navathe, Pearson Education*
- ✓ *Database Management Systems, Rajiv Chopra, S. Chand Pubs.*

Reference Book:
- ✓ *An Introduction to Database System, Date C. J. - Pearson Education, New Delhi*

BCA 3.3 Lab: Data Base Management System

Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	Type	NULL	KEY	DEFAULT
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema

Field	Type	NULL	KEY	DEFAULT
Dno	Integer	No	PRI	NULL
Dname	Varchar(50)	Yes		NULL
Location	Varchar(50)	Yes		New Delhi

List of Queries:
1. Display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Display unique Jobs from the Employee Table.
3. Display the Employee Name concatenated by a Job separated by a comma.
4. Display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Display the Employee Name and Salary of all the employees earning more than $2850.
6. Display Employee Name and Department Number for the Employee No= 7900.
7. Display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
8. Display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.

9. Display Name and Hire Date of every Employee who was hired in 1981.
10. Display Name and Job of all employees who don't have a current Manager.
11. Display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Display Name of all the employees where the third letter of their name is 'A'.
14. Display Name of all employees either have two 'R's or have two 'A's in their name and are either in Dept No = 30 or their Mangers Employee No = 7788.
15. Display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Display the Current Date.
17. Display Name, Hire Date and Salary Review Date which is the 1_{st} Monday after six months of employment.
18. Display Name and calculate the number of months between today and the date each employee was hired.
19. Display the following for each employee <E-Name> earns < Salary> monthly but wants <3*Current Salary>. Label the Column as Dream Salary.
20. Display Name with the 1_{st} letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with 'J', 'A' and 'M'.
21. Display Name, Hire Date and Day of the week on which the employee started.
22. Display Name, Department Name and Department No for all the employees.
23. Display Unique Listing of all Jobs that are in Department # 30.
24. Display Name, Department Name of all employees who have an 'A' in their name.
25. Display Name, Job, Department No. and Department Name for all the employees working at the Dallas location.
26. Display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees Name who do not have a Manager.
27. Display Name, Department No. And Salary of any employee whose department no. and salary matches both the department no. And the salary of any employee who earns a commission.
28. Display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
29. Display the Highest, Lowest, Sum and Average Salaries of all the employees.
30. Display the number of employees performing the same Job type functions.
31. Display the no. of managers without listing their names.
32. Display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33. Display Name and Hire Date for all employees in the same dept. as Blake.
34. Display the Employee No. And Name for all employees who earn more than the average salary.
35. Display Employee Number and Name for all employees who work in a department with any employee whose name contains a 'T'.
36. Display the names and salaries of all employees who report to King.
37. Display the department no, name and job for all employees in the Sales department.

Core VI   Computer Organization & Architecture

Course Objectives :
- To understand the basic components of a digital computer and their working
- To understand data representation techniques and used of various logic gates
- To gain knowledge about processor and various memory devices

Learning Outcomes:
Upon completion of this course, students will be able to:
- Learn basic computer organization and design
- Design various combinational circuits
- Understand the functioning of central processing unit and memory organization
- Understand the use of various input/output organization and parallel processing

Unit I:
- Introduction to Computer Organization and Architecture: Basic concepts, Computer evolution and performance, Basic Structure of Computers: Functional Units, Operational Concepts, Bus Structures. Machine Instructions and Programs, Instruction formats, Addressing modes. Overview of Instruction set architecture.
- Number systems and their Conversions, Data representation, Arithmetic Operations: Integer-Arithmetic, Floating-point arithmetic.

Unit II:
- Boolean Algebra, Basic Logic Functions, Electronic Logic Gates, Synthesis of Logic Functions, Minimization of Logic Expressions, Minimization using Karnaugh Maps.
- Combinational circuits: Adders, Subtractors, Multiplexers and Demultiplexers, Sequential circuits: Characteristics, Flip-Flops (SR, JK, D, T)

Unit III:
- Memory Organization: Instruction execution cycle, Memory hierarchy: RAM, ROM, Cache memory, Addressing modes and memory addressing techniques.
- Processor Organization: CPU organization, Arithmetic logic unit (ALU), Control unit, Instruction pipeline, RISC vs. CISC Architectures.

Unit IV:
- Input/Output Organization: I/O interface and devices, Interrupts and DMA (Direct Memory Access). Storage: Disk storage systems, RAID (Redundant Array of Independent Disks).
- Parallel Processing: Multiple Processor Organization, Symmetric Multiprocessors, Cache Coherence and MESI Protocol, Multithreading and Chip Multiprocessors, Non-Uniform Memory Access (NUMA). Multicore Computers.

Text Books:
- ✓ *M. Morris Mano, Michael D. Ciletti (2008), Digital Design, 4th edition, Pearson Education Inc, India.*
- ✓ *Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India*

Reference Books:
- ✓ *Stallings, W. Computer Organization and Architecture 11th Edition (PHI)*
- ✓ *Computer Architecture and Organization: John P. Hayes McGraw Hill.*
- ✓ *Computer Organization and Design Hardware/ Software Interface: David A. Patterson, John L. Hennessy, Elsevier.*

Core VII

Operating Systems

Course Objectives:
- To understand Operating system structure and services.
- To understand the concepts of Process, memory, storage, and I/O management.
- To explore different applications of data structures.

Learning Outcomes:
Upon completion of this course, students will be able to:
- Understand various services offered by an OS as a resource manager
- Understand the concept of a process and various CPU scheduling techniques
- Learn the concepts on effective memory management and virtual memory
- Learn various approaches to disk scheduling & file management techniques

Unit I:

Introduction to Operating System, Computer System Architecture, System Structures: Operating system services, User and Operating-System Interface, system calls, system programs, Operating system design and implementation, Operating system structure, Batch processing, multi-programming, time-sharing and real-time systems

Unit II:

Process Management: Process Concept, Operations on processes, Process scheduling, Inter-process Communication, Threads, Multithreading Models. CPU Scheduling algorithms: Scheduling Criteria, FCFS, SJF, Priority, Round Robin, Multilevel Queue, Multilevel Feedback Queue. Deadlocks: Deadlock detection, deadlock prevention, and deadlock avoidance fundamentals.

Unit III:

Memory Management Strategies: Swapping, Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory Management: Concepts, Demand Paging, Page Replacement techniques: FIFO, LRU, Optimal, Thrashing.

Unit IV:

Storage Management: Overview of Mass-Storage Structure, Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK, RAID technology.
File System concept, Access Methods, Directory and Disk Structure, File System systems, File, Sharing and File Protection.

Text Books:
- ✓ *Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, Eighth Edition, Wiley Student Edition 2009*
- ✓ *Operating Systems, Rajiv Chopra, S. Chand Pubs.*

Reference Books:
- ✓ *Modern Operating System, Tanenbaum, Pearson, 4/ed. 2014*
- ✓ *Operating Systems 5th Edition, William Stallings, Pearson Education India*
- ✓ *Richard Blum, Linux Command Line and Shell Scripting Bible, O' Reilly*

BCA 4.2 Lab: Operating Systems

1. Basic Linux Commands and Overview (date, cal, who, tty, echo, bc, pwd, mkdir, rmdir, cd, cat, cp, mv, rm, ls, wc)
2. Write a shell script to perform the tasks of basic calculator.
3. Write a shell script to find the greatest number among the three numbers.
4. Write a shell script to check if the number entered at the command line is prime or not.
5. Write a shell script to display the multiplication table of any number.
6. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
7. Write a shell script to find the sum of digits of a given number.
8. Write a shell script to find the factorial of a given number.
9. Write a program (using fork() and/or exec() commands) where parent and child execute:
   a. same program, same code.
   b. same program, different code.
   c. before terminating, the parent waits for the child to finish its task.
10. Write a program to copy files using system calls.
11. Write a program using C to implement FCFS scheduling algorithm.
12. Write a program using C to implement Round Robin scheduling algorithm.
13. Write a program using C to implement SJF scheduling algorithm.
14. Write a program using C to implement first-fit, best-fit, and worst-fit allocation strategies.

DISCRETE MATHEMATICS

Course Objectives:

The main objectives of this course are to introduce topics and techniques of counting principles, combinatorics, and graph theory to understand problems in almost all areas of knowledge.

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

• Learn core ideas in logic and relations.

• Know the concept of the Pigeon-hole principle and solve recurrence relations.

• Learn lattices and Boolean algebra.

• Get a good knowledge of the basics of Graph theory.

UNIT-I

Propositional logic, proportional equivalences, predicates and quantifiers, nested quantifiers, rules of inference, methods of proof, relations and their properties, n- ary relations and their applications.

UNIT-II

The basic counting principle, The Pigeon-hole principle, generalized permutations and combinations, recurrence relations, counting using recurrence relations, solving linear homogeneous recurrence relations with constant coefficients, generating functions, solving recurrence relations using generating functions.

UNIT-III

Partially ordered sets, Hasse diagram of partially ordered sets, maps between ordered sets, duality principle, lattices, Boolean algebra.

UNIT-IV

Graphs, basic concepts and graph terminology, representing graphs and graph isomorphism, distance in a graph, cut vertices and cut edges, connectivity, Euler and Hamiltonian path, shortest-path problems, planar graphs and graph coloring.

Books Recommended:

✓ *Kenneth H. Rosen, Discrete Mathematics and Applications (Sixth Edition), Tata McGraw Hill Publications, 2007.*

✓ *Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory (2nd Edition), Pearson Education (Singapore) Pte. Ltd., Indian Reprint 2003.*

Books for Reference:

✓ *1. B A. Davey and H. A. Priestley, Introduction to Lattices and Order, Cambridge University Press, Cambridge, 1990.*

✓ *2. Rudolf Lidl and Gnter Pilz, Applied Abstract Algebra (2nd Edition),*

Professional Writing

Course Objectives

- The course aims at teaching students to write grammatically correct, clear, effective prose and applies it to writing for the workplace.
- Its objective is to help students develop writing skills and acquire the knowledge to apply these skills in standard workplace document formats.
- It includes a study of writing in a variety of professional contexts with an emphasis on assessing rhetorical situations and crafting messages to inform and persuade diverse audiences in a variety of forms and formats.

Unit-1

Writing: Definition and Requirement

Writing Process: Prewriting, Writing and Post writing

Basic Writing Skills

Plain English

Unit-2

Genres of Writing: Persuasive, Expository, Narrative, Descriptive and Argumentative

Unit-3

Basic forms: Letters, Application, Memo, Notices and Minutes

Raising the Bar: Presentations, Proposal, and Report

Unit-4

The Elements of Style: Grammar, Usage, and Mechanics

Prescribed Texts

- ✓ *The Craft of Professional Writing*, Second Edition by Michael S. Malone
- ✓ *Literature and Art of Communication*. Parhi, Pati, Mohol et al. Cambridge University Press, 2019.
- ✓ *Professional Writing Skills: A Write It Well Guide* by Natasha Terk

Suggested Readings

- ✓ *Huddleston R., and Geoffrey K. Pulia, eds. A Student's Introduction to English Grammar. CUP.2005*
- ✓ *MLA Handbook for Writers of Research Papers. Eighth edition. Modern Language Association of America. 2021*
- ✓ Excellence In Business Communication by John V. Thill and Courtland L. BoveeOn Writing Well by William Zinsser

  https://communicationprogram.wharton.upenn.edu/library/

  https://www.osou.ac.in/eresources.php

ETHICS & VALUES

Credit point: 3   **Full mark -100**   **Total Hours: 45**

COURSE OUTCOME

- Development of a good human being and a responsible citizen
- Developing a sense of right and wrong leading to ethically correct behavior
- Inculcating a positive attitude and healthy work culture
- To equip the students to prepare themselves national and state level civil service and other competitive examination.

COURSE CONTENTS

UNIT-I- ETHICS AND HUMAN INTERFACE   [5 Hours]

Learning Outcome-

✓ *Understand the basic concept of ethics and its relevance in life*

- Ethics and Human Interface: Essence, Determinants and consequence of ethics and human action.
- Dimensions of Ethics in private and public relationship
- Human Values: Tolerance, Compassion, Rationality, Objectivity, Scientific Attitude Integrity, Respecting conscience and Empathy etc.
- Mahatma Gandhi and Ethical Practices: Non-Violence, Truth, Non-hatred and love for all, concern for the poorest, objective Nationalism and Education for man making. Relation between Ends and Means.

Subject Teacher: Philosophy/Political Science or Any other Teacher.

UNIT-II- ETHICS AND MAJOR RELIGIONS AND CIVILIZATIONS   [7 hours]

Learning Outcome-
✓ *Be familiar with ethical principles and values promoted by major religious traditions and civilization*

- Hinduism- Dharma and Mokhya (out of 4 goals of life Dharma, Artha, Kama and Mokhya), Concept of Purusartha, Nisakama Karma(work without attachment to results), Concept of Basudev Kutumba and Peace (Whole world including all animals, plants, inanimate beings and human form one world)
- Ten Commandments: (Christianity and Judaism Tradition)
- Islamic Ethics: Justice, Goodness, Kindness, Forgiveness, Honesty, Purity and Piety
- Egyptian- Justice, Honesty, Fairness, Mercy, Kindness and Generosity
- Mesopotian-Non-indulgence in lying, stealing, defrauding, maliciousness, adultery, coveting possession of others, unworthy ambition, misdemeanors and injurious teaching.
- Buddhism-Arya Astangika Marg: Right View, Thought, Speed, Action, Livelihood, Efforts, Attention and Concentration.
- Jainism-Right faith, knowledge and conduct(Triralna)

- Chinese-Confucianism- Respect for Autonomy, Beneficence, non-maleficence and justice. Taoism: No killing, No stealing, No sexual misconduct, No false Speech and No taking of intoxicants.

Subject Teacher: History/Philosophy/Political Science or Any other Teacher.

UNIT-III- CONSTITUTIONAL VALUES, GOOD CITIZENSHIP, PATRIOTISM AND VOLUNTEERISM   [10 Hours]

Learning Outcome-
- ✓ *Students Learns about constitutional values of India, Civic Sense and good Citizenship (both National and International) Patriotism and need for Volunteerism*
- Salient Values of Indian Constitution: Sovereign, Socialist, Secular, Democratic, Republic, Justice, Liberty, Equality and Fraternity
- Patriotic values and ingredients of National Building, Examples of great Patriots, Rani Laxmi Bai, Bhagat Singh, Mangal Pandey, Birsa Munda, Laxman Naik, Subhas Chandra Bose and Khudiram Bose.
- Law abiding citizenship
- Concept of Global citizenship in contemporary world
- Volunteerism- concept and facts of Volunteerism, building a better society through Volunteerism, Blood Donation, Social work, Helping the Aged, Promotion of Green Practices and Environment protection.

Subject Teacher: Philosophy/Political Science /History/ or Any other Teacher.

UNIT-IV- WORK ETHICS   [6 hours]
Learning Outcome-
- ✓ *Understand the concept of work ethics, ethics in work place and ethical practices to be adopted by various professionals*
- The concept of professionalism.
- Professional ethics at work place
- Core values needed for all professionals. Reliability, Dedication, Discipline, Productivity, Co-operation , Integrity, Responsibility, Efficiency, Professionalism, Honesty, Purity and Time Management, Accountability, Respect Diversity, Gender Sensitivity, Respect for others, Cleanliness, Rational Thinking, Scientific Attitude, Clarity in Thinking . Diligence, cleanliness and Environment Consciousness.
- Codes of conduct for Students(both in College and Hostels),Teachers, Business professional, Doctors, Lawyers, Scientist, Accountants, IT professionals and Journalist.
- Practical ethics in day to day life.

Subject Teacher: Commerce/Philosophy/Education/History/ or Any other Teacher.

UNIT-V-ETHICS AND SCIENCE AND TECHNOLOGY   [7 Hours]

Learning Outcome-

- ✓ *Understand how Science is related to ethics and values has ethical implications.*

- Ethics of Science and Technology. Are science and Technology ethically neutral? Are Science and Technology Value Free?

- Ethics of scientific Research ,Innovation and Technology
- Ethics of Social Media, Modern Gadgets
- AI and Ethics

Subject Teacher: Philosophy or Any Science Teacher

UNIT-VI- ETHICS AND VULNERABLE SECTIONS OF SOCIETY [10 hours]

Learning Outcome-

✓ *Understand how various vulnerable sections of our society are treated unequally and what needs to be done to address their inequality*
✓ *Understand dimensions of substance abuse*

1. **Women and family-**Gendered practices in the family, marriages (dowry, child marriage, women's consent).
   Women and work- women's work at home and at work place, pay gap, gendered roles, harassment at work place and working women and role conflict.
   Women and Society- Gender sensitive language, property right, marriage-divorce/Separation and women's right; violence against women
2. **Issues Relating to Children:** Nutrition and health , Child Exploitation: Child labour ,trafficking, sexual exploitation
3. **Issues Relating to Elderly Persons :** Abuse of Elders, Financial insecurity, Loneliness and Social insecurity, Health Care Issues, Needs for a happy and Dignified Ageing
4. **Issues Relating to persons with disability:** Rights of PWD, affirmative action, prevention of discrimination, providing equal opportunity, various scheme for empowering PWD and social justice for PWD.
5. **Issues Relating to Third Gender:** Understanding LGBTQ, Social justice for them, Removal of discrimination, Affirmative action and Acceptance of diversity of gender.

Subject Teacher: Sociology/political Science /Anthropology or Any Science Teacher

Sample Questions-

1. Birsa Munda belongs to which state of India?[1 mark]
2. Recall at least 4 constitutional values from the preamble to India constitution.[2 marks]
3. **Explain utility of being Punctual.[5 marks]**
4. **Explain the ethical principles a scientist should follow.[8 marks]**

Course material: To be developed by OSHEC and DDCE, Utkal University. Video Lectures will be also prepared by OSHEC and VTP, Utkal University. There shall be no internal examination for this course. The Term End Examination shall be conducted by the respective Universities. Student would engage in self-study and colleges shall conduct at least 4 doubt clearing session for each unit by engaging subject teachers as indicated above. The Principal may assign responsibility to any teacher.

4TH SEMESTER BCA			
	SUB CODE		SUB NAME
MAJOR	CORE-I	PAPER-8	Computer Graphics
	CORE-I	PAPER-9	Web Development with PHP
	CORE-I	PAPER-10	Computer Network
MINOR	CORE-III		
	INTERNSHIP		

Core VIII

Computer Graphics

Course Objectives:
- To understand basic concepts of computer graphics.
- To learn techniques for creating basic graphical structures
- To learn different transformation techniques

Learning Outcomes:
Upon completion of this course, students will be able to:
- Know the use of different graphics systems
- Learn different algorithms to draw geometrical figures
- Learn various geometric transformation techniques
- Learn techniques for clipping

Unit I:

Computer Graphics: A Survey of Computer graphics, Overview of Graphics System: Video Display Devices, Raster-Scan Systems, Input Devices, Hard-Copy Devices, Graphics Software.

Unit II:

Graphics Output Primitives: Point and Lines, Algorithms for line, circle & ellipse generation, Filled-Area Primitives. Attributes of Graphics Primitives: Point, line, curve attributes, fill area attributes, Fill methods for areas with irregular boundaries.

Unit III:

Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Transformation Matrix, Types of transformation in 2-D and 3-D Graphics: Scaling, Reflection, shear transformation, rotation, translation. 2-D, 3-D transformation using homogeneous coordinates.

Unit IV:

Two-Dimensional Viewing: Introduction to viewing and clipping, viewing transformation in 2-D, viewing pipeline, Clipping Window, Clipping Algorithms: Point clipping, Line clipping and Polygon clipping.

Text Books:
- ✓ *Donald Hearn & M. Pauline Baker, "Computer Graphics with OpenGL", Pearson Education.*
- ✓ *Mathematical Elements for Computer Graphics, D. F. Rogers & J. A. Adams, MGH, 2/ed.*

Reference Books:
- ✓ *Computer Graphics principles & practice, Foley, Van Dam, Feiner, Hughes Pearson Education*
- ✓ *Computer Graphics by Zhigang Xiang, Roy A Plastic, McGraw-Hill*

BCA 4.3 Lab: Computer Graphics using OpenGL

1. Write a program to implement Bresenham's line drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to fill a polygon using Scan line fill algorithm.
6. Write a program to apply various 2D translation transformation.
7. Write a program to apply 2D object homogenous coordinates translation.
8. Write a program to apply various 2D rotation transformation.
9. Write a program to apply 2D object homogenous coordinates rotation.
10. Write a program to apply various 2D scaling transformation.
11. Write a program to apply 2D object homogenous coordinates scaling transformation.
12. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.

Core IX

Web Development with PHP

Course Objectives:
- To understand the essentials of Server-side programming
- To understand web development using PHP

Learning Outcomes:
On successful completion of this course, Students will be able to:
- Learn the basics of JSON, XML and AJAX
- Learn the programming concepts of PHP
- Learn the server-side programming using PHP
- Learn the mechanisms of connecting Database using PHP & use AJAX with PHP

Unit I:
Introduction to Server-Side Technologies, Web Servers, Understanding the concepts of JSON, AJAX: Introduction, Creating Internet Applications using AJAX. XML: Introduction, Features, Fundamentals, Document Type Definition, XML Schema.

Unit II:
PHP: Features, Programming fundamentals: Print/echo statement, Data Types, Variables, Constants, Strings, Arrays, Operators. Control Structures: Conditional, Looping & Jump Statements. Functions: String, Date-Time, Mathematical and User-defined functions. Embedding PHP in HTML, Reading Form Data of a Web Page.

Unit III:
Introduction to PHP with Database: Connecting to Database, selecting a Database, Adding Table and Altering a Table in a Database. Inserting Data, Modifying Data in a Table, Retrieving Data from a table and displaying in HTML.

Unit IV:
State Management in PHP: Introduction, Cookies, Session. Authentication in PHP: Creating a User, Adding authorized users, Displaying the User. Using AJAX: AJAX with PHP, AJAX with Database.

Text Book:

- ✓ *Web Technologies (Black Book), DreamTech Press*

Reference Books:

- ✓ *Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP 4th Edition by Ivan Bayross.*
- ✓ *PHP and MySQL Web Development by Luke Welling and Laura Thomson*. Addison - Wesley.

BCA 5.1 Lab: Web Development with PHP

1. Write PHP program (s) for the following.
   a. Find greatest among three numbers entered by the user
   b. Print the sum of numbers from M to N where their values are entered by the user.
   c. Find the factorial of a number entered by the user.
2. Write a PHP program that asks the name and date of birth of the user.
   a. Find the number of letters, words in the name
   b. Display the Name in reverse order
   c. Print the current date and time and age of the user.
3. Design a web page to create a form that collects the name, gender and mail of a person. Write a PHP program that collects the data entered by the user in the form and displays them in a new page.
4. Write a PHP program that creates a Table in a database. The number of columns of the table are determined by the fields in the form (created in question no. 3).
5. Write a PHP program to
   a. insert new records
   b. update a record
   c. delete a record based on a value of a field in the table.
6. Write a PHP program that asks the user to enter a name and display the details of the user retrieved from the database in the same page. [show the error message if no matching name is found in the database].
7. Write a PHP program to create a cookie and store your name and then read the cookie.
8. Write a PHP program that allows only authenticated users to retrieve the details of a table. [Use username and password of the user to validate the authenticity].
9. Write a PHP application to make use of AJAX.

Core X

Computer Network

Course Outcomes:
- To understand data communication and network concepts.
- To learn about different communication standards
- To understand different network protocols

Learning Outcomes:

Upon completion of this course, students will be able to:
- Understand concepts on data communication and the use of communication devices
- Learn about analog and digital signals and basic components of data communication
- Learn about errors during data communication & access control mechanisms
- Learn various network protocols and network security issues

Unit I:

Introduction to Data Communications and Network Models: Protocols and Standards, Layers in OSI Models, Analog and Digital Signals, Network Topology, Transmission Modes, Transmission Impairment, Data Rate Limits, Performance, Digital Transmission, Network Devices & Drivers: Router, Modem, Repeater, Hub, Switch, Bridge (fundamental concepts only).

Unit II:

Signal Conversion: Digital-to-Digital Conversion, Analog-to-Digital Conversion, Digital-to-analog Conversion, Analog-to-analog Conversion. Switching Techniques: Packet Switching, Circuit Switching, Datagram Networks, Virtual-Circuit Networks, and Structure of a Switch.

Unit III:

Error Detection and Correction: Parity Check, Checksum, CRC, Error correction technique (Hamming code), Data Link Control: Framing, Flow and Error Control, Noiseless Channels, Noisy channels, (Stop and Wait ARQ, Sliding Window Protocol, Go Back N, Selective Repeat) Point-to-Point Protocol. Access Control: TDM, CSMA/CD, and Channelization (FDMA, TDMA, and CDMA).

Unit IV:

Network Layer: Logical Addressing, IPv4 Addresses, IPv6 Addresses, Subnet, Subnet masking, Virtual-Circuit Networks: Frame Relay and ATM, Transport Layer: Process-Process Delivery: UDP, TCP. Application layers: DNS, SMTP, POP, FTP, HTTP, Basics of WiFi (Fundamental concepts only), and Network Security: Authentication, Basics of Public Key and Private Key Cryptography, Digital Signatures and Certificates (Fundamental concepts only).

Text Book:
- ✓ *Computer Networks, A. S. Tanenbaum, 4th edition, Pearson Education.*

Reference Book:

- Data Communications and Networking, Fourth Edition by Behrouza A. Forouzan, TMH.

	SUB CODE		SUB NAME
MAJOR	CORE-I	PAPER-11	Software Engineering
	CORE-I	PAPER-12	An Intro^n to AI/ An Intro^n to DS
	CORE-I	PAPER-13	Programming in JAVA
MINOR	CORE-II	PAPER-3	
SEC	PAPER-2		
VAC	PAPER-3		

Core XI

Software Engineering

Course Outcomes:
- To understand importance of Software engineering.
- To understand different software development models
- To understand various issues involved in a software development project

Learning Outcomes:
Upon completion of this course, students will be able to:
- Understand various software development lifecycle models
- Know the complexities involved in software development projects & how to deal with them
- Understand the software design process starting from requirement analysis
- Learn about software documentation, software testing and maintenance

Unit I:

Introduction: Evolution of Software to an Engineering Discipline, Software Development Projects, Exploratory Style of Software Development, Emergence of Software Engineering, Changes in Software Development Practices, Computer Systems Engineering. Software Lifecycle Models: Waterfall Model and its Extensions, Rapid Application Development (RAD), Agile Development Models, Spiral Model.

Unit II:

Software Project Management: Software Project Management Complexities, Responsibilities of a Software Project Manager, Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO, Halstead's Software Science, Staffing Level Estimation, Scheduling, Organization and Team Structures, Staffing, Risk Management, Software Configuration Management.

Unit III:

Requirement Analysis and Specification: Requirements Gathering and Analysis, Software Requirement Specifications, Formal System Specification Axiomatic Specification, Algebraic Specification, Executable Specification and 4GL.

Software Design: Design Process, Characterize a Good Software Design, Cohesion and Coupling, Layered Arrangements of Modules, Approaches to Software Design (Function Oriented & Object-Oriented).

Unit IV:

Coding and Testing: Coding: Code Review, Software Documentation, Testing, Unit Testing, Black Box and White Box Testing, Debugging, Program Analysis Tools, Integration Testing, System Testing, Software Maintenance.

Text Books:
- ✓ *Software Engineering– Ian Sommerville, 10/Ed, Pearson*
- ✓ *Fundamental of Software Engineering, Rajib Mall, Fifth Edition, PHI Publication, India.*

Reference Books:
- ✓ *Software Engineering Concepts and Practice – Ugrasen Suman, Cengage Learning India Pvt, Ltd.*
- • *Software Engineering, R Khurana, Vikash Pubs.*

Core XII

(A) Introduction to Artificial Intelligence
(Students can choose any one course from this group)

Course Outcomes:
- To learn the basic concepts of AI.
- To understand AI problem-solving approaches

Learning Outcomes:

Upon completion of this course, students will be able to:
- Understand state space search as an approach to AI problem solving
- Understand various Knowledge Representation techniques
- Learn the complexity involved in NLP & role of learning in AI problem-solving
- Understand the importance of Expert systems and the use of AI programming languages.

Unit I:

Introduction to AI, Scope of AI, Characteristics of AI problems, Turing test, Concept of Intelligent agents, Approaches to AI problem-solving, State space search, production system, Uninformed search: Breadth-First, Depth-First, Iterative deepening, bidirectional and beam search.

Unit II:

Informed/Heuristic search: Generate-and-Test, Hill climbing, Best-first search, A^* algorithm, Problem reduction, AO^*, Constraint satisfaction, Solution of CSP using search, Means-End analysis.

Unit III:

Knowledge Representation: Propositional logic and Predicate logic along with their resolution principles, Unification algorithm, forward and backward chaining and conflict resolution, Semantic nets, Frames, Conceptual dependencies, Scripts.
Reasoning under uncertainty: Bayesian Belief networks, Dempster Shafer theory

Unit IV:

Natural language processing: Introduction, Levels of knowledge in language understanding, , Phases of Natural language understanding, top-down and bottom-up parsing, transition networks.
Expert Systems: Introduction, Architecture, Expert system development cycle, Examples of ES: Mycin and Dendral.

Text Books:
- ✓ *Artificial Intelligence by Rajiv Chopra, S. Chand Pubs.*
- ✓ *Artificial Intelligence by E. A. Rich and Kelvin Knight, TMH*

Reference Books:
- ✓ *Introduction to AI and Expert Systems- D.W. Patterson, PHI*
- ✓ *Principles of AI and Expert systems development, D. W. Rolston (McGraw Hill)*

(B) Introduction to Data Science

Course Objectives:
- To understand emerging issues related to various fields of data science.
- To understand the underlying principles of data science, exploring data analysis.
- To learn the basics of R Programming.

Learning Outcomes:
Upon completion of this course, students will be able to:
- Appreciate the importance of data science & learn the use different data analysis tools
- Learn R Programming
- Understand the techniques for data cleaning
- Learn the use of various data analysis and visualization tools

Unit I:
Data Scientist's Tool Box: Turning data into actionable knowledge, introduction to the tools that are used in building data analysis software: version control, markdown, git,GitHub, R, and RStudio.

Unit II:

R Programming Basics: Overview of R, R data types and objects, reading and writing data, Control structures, functions, scope rules, dates and times, Loop functions, debugging tools, Simulation, code profiling.

Unit III:

Getting and Cleaning Data: Obtaining data from the web, from APIs, from databases and other sources in various formats, basics of data cleaning and making data "tidy".

Unit IV:
Exploratory Data Analysis: Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to visualize high-dimensional data.

Text Book:

- ✓ *Rachel Schutt, Cathy O'Neil, "Doing Data Science: Straight Talk from the Front line" Schroff /O'Reilly, 2013.*

Reference Books:

- ✓ *Foster Provost, Tom Fawcett, "Data Science for Business" What You Need to KnowAbout Data Mining and Data-Analytic Thinking by O'Reilly, 2013.*
- ✓ *John W. Foreman, "Data Smart: Using data Science to Transform Information into Insight"by John Wiley & Sons, 2013.*
- ✓ *Eric Seigel, "Predictive Analytics: The Power to Predict who Will Click, Buy, Lie, or Die",1st Edition, by Wiley, 2013.*

BCA 5.4B Lab: Introduction to Data Science

1. Study of basic Syntaxes in R

2. Implementation of vector data objects operations

3. Implementation of matrix, array and factors and perform variance analog in R

4. Implementation and use of data frames in R

5. Create Sample (Dummy) Data in R and perform data manipulation with R

6. Study and implementation of various control structures in R

7. Data Manipulation with dplyr package

8. Data Manipulation with data.table package

9. Study and implementation of Data Visualization with ggplot2

10. Study and implementation data transpose operations in R

Major XIII

Programming in Java

Course Outcomes:
- To learn Java for writing object-oriented programs
- To understand the use of different Java programming constructs
- To learn exception handling in Java and use of threads.

Learning Outcomes:

Upon completion of this course, students will be able to:
- Learn the basics of Java programming
- Create classes/objects and implement different forms of inheritance
- Use arrays and files in Java
- Learn about exception handling

Unit I:

Introduction to Java: Java History, Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords (super, this, final, abstract, static, extends, implements, interface) , Data Types, Wrapper class, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods). Input through keyboard using Command line Argument, the Scanner class, BufferedReader class.

Unit II:

Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes, Class Variables & Methods, Objects, Object reference, Objects as parameters, final classes, Garbage Collection. Constructor- types of constructors, this keyword, super keyword. Method overloading and Constructor overloading. Aggregation vs Inheritance, Inheritance: extends vs implements, types of Inheritance, Interface, Up-Casting, Down-Casting, Auto-Boxing, Enumerations, Polymorphism, Method Overriding and restrictions. Package: Pre-defined packages and Custom packages.

Unit III:

Arrays: Creating & Using Arrays (1D, 2D, 3D and Jagged Array), Array of Object, Referencing Arrays Dynamically. Strings and I/O: Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability& Equality, Passing Strings To & From Methods, StringBuffer Classes and StringBuilder Classes. IO package: Understanding StreamsFile class and its methods, Creating, Reading, Writing using classes: Byte and Character streams, FileOutputStream, FileInputStream, FileWriter, FileReader, InputStreamReader, PrintStream, PrintWriter. Compressing and Uncompressing File.

Unit IV:
Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-

threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

Text Book:
- ✓ *E. Balagurusamy, "Programming with Java", TMH, 4/Ed*

Reference Book:
- *Herbert Schildt, "The Complete Reference to Java", TMH, 10/Ed.*

BCA 6.1 Lab: Programming in Java

1. To find the sum of any number of integers entered as command line arguments.
2. To find the factorial of a given number.
3. To convert a decimal to binary number.
4. To check if a number is prime or not, by taking the number as input from the keyboard.
5. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument.
6. Write a program that show working of different functions of String and StringBufferclasss like setCharAt( ), setLength( ), append( ), insert( ), concat( )and equals( ).
7. Write a program to create a – "distance" class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
8. Modify the – "distance" class by creating constructor for assigning values (feetandinches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
9. Write a program to show that during function overloading, if no matching argument is found, then Java will apply automatic type conversions (from lower to higher data type).
10. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword.
11. Write a program to show the use of static functions and to pass variable length arguments in a function.
12. Write a program to demonstrate the concept of boxing and unboxing.
13. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
14. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.
15. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages

16. Write a program – "DivideByZero" that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
17. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
18. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
19. Write a program to demonstrate priorities among multiple threads.
20. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed(), mouseReleased() & mouseDragged().
21. Write a program to demonstrate different keyboard handling events.

6TH SEMESTER BCA			
	SUB CODE		**SUB NAME**
MAJOR	CORE-I	PAPER-14	Algorithm Design Techniques
	CORE-I	PAPER-15	Project Work
MINOR	CORE-III	PAPER-3	
SEC	PAPER-3		
VAC	PAPER-4		

Core XIV   **Semester VI**

Algorithm Design Techniques

Course Objectives:
- To understand the importance of algorithm design.
- To learn ways to analyze algorithms
- To learn about adoption of different algorithmic styles for solving problems

Learning Outcomes:
Upon completion of this course, students will be able to:
- Learn approaches to algorithm analysis & design
- Learn different searching and sorting techniques
- Learn greedy techniques for problem-solving
- Learn graph-based techniques for practical problem-solving

Unit I:

Algorithm specification: Pseudo code, Asymptomatic Analysis, Space complexity and time complexity, Analysis and design of Insertion sort algorithm, Divide and Conquer paradigm, Recurrence relations, Solving Recurrences: Substitution methods, Recursion tree method, and Master method.

Unit II:

Searching and Sorting: Analysis of Linear Search, Binary Search, Merge Sort and Quick Sort, Heap Sort. Hashing: Hash functions, Hash table, Collision resolution: Chaining and Open Addressing (Linear probing, Quadratic probing, Double hashing).

Unit III:

Greedy Technique: General Method, Applications: Fractional Knapsack Problem, Job Sequencing with Deadlines, Huffman Codes.
Dynamic Programming: General Method, Applications: Matrix Chain Multiplication, longest common subsequence, 0/1 Knapsack.

Unit IV:

Graph Algorithms, Topological sort, Minimum Spanning Trees: Prim's and Kruskal's algorithm, Single-source shortest paths: Bellman-Ford algorithm, Dijkstra's algorithm.

Text Book:
- ✓ *Introduction to Algorithms, by Thomas H, Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI.*

Reference Book:
- *Algorithm Design, by Jon Kleinberg, Eva Tardos.*

BCA 6.2 Lab: Algorithm Design Techniques

1. Write C / C++ Programs to implement Insertion Sort

2. Write C / C++ Programs to implement Merge Sort

3. Write C / C++ Programs to implement Quick Sort

4. Write C / C++ Programs to implement Heap Sort

5. Write C / C++ Programs to implement Hashing

6. Write C / C++ Programs to implement Fractional Knapsack

7. Write C / C++ Programs to implement Matrix Chain Multiplication

8. Write C / C++ Programs to implement Longest Common Subsequence

9. Write C / C++ Programs to implement Huffman Code

10. Write C / C++ Programs to implement Prim's Algorithm

11. Write C / C++ Programs to implement Krushkal's Algorithm

12. Write C / C++ Programs to implement Dijkstra's Algorithm

Core XV

Project Work-I

A student has to do a Project work under the guidance of a faculty member. After completing the project, the student has to submit a project report which has to be evaluated by an external examiner. The model template for the project report can be as follows

1. Title of the project
2. Declaration (by the student)
3. Certificate (of the project guide)
4. Acknowledgement
5. Abstract
   [Provide a brief summary of your project, including its objectives, methods, and key findings.]
6. Table of Contents
   Introduction
   Literature Review
   Methodology
   Results
   Discussion
   Conclusion
   References
7. Introduction
   [Describe the background and context of your project, including the problem statement and objectives.]
8. Literature Review
   [Review relevant literature related to your project, discussing previous research, theories, and concepts.]
9. Methodology/
   [Explain the methods you used to conduct your research or project, including data collection, analysis techniques, and any tools or software used.]
10. Implementation/Software development
11. Results
    [Present the findings of your research or project, using tables, figures, or graphs as needed to illustrate key points.]
12. Discussion
    [Interpret your results and discuss their implications, relating them back to your research objectives and the broader context of your field.]
13. Conclusion
    [Summarize the main findings of your project and their significance, as well as any recommendations for future research or applications.]
14. References
    [List all sources cited in your project using a consistent citation style (e.g., APA, MLA).]

The evaluation pattern of the project will be as follows:

   i. Problem formulation and definition
   ii. Execution of code & results
   iii. Documentation
   iv. Clarity in presentation
   v. Performance in the Viva voce

1ST SEMESTER BSC. CS			
	SUB CODE		SUB NAME
MAJOR	CORE-I	PAPER-1	Introduction To Computer Science & Python Programming
	CORE-I	PAPER-2	Problem Solving Using C Programming
MINOR	CORE-II		Calculus & Analytic Geometry
	MULTI DISCIPLINARY		Computer Fundamentals
	AEC		Odia/Hindi
	VAC		Environmental Studies And Disaster Management

SEMESTER-I

Core I (PAPER-1)
Introduction to Computer Science and Python Programming

Course Outcomes:

- To learn the fundamentals of computer and its working mechanism.
- To learn programming paradigms and design.
- To learn the basics of Python Programming for problem solving.

Learning Outcomes:

Upon completion of this course, students will be able to:
1. gain knowledge about the components of a computer with their functions
2. have an exposure to various computer networks
3. learn the steps for program development
4. learn the use of control structures, built-in functions, lists, recursions in Python programming

Unit-I:

Introduction to Computers: Generation of computers, types of computers. Computer System hardware: Block diagram, CPU, Memory unit, and Storage devices with their functions. Computer memory: Memory hierarchy, CPU Registers, Cache Memory, Primary Memory, Secondary memory, access methods.
Input & Output Units: Various types of Input and Output devices with their functions.
Computer Software: Introduction, Types of software: System software, Application software, Utility software, firmware and their usage. Computer Network: Importance of Networking, Network types: LAN, MAN, WAN, Internet and its applications, network devices: Repeater, bridge, hub, switch, router, and Gateway.

Unit-II:

Program Development: Problem Analysis, program design, development. Algorithm: Introduction, Pseudo code, Control Structures. Flowchart: Introduction, Symbols, preparing a flowchart. Programming Paradigms & Design: Structured programming, Object-oriented programming, Top-down and Bottom-up design approaches. Characteristics of a good program.

Programming Languages: Concept of Low-level & high-level languages, Different generations of Programming Languages. Translators: Assembler, Compiler, Interpreter. Linker, Loader, Editors, Integrated Development Environment. Programming Errors: Syntax, Semantic, Logical, Compile-time, run-time, link-time, environmental, Input/output errors. testing and debugging.

Unit-III:

Introduction to Python, getting started with Python, Python Basics: Identifiers, Keywords, Python types, basic types, mutable and immutable types, Integer & float ranges, Variable type & assignment, Arithmetic Operators, Precedence & Associativity, Conversions, built-in functions, modules, container types, comments & indention, multi-lining, classes & Objects, Multiple Objects. Strings: Introduction, Accessing String elements, Properties, built-in functions, Methods, Conversions, Comparisons.

Console I/O: I/O operations, formatted printing. Decision Control Instruction: Logical operators, Conditional Expressions, all () & any (), receiving input, pass statement. Repetition Control Instruction: types, usage of loops, break & continue, else block of a loop.

Unit-IV:

Lists, Sets, Tuples, Dictionaries: creating, accessing, and looping-in each type. Applying basic operations, using built-in functions and methods on each type, possible data structure / mathematical operations on each type.

Comprehensions on List, Set, and dictionary. Functions: built-in and user-defined functions, invoking functions, unpacking arguments. recursive function, iteration vs recursion.

Text Books:

- *Computer Fundamentals by Anita Goel, Pearson Pub.*
- *Let us Python by Yashavant Kanetkar & Aditya Kanetkar, BPB Pub.*

Reference Books & e-Resources:

- *Fundamentals of Computers by Reema Thareja, Oxford University Press*
- *Python Programming: Using Problem Solving Approach by Reema Thareja, Oxford University Press*
- *Computer Fundamentals by D. P. Nagpal, S. Chand Pub.*
- *https://docs.python.org/3/*

Core-I- Lab: Programming using Python

1. Write a program to demonstrate the usage of various arithmetic operators.
2. Write a program that makes use of trigonometric functions available in math module.
3. Write a program that will convert various temperatures.
   a. Fahrenheit to Centigrade
   b. Centigrade to Fahrenheit
4. Write a program that will find the roots of a quadratic equation: $ax^2 + bx + c = 0$
5. Write a program that demonstrate the usage of various String functions.
6. Write a program that will ask you to enter your name, through keyboard, and perform following operations
   a. Find the middle name
   b. Find the last name (using string slicing)
   c. Re-write the name with surname first.
7. Write a program to find out whether the integer entered by the user, through the keyboard, is even or odd number.
8. Find out the youngest among Shyam, Dugu and Ishan whose ages are entered by the user through keyboard.
9. Given three points (x1, y1), (x2, y2), (x3, y3), write a program to check all the three points fall on one straight line.
10. Write a program that will print the odd numbers from n1 to n2 where the values of n1 and n2 are entered by the user.
11. Write a program to find the factorial value of a number entered by the user.
12. Write a program to print all prime numbers between n1 to n2 where the values of n1 and n2 are entered by the user.
13. Write a program to demonstrate basic operations on the list.
14. Write a program to demonstrate stack and queue operations using a list of numbers.
15. Write a program to ask the data of five students that contain name, roll number, age. Sort the list based on roll number of the Student. [Note: Use list of lists].
16. Write a program that will add two square matrices. The dimension and elements of the matrices will be entered by the user.
17. Write a program to demonstrate basic operations on the tuple.
18. Store the data about the shares held by the user as tuples containing the following information about shares: share name, cost price, number of shares, selling price. Write a program to determine:
   a. total cost of the portfolio
   b. total amount gained or lost
19. Write a program to demonstrate basic operations on the set.
20. Create an empty set. Write a program that adds five student names to this set, modifies one existing name, and deletes two names existing in it. [ask the user which name to modify/delete].
21. Write a program to demonstrate basic operations on the dictionary.
22. Create a dictionary to store data (name, roll number) of N students. The key will be the roll number of the student and the value contains the data of the student (in a list). Write a program that asks the user to enter a name of a Student, search it in the dictionary and print the data of the Student if it is available otherwise display an appropriate message.
23. Write a program to demonstrate basic comprehensions on list, set and dictionary.

24.   Write a program that will find x^n (x to the power of n) using a function. The function receives the value of x, n and should return the value of x^n. [don't use any mathematical function].

Core I (PAPER-2)

Problem Solving with C Programming

Course Objectives:

- To learn the C programming language to solve different scientific and business problems
- To learn how to design and write effectively codes using various programming constructs available in the C programming language

Learning Outcomes:

Upon completion of this course, students will be able to:

1. Gain knowledge about different data types and operators in C language
2. Learn the use of various control structures and array
3. Learn the use of pointers, functions, and storage classes
4. Write programs using structures, union, and files

Unit-I:

Introduction: Introduction   to   Programming   Language, Introduction to C Programming, Keywords & Identifiers, Constants, Variables, Input and Output Operations, Compilation and pre-processing, Data types: Different data types, Data types qualifier, modifiers, Memory representation, size and range, Operators: Operators (Arithmetic, Relational, Logical, Bitwise, Assignment & compound assignment, Increment & Decrement, Conditional), Operator types (unary, binary, ternary). Expressions, Order of expression (Precedence and associativity)

Unit-II:

Decision Control structures & Loops: Decision Making and Branching statements (Simple IF, IF…ELSE, Nested IF… ELSE, ELSE … IF ladder), Selection control structure (Switch Statement). Looping statements (FOR, WHILE, DO…WHILE), break, continue and GOTO statements
Array: Concept of Array, Array Declaration, types of array (one and multiple dimension), Character Arrays and Strings, limitation of array.

Unit-III:

Pointers: Concept of Pointer (NULL pointer, wild pointer, dangling pointer, generic pointer), Pointer Expressions, Accessing the Address of a Variable, Declaring Pointer Variables, Initializations of Pointer Variable, Accessing a Variable through its Pointer, Pointer arithmetic, Pointer representation of array, Array of Pointers, Accessing Sting using Pointer.
Function: Types of Function, Function Declaration, Function Definition, Function Call, Recursive Function, Dynamic Memory Management functions, String handling function (strlen, strcmp, strcpy, strncpy, strcat, strstr).
Storage class: Types (auto, register, static, extern), scope rules, declaration and definition.

Unit-IV:

Structure and Union: Defining, Declaring, Accessing, Initialization Structure, nested structure, self-referential structure, bit-field, Arrays of Structures, Structures and Functions, structures and pointers, Unions, difference between structure and union, structure within union. File: File Management in C, Defining and Opening a File, File opening modes (read, write, append), Closing a File, File operations, Error handling during I/O Operations, sequential and random access files. Command line arguments.

Text Book:

Programming in ANSI C by E. Balagurusamy, TMH

Reference Books:

- *The C Programming Language by B. Kernighan & Dennis Ritchie, PHI.*
- *C: How to Program by Paul Deitel, Harvey Deitel, Prentice Hall.*
- *Programming using C by P.C. Sethi & P.K. Behera, Kalyani Publisher*.

Core II- Lab: Problem Solving with C Programming

1. Write a Program to find greatest among three numbers.
2. Write a Program to all arithmetic operation using switch case.
3. Write a Program to print the sum and product of digits of an integer.
4. Write a Program to reverse a number.
5. Write a Program to compute the sum of the first n terms of the following series
$$S = 1+1/2+1/3+1/4+……$$
6. Write a Program to compute the sum of the first n terms of the following series
$$S = 1-2+3-4+5…………….$$
7. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
8. Write a function to find whether a given number is prime or not. Use the same to generate the prime numbers less than 100.
9. Write a Program to compute the factors of a given number.

10.   Write a program to swap two numbers.

11.   Write a Program to print a triangle of stars as follows (take number of lines from user):
    *
    ***
    *****
    ****
12.   Write a Program to perform following actions on an array entered by the user:
a.   Print the even-valued elements
b.   Print the odd-valued elements
c.   Calculate and print the sum and average of the elements of array
d.   Print the maximum and minimum element of array
e.   Remove the duplicates from the array
f.   Print the array in reverse order
    The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.
13.   Write a Program that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
14.   Write a program that swaps two numbers using pointers.
15.   Write a program in which a function is passed address of two variables and then alter its contents.
16.   Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main( ) function.
17.   Write a program to find sum and average of n elements entered by the user. To write this program, allocate memory dynamically using malloc( ) / calloc( ) functions.
18.   Write a menu driven program to perform following operations on strings:
a.   Show address of each character in string
b.   Concatenate two strings without using strcat function.
c.   Concatenate two strings using strcat function.
d.   Compare two strings
e.   Calculate length of the string (use pointers)
f.   Convert all lowercase characters to uppercase
g.   Convert all uppercase characters to lowercase
h.   Calculate number of vowels
i.   Reverse the string
19.   Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
20.   Write a program to copy the content of one file to other.

MINOR Core II

Calculus & Analytic Geometry

Course Objective:

The main emphasis of this course is to equip the student with necessary analytic and technical skills to handle problems of mathematical nature as well as practical problems. More precisely, main target of this course is to explore the different tools for higher order derivatives to plot the various curves and to solve the problems associated with differentiation and integration of vector functions.

Learning Outcomes:

After completing the course the student will be able to

- Trace a curve and find asymptotes.
- Talculate integrals of typical type using reduction formulae, etc.
- Calculate arc length, surface of revolution and know about conics
- Calculate triple products, gradient divergence, curl, etc.

Unit I

Hyperbolic functions, higher order derivatives, Leibnitz rule and its applications to problems of the type $e^{ax+b}sinx$, $e^{ax+b}cosx$, $(ax + b)^n sinx$, $(ax + b)^n cosx$, concavity and inflection points, asymptotes, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves, L'Hospital rule, application in business, economics and life sciences.

Unit II

Riemann integration as a limit of sum, integration by parts, reduction formulae, derivations and illustrations of reduction formulae of the type $\int sin^n x dx$, $\int cos^n x dx$, $\int tan^n x dx$, $\int sec^n x dx$, $\int (logx)^n dx$, $\int sin^n x cos^n x dx$, definite integral, integration by substitution.

Unit III

Volumes by slicing, disks and washers methods, volumes by cylindrical shells, parametric equations, parameterizing a curve, arc length, arc length of parametric curves, area of surface of revolution, techniques of sketching conics, reflection properties of conics,

rotation of axes and second degree equations, classification into conics using the discriminant, polar equations of conics.

Unit IV

Triple product, introduction to vector functions, operations with vector-valued functions, limits and continuity of vector functions, differentiation, partial differentiation, div, curl and integration of vector functions, tangent and normal components of acceleration.

Books Recommended:

- ✓ H. Anton, I. Bivens and S. Davis: Calculus,10th Ed., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.

- ✓ Shanti Narayan, P. K. Mittal: Differential Calculus, S. Chand, 2014.
- ✓ R. J. T Bell: An elementary Treatise on coordinate geometry, MacMillan and Company Limited, 2005.

Books for Reference:

- ✓ James Stewart: Single Variable Calculus, Early Transcendental, 8th edition, Cengage Learning, 2016.
- ✓ G.B. Thomas and R. L. Finney: Calculus, 9th Ed., Pearson Education, Delhi, 2005.
- ✓ M. J. Strauss, G. L. Bradley and K. J. Smith: Calculus, 3rd edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
- ✓ Suggested digital platform: NPTEL/SWAYAM/MOOCs.
- ✓ e-Learning Source http://ndl.iitkgp.ac.in ; http://ocw.mit.edu ; http://mathforum.org

MULTIDISCIPLINARY
Computer Fundamentals

Course Objectives:

- Introduce number systems and data representation
- Understand functional units and components of computer
- Introduce the emerging technologies

Learning Outcomes:

Upon completion of this course, students will be able to:
- Understand the basic organization of a computer and the number system
- Learn about the working of commonly used input-output and memory devices
- Understand the role of Operating system and Computer Networks
- Know about some of the emerging computing technologies and web services

UNIT-1:

Computer Basics: Simple Model of a Computer, Characteristics of Computers, Hardware and Software, working of a Computer, Stored Program Concept, Problem Solving with computer: Flowchart, Algorithms, Programming,
Computer Software: Introduction to computer software, classification of computer software, system software, application software, firmware, middleware

UNIT-2:

Input/output Units: Input devices, Output devices, Computer Memory: Introduction, Read Only Memory, Serial Access Memory, Cache memory, primary memory, secondary storage devices, magnetic tapes, hard disks, SSD, optical drives, USB flash drivers, Memory cards, Mass storage devices, Memory Hierarchy.

UNIT-3:

Operating Systems: Definition, Batch Operating System, Multiprogramming Operating System, Time Sharing Operating System, Multiprocessing Operating System. Services of OS. Computer Networks: Concepts of Networking-LAN, WAN, MAN, Network topologies. Internet and the World Wide Web.

UNIT-4:

Emerging Computing Environments: Peer to Peer Computing, Grid computing, distributed computing, Cloud Computing: Introduction, cloud services, cloud deployment models.
Email, video conferencing, e-Learning, e-Banking, UPI, e-commerce, e-Governance, social networking, emerging computer applications.

Text Book:

ସାମର୍ଥ୍ୟବର୍ଦ୍ଧକ ପାଠ୍ୟକ୍ରମ

Ability Enhancement Course (AEC)

ପରିଶୁଦ୍ଧ ଭାଷା ଓ ଲିଖନ ଧାରା

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ସାହିତ୍ୟର ଶିକ୍ଷଣ ଓ ଅଧ୍ୟୟନ କ୍ଷେତ୍ରରେ ଭାଷାର ପରିଶୁଦ୍ଧତା ନିହାତ ଆବଶ୍ୟକ । ସାହିତ୍ୟକର୍ମ ବାହିରେ ଦିନିକଜୀବନରେ ନିର୍ଭୁଲଭାଷା ବ୍ୟବହାର ହେବା ବାଞ୍ଛନୀୟ । ଭାରତର ସମ୍ବିଧାନସ୍ୱୀକୃତ ଭାଷାମାନଙ୍କ ମଧ୍ୟରେ ଓଡ଼ିଆଭାଷାର ସ୍ଥାନ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ । ଶିକ୍ଷାର୍ଥୀମାନେ ନିର୍ଭୁଲ ଭାଷା ପ୍ରୟୋଗକ୍ଷେତ୍ରରେ ଦିପଟି ସମର୍ଥ ହେବେ, ସେଥିନିମିଇ ଏହି ପାଠ୍ୟପଦ୍ଧତି ପରିକଳ୍ପିତ । ଦିଜିଟଲ ପ୍ରତିଯୋଗିତାମୂଳକ ତଥା ପ୍ରାଶାସନିକ ସେବାମୂଳକ ନିଯୁକ୍ତ ହେବାପାଇଁ ସସ୍ତୁଖ୍ୟାନ ହେଉଥିବା ପରୀକ୍ଷାନିମିଇ ମଧ୍ୟ ଏହା ଶିକ୍ଷାର୍ଥୀଙ୍କୁ ସାହାଯ୍ୟ କରିବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି):

୧ମ ଏକକ: କ) ଶବ୍ଦ ଗଠନରେ ଶୁଦ୍ଧତା

ଖ) ଶବ୍ଦିର ଅର୍ଥ ଅବଗତି

ଗ) ଶବ୍ଦିର ପ୍ରୟୋଗବିଧୃ ଶିକ୍ଷା

୨ୟ ଏକକ: କ) ବାକ୍ୟର ଗଠନରୀତି ଶିକ୍ଷା

ଖ) ବିବିଧ ପ୍ରକାର ବାକ୍ୟ ସମ୍ପର୍କରେ ଧାରଣା

ଗ) ନିର୍ଭୁଲ ବାକ୍ୟଲିଖନ ବିଦ୍ୟା

୩ୟ ଏକକ: କ) ବୃହତ ଅନୁଚ୍ଛେଦକୁ ସଂକ୍ଷିପ୍ତ କରିବାର କୌଶଳ

ଖ) ବିଷୟଗତ ଶୀର୍ଷକ ନିର୍ଦ୍ଧାରଣ କଳା

ଗ) ଅନୁଚ୍ଛେଦରୁ ବିଭିନ୍ନ ପ୍ରଶ୍ନର ଉତ୍ତର ପ୍ରଦାନ

୪ର୍ଥ ଏକକ: କ) ଫର୍ମଲିଖନ ଜ୍ଞାନ

ଖ) ସିଭି ପ୍ରସ୍ତୁତି

ଗ) ନିର୍ଭୁଲ ପତ୍ରଲିଖନ ଓ ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି କଳା

ପାଠ୍ୟ ବିଷୟ

ପ୍ରଥମ ଏକକ: (କ) ଶବ୍ଦର ସଂଜ୍ଞା, ଶୁଦ୍ଧ ଶବ୍ଦ ଓ ବର୍ଣ୍ଣାଶୁଦ୍ଧି

(ଖ) ଶବ୍ଦିର ଅର୍ଥ ଓ ପ୍ରୟୋଗ ବିଧୃ

ଦ୍ୱିତୀୟ ଏକକ: ବାକ୍ୟ ଗଠନରୀତି ଓ ପ୍ରକାର ଭେଦ

ତୃତୀୟ ଏକକ: ଅନୁଚ୍ଛେଦ ସଂକ୍ଷେପଣ, ଶୀର୍ଷକ ନିର୍ଦ୍ଧାରଣ ଓ ପ୍ରଶ୍ନୋତ୍ତର

ଚତୁର୍ଥ ଏକକ: ନିର୍ଭୁଲ ଲିଖନ ପଦ୍ଧତି, ଫର୍ମ ଲିଖନ, ସିଭି, ପତ୍ର ଲିଖନ, ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି

ସହାୟକ ଗ୍ରନ୍ଥସୂଚୀ (Book of reference) :

୧. ସର୍ବସାର ବ୍ୟାକରଣ - ଶ୍ରୀଧର ଦାସ, ଗ୍ରନ୍ଥ ମନ୍ଦିର, କଟକ ।

୨. ସାରସ୍ୱତ ବ୍ୟାବହାରିକ ବ୍ୟାକରଣ - କୃଷ୍ଣଚନ୍ଦ୍ର ପ୍ରଧାନ, ସତ୍ୟ ନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର ।

୩. ବୃହତ ଓଡ଼ିଆ ବ୍ୟାକରଣ- ତ୍ରିଲୋଚନ ଦେହେରୀ, ଗୋବିନ୍ଦ ଚନ୍ଦ୍ର ଲେଙ୍କା, ପ୍ରେଷ୍ୱ ପଦ୍ଲିଶର୍, କଟକ ।

୪. ଆଧୁନିକ ଓଡ଼ିଆ ବ୍ୟାକରଣ- ଧନେଶ୍ୱର ମହାପାତ୍ର, କିତାବ୍ ମହଲ, କଟକ ।

୫. ସାଧାରଣ ଓଡ଼ିଆ ବନାନ ଶୁଦ୍ଧି- ଓଡ଼ିଆ ଭାଷା ପ୍ରତିଷ୍ଠାନ, ଭୁବନେଶ୍ୱର ।

୬. ଗଣମାଧମ ଓ ଗଣଯୋଗାଯୋଗ – ଶିଶିର ଦେହେରୀ, ପ୍ରେଷ୍ୱ ପଦ୍ଲିଶର୍, କଟକ ।

୭. ଯୋଗାଯୋଗ ମୂଳକ ମାତୃଭାଷା – ଦିରଜ୍ଞ ନାରାୟଣ ସାମଲ, ସତ୍ୟନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର, କଟକ ।

୮. ଯୋଗାଯୋଗର ଭାଷା – ସୁଧୀର ଚନ୍ଦ୍ର ମହାନ୍ତି, ପ୍ରାଚୀ ପ୍ରକାଶନ, କଟକ ।

୯. ନିର୍ଭୁଲ ଲେଖାର ମୂଳସୂତ୍ର, ନୀଳାଦ୍ରି ଭୂଷଣ ହରିଚନ୍ଦନ, କିତାବ ମହଲ, କଟକ ।

୧୦.ଓଡ଼ିଆ ଭାଷା ବ୍ୟାକରଣ ସୌରଭ, ଚନ୍ଦ୍ରଶେଖର ପତି, ଓଡ଼ିଶା ବୁକ୍ ଏମୋରିୟମ୍, କଟକ ।

ନମୁନା ପ୍ରଶ୍ନ (Sample Questions) :

୧. ଶବ୍ଦ କାହାକୁ କୁହାଯାଏ ? (୧ ମାର୍କ)

୨.ପର୍ବତର ଦୁଇଟି ପ୍ରତିଶବ୍ଦ ଲେଖ । (୨ ମାର୍କ)

୩.ବାକ୍ୟର ପ୍ରକାରଭେଦ ଦର୍ଶାଅ। (୫ ମାର୍କ)

୪.ତୁମ ମହାବିଦ୍ୟାଳୟରେ ଏକ ଶିକ୍ଷକ ନିଯୁକ୍ତିପାଇଁ କୌଣସି ସମ୍ବାଦପତ୍ରରେ ଓଡ଼ିଆ ଭାଷାରେ କିପରି ବିଜ୍ଞାପନ ଦିଆଯିବ,

ତାହାର ଏକ ନମୁନା ଲେଖ । (୮ ମାର୍କ)

***

SEMESTER-I

AEC

प्रयोजनमूलक हिंदी

UNIT - I

प्रयोजनमूलक हिंदी :

प्रयोजनमूलक हिंदी का स्वरूप और परिभाषा, प्रयोजनमूलक हिंदी के भेद, प्रयोजनमूलक हिंदी की विशेषताएँ, प्रयोजनमूलक हिंदी की समस्याएँ और संभावनाएँ

UNIT - II

राजभाषा हिंदी की संवैधानिक स्थिति:

राजभाषा समिति, 1957, राजभाषा के संबंध में राष्ट्रपति के आदेश, 952, 1955, 1960, राजभाषा अधिनियम 1963, राजभाषा अधिनियम 1967, राजभाषा अधिनियम 1976

UNIT - III

कार्यलयी हिंदी:

हिंदी के विविध रूप : राजभाषा, राष्ट्रभाषा, संपर्क भाषा, संचार भाषा, मातृभाषा, सर्जनात्मक भाषा राष्ट्रभाषा और राजभाषा में अंतर, मानक हिंदी

कार्यालयी हिंदी के प्रमुख प्रकार्य

आलेखन: परिभाषा, स्वरूप, विशेषता, प्रारूप

टिप्पण: परिभाषा, स्वरूप, विशेषता, प्रारूप

पत्रलेखन, पल्लवन, संक्षेपण

पारिभाषिक शब्दावली : पारिभाषिक शब्दावली का स्वरूप एवं महत्त्व पारिभाषिक शब्दावली निर्माण के सिद्धांत, पारिभाषिक शब्दावली के भेद, ज्ञान-विज्ञान के विभिन्न क्षेत्रों में प्रयुक्त कुछ निर्धारित पारिभाषिक शब्दाबली

UNIT – IV

हिंदी में कंप्यूटर का अनुप्रयोग:

कंप्यूटर का परिचय, कंप्यूटर की संरचना, कंप्यूटर के प्रकार, कंप्यूटर की उपयोगिता, हिंदी में शब्द संसाधन, हिंदी में डाटा संसाधन, वेब पब्लिशिंग, वेब पेज डिजाइनर

इंटरनेट :

इंटरनेट स्वरूप और विकास इंटरनेट : कार्यप्राणाली, इंटरनेट के संपर्क उपकरणों का परिचय, इंटरनेट एक्सप्लोटर, इंटरनेट की अनुप्रयुक्तता।

लिंक, ई-मेल, ब्राउजिंग, अपलोडिंग, डाउनलोडिंग, न्यू मीडिया, वेब पत्रकारिता, ब्लागिंग, इंटरनेट रिलै चैट, हिंदी के प्रमुख इंटरनेट पोर्टल।

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पाठ्य पुस्तक:

1. प्रयोजनमूलक हिंदी-   प्रो. राधाकांत मिश्र,

डॉ. अमूल्य रत्न महांती,

प्लैनेट वी, हिंदी बुक सेंटर, बादामबाड़ी, कटक

VAC
Environmental Studies
&
Disaster Management

SEMESTER-I
For Under Graduate Compulsory Courses for Arts, Science and Commerce

FULL MARK-100 (Credit-3)

Unit 1: Multidisciplinary nature of environmental studies   **(8Period)**
Definition, scope and importance
Need for public awareness
Environmental Pollution
Definition
• Cause, effects and control measures of:-
a.   Air pollution
b.   Water pollution
c.   Soil pollution
d.   Marine pollution
e.   Noise pollution
f.   Radiation pollution

Unit 2: Natural
Resources: **(8Period)**

Renewable and non-renewable resources:
Natural resources and associated problems.
a.   <u>Forest resources:</u> Use and over-exploitation, deforestation, case studies.
    Timber extraction, mining, dams and their effects on forest and tribal people.
  b.   <u>Water resources</u> : Use and over-utilization of surface and ground water,
    floods, drought, conflicts over water, dams-benefits and problems.
  c.   <u>Mineral resources</u> : Use and exploitation, environmental effects of extracting
    and using mineral resources, case studies.
  d.   <u>Food resources</u> : World food problems, changes caused by agriculture and
    Overgrazing, effects of modern agriculture, fertilizer-pesticide problems,
    waterlogging, salinity, case studies.
  e.   <u>Energy resources :</u> Growing energy needs, renewable and non-renewable
    energy sources, use of alternate energy sources. Case studies.
Biodiversity:-
Introduction-Definition; Biogeographically classification of India
India as a mega diversity nation. Hot sports of biodiversity, Threats to biodiversity.
Endangered and endemic species of India. Conservation of biodiversity. In Situ and Ex-so
conservation of biodiversity

Unit-3: Disaster Management   **(8 Period)**

1. **Disaster Management:** Types of disasters (natural and Man-made) and their causes and effect)
2. **Vulnerability Assessment and Risk analysis:** Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves, Desertification and Lighting)
3. **Institutional Framework:** Institutional arrangements for disaster management (National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), Disaster Management Act, 2005, District Disaster Management Authority (DDMA), National Disaster Response Force(NDRF) and Odisha Disaster Rapid Action Force(ODRAF)
4. **Preparedness measures:** Disaster Management cycle, Early Warning System, Pre-Disaster and Post-Disaster Preparedness, strengthening of SDMA and DDMA, Community Preparedness for flood cyclone, heat waves, fire safety, lightening and snake biting. Stakeholders participation, Corporate Social Responsibility (CSR)
5. **Survival Skills:** Survival skills adopted during and after disaster (Flood, Fire, Earthquake, Cyclone and Lightening), Disaster Management Act-2005, Compensation and Insurance

Unit 4: Social Issues and the Environment   **(6 Period)**

A.

a.   Environmental Ethics: Issues and possible solutions.
b.   Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies
  c. Environment Protection Act
d.   Air(Preservation Control of Pollution) Act
e.   Water(Preservation Control of Pollution) Act
f.   Wildlife Protection Act
g.   Forest Conservation Act
h.   Solid waste management Cause, effect and Control Measure of Urban and Industrial waste
       (Role of each individual in conservation of Natural resources and prevention of pollution)
  B. Human Population and the Environment
     Population Ecology: Individuals, species, population, community
     Human population growth, population control method
     Urbanisation and its effect on society

Unit 5: Field work   **(15 Periods of 30 hrs)**
  • Visit to an area to document environmental assets: river/forest/flora/fauna, etc.
  • Visit to a local polluted site- Urban/Rural/Industrial/Agricultural
  • Study of common plants, insects, birds and basic principles of identification.
  • Study of simple ecosystems-pond, river, Delhi Ridge ,etc.

BSc. CS 2ND SEMESTER (NEP 2020)

SUBJECT CODE	SUBJECT NAME
MAJOR-P-3	Data Structures
MAJOR-P-4	DBMS
MINOR-2-P-1	Mathematical Physics-I
MDC-2	Environmental Education
AEC-2	English
SEC-1	Analytical Thinking & Logical Reasoning

SEMESTER-II
Core-III   **Data Structures**

Course Objectives:
- To understand different ways of organizing data in computer's memory.
- To learn different operations on data structures.
- To explore different applications of data structures.

Learning Outcomes:
Upon completion of this course, students will be able to:
1. Learn about data structures and the use of array
2. Create linked lists and perform insertion/deletion operations on them
3. Represent Stack and Queue in the memory and learn their applications
4. Learn the use of various non-linear data structures and their applications

Unit-I:

Introduction to Data Structures: Definition, Concepts, Classification of Data Structures.
Array: Introduction, One-Dimensional Array, Memory representation, Operations: Traversing, Searching, Insertion, Deletion, Merge. Two-Dimensional Array & Memory Representation, Multidimensional Array. Linear Search versus Binary Search, Sorting: Selection Sort, Bubble Sort.

Unit-II:

Linked Lists: Definition, Single Linked List, Memory representation, Operations: Traversing, Searching, Insertion, Deletion and Merge. Double Linked List, Operations: Insertions, Deletion. Circular, Double Circular Linked list, Operations: Traversing, Insertion. Applications of Linked List, Sparse Matrix and Polynomial representations.

Unit-III:

Stack: Definition, Representation: Array and Linked List representations, Operations: PUSH, POP, STATUS. Applications: Evaluation of Arithmetic Expressions: Notations, Infix to Postfix Conversion, Evaluation of Postfix expression. Recursion (Factorial and Fibonacci), Tower of Hanoi.
Queues: Definition, Representation: Array and Linked List representations, Operations: Enqueue, Dequeue. Structures of Queue: Circular, Deque and Priority Queue. Applications of Queue

Unit-IV:
Trees: Definition, Terminologies, Binary Tree: Properties, Representations (Linear and Linked List representations). Operations: Traversal (Inorder, Preorder, Postorder), Search. Introduction to Binary Search Tree, AVL tree, M-Way Search Tree. Applications of Trees.
Graph: Definition, Terminologies, Representations (Set, Linked List, Matrix), Operations: Traversal (BFS, DFS). Applications of Graphs.

Text book:

Classic Data Structure, D. Samanta, PHI, 2/ed.

Reference Books:

- ✓ *Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Pubs.*
- ✓ *Sastry C.V., Nayak R, Ch. Rajaramesh, Data Structure & Algorithms, I. K. International*
- ✓ *Publishing House Pvt. Ltd, New Delhi.*

Core III - Lab: Data Structures

Write a C Program for the followings

1. To search an element and print the total occurrences in the array.
2. To insert and delete elements into/from appropriate position in an array.
3. To perform Binary Search.
4. To perform Bubble sort.
5. To perform Selection sort.
6. To implement linear linked list and perform operations such as traverse, search, insert, delete, and reversing the list.
7. To implement circular linked list and perform operations such as node insert and delete.
8. To implement double linked list and perform operations such as node insert and delete.
9. To represent a Sparse Matrix using linked list.
10. Polynomial representation using linked list.
11. Array and Linked list implementations of Stack and perform operations such as push, pop and status.
12. Linked list implementation of Queue and perform operations such as enqueue and dequeue.
13. Linked list implementation of Circular Queue.
14. To implement a Binary Search Tree.
15. To perform tree traversal operations.
16. To implement adjacency matrix for a given graph.
17. To perform BFS and DFS traversal.

Core IV   Data Base Management System

Course Objectives:

- To understand the database concepts for efficient storage and retrieval of data.
- To learn about database design and transaction processing

Learning Outcomes:

Upon completion of this course, students will be able to:

1. Build data models using entity relationship concepts
2. Design databases by systematically applying the normalization process
3. Create relational database tables and perform various operations using SQL
4. Learn issues relating to database transactions and approaches to deal with them

Unit-I:

Introduction to Database and Database Users, Database System Concepts and Architecture: data Models, schema, and instances, Conceptual Modeling and Database Design, Entity Relationship (ER) Model: Entity Types, Entity Sets, Attributes, Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, ER Naming Conventions. Enhanced Entity-Relationship (EER) Model.

Unit-II:

Relational data Model and SQL: Relational Model Concepts, Basic SQLs, SQL Data Definition and Data types, Constraints in SQL, Retrieval Queries in SQL, INSERT, DELETE, UPDATE Statements in SQL, Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Binary Relation: JOIN and DIVISION.

Unit-III:

Database Design Theory and Normalization: Functional Dependencies, Normal Forms based on Primary Keys, Second and third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

Unit-IV:

Transaction Processing Concepts: Transaction and System Concepts, Properties of Transactions, Recoverability, Serializability, Concurrency Control Techniques, Locking techniques for Concurrency Control, Concurrency Control based on Time-Stamp Ordering.

Text Books:

- ✓ *Fundamentals of Database Systems, R Elmasri, S B. Navathe, Pearson Education*
- ✓ *Database Management Systems, Rajiv Chopra, S. Chand Pubs.*

Reference Book:

An Introduction to Database System, Date C. J. - Pearson Education, New Delhi.

Core IV- Lab: Data Base Management System

Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	Type	NULL	KEY	DEFAULT
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema

Field	Type	NULL	KEY	DEFAULT
Dno	Integer	No	PRI	NULL
Dname	Varchar(50)	Yes		NULL
Location	Varchar(50)	Yes		New Delhi

List of Queries:

1. Display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Display unique Jobs from the Employee Table.
3. Display the Employee Name concatenated by a Job separated by a comma.
4. Display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Display the Employee Name and Salary of all the employees earning more than $2850.
6. Display Employee Name and Department Number for the Employee No= 7900.
7. Display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
8. Display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Display Name and Hire Date of every Employee who was hired in 1981.
10. Display Name and Job of all employees who don't have a current Manager.
11. Display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Display Name of all the employees where the third letter of their name is 'A'.
14. Display Name of all employees either have two 'R's or have two 'A's in their name and are either in Dept No = 30 or their Mangers Employee No = 7788.

15. Display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Display the Current Date.
17. Display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
18. Display Name and calculate the number of months between today and the date each employee was hired.
19. Display the following for each employee <E-Name> earns < Salary> monthly but wants <3*Current Salary>. Label the Column as Dream Salary.
20. Display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with 'J', 'A' and 'M'.
1. Display Name, Hire Date and Day of the week on which the employee started.
2. Display Name, Department Name and Department No for all the employees.
3. Display Unique Listing of all Jobs that are in Department # 30.
4. Display Name, Department Name of all employees who have an 'A' in their name.
5. Display Name, Job, Department No. and Department Name for all the employees working at the Dallas location.
6. Display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees Name who do not have a Manager.
7. Display Name, Department No. And Salary of any employee whose department no. and salary matches both the department no. And the salary of any employee who earns a commission.
8. Display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
9. Display the Highest, Lowest, Sum and Average Salaries of all the employees.
10. Display the number of employees performing the same Job type functions.
11. Display the no. of managers without listing their names.
12. Display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
13. Display Name and Hire Date for all employees in the same dept. as Blake.
14. Display the Employee No. And Name for all employees who earn more than the average salary.
15. Display Employee Number and Name for all employees who work in a department with any employee whose name contains a 'T'.
16. Display the names and salaries of all employees who report to King.
17. Display the department no, name and job for all employees in the Sales department.

Mathematical Physics-I

Course Outcomes

- Basic understanding of Differential equations and their solutions, conceptual understanding of calculus.

- Basic understanding of vector calculus and its differentiation.

- Use of vector calculus to understand vector integration. Dirac delta function and its properties.

- Understanding of orthogonal curvilinear coordinates and its application in vector differentiation.

- To understand the basic algorithm in application to functional algebra and error analysis.

Unit I

- **Calculus -I:** Plotting of functions, Intuitive ideas of continuous, differentiable functions and plotting of curves, Approximation: Taylor and binomial series (statements only), First Order Differential Equations and Integrating Factor, Second Order Differential equations: Homogeneous Equations with constant coefficients, Wronskian and general solution, Statement of existence and Uniqueness Theorem for Initial Value Problems, Particular Integral.

- **Calculus-II:** Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor with simple illustration, Constrained Maximization using Lagrange Multipliers,

Unit II

- **Vector algebra:** Recapitulation of vectors: Properties of vectors under rotations. Scalar product and its invariance under rotations, Vector product, Scalar triple product and their interpretation in terms of area and volume respectively, Scalar and Vector fields.

- **Vector Differentiation:** Directional derivatives and normal derivative, Gradient of a scalar field and its geometrical interpretation, Divergence and curl of a vector field, Del and Laplacian operators, Vector identities.

Unit III

- **Vector Integration:** Ordinary Integrals of Vectors, Multiple integrals, Jacobian, Notion of infitesimal line, surface and volume elements, Line, surface and volume integrals of Vector fields, Flux of a vector field, Gauss' divergence theorem, Green's and Stokes Theorems and their applications (no rigorous proofs)

- **Dirac Delta function and its properties:** Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function, Properties of Dirac delta function

Unit IV

Orthogonal Curvilinear Coordinates: Orthogonal Curvilinear Coordinates, Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems, Comparison of velocity and acceleration in cylindrical and spherical coordinate system.

Text Books:

- ✓ *Mathematical Methods for Physicists, G.B.Arfken, H.J.Weber, F.E.Harris (2013,7th Edn.,Elsevier)*

- ✓ *Advanced Engineering Mathematics, Erwin Kreyszig (Wiley India)*

Reference books:

- ✓ *Mathematical Physics C. Harper (Prentice Hall India)*

- ✓ *Complex Variable: Schaum's Outlines Series M. Spiegel (2nd Edition, Mc- Graw Hill Education)*

- ✓ *Complex variables and applications, J. W. Brown and R.V. Churchill*
- ✓ *Mathematical Physics, Satya Prakash (SultanChand)*
- ✓ *Mathematical Physics, B. D. Gupta (4th edition, Vikas Publication)*
- ✓ *Mathematical Physics and Special Relativity, M. Das, P.K. Jena and B.K.Dash (Srikrishna Prakashan)*

- ✓ *Mathematical Physics –H.K.Das, Dr. Rama Verma (S. ChandPublishing)*

- ✓ *Mathematical Physics, B.S. Rajput,(Pragati Prakashana*

Environmental Education

Course Learning Outcomes (CLOs)

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

- Understand the natural environment, different cycles related to Ecology & Ecosystem.
- Identity different causes of Environmental Pollution, Climate Change and need for Sustainable   Development.
- Acquire comprehensive knowledge about Population Ecology, population Growth and Public Health.
- Learn about Environmental Movements and Laws.
- Acquire the knowledge about State pollution Control Board and Central pollution Control Board.

Unit-I: Introduction to Environment

Learning Outcomes

LO: Understand basic concepts of Environment , Ecology, Eco-System and Biodiversity.

- The Environment: Atmosphere, Hydrosphere, Lithosphere, Biosphere.
- Ecology, Ecosystem, major eco-system, Biogeochemical Cycle (Carbon Cycle, Nitrogen Cycle).
- Biodiversity-Values and Services, Global Environmental Issues.

Unit-II: Climate Change and Sustainable Development

Learning Outcomes

LO: Identify factors of pollution and climate change.
LO: Learn basics of wild life conservation and Sustainable Development Goals.
- Environment Pollution: Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, Thermal Pollution, Radiation Pollution.
- Climate Change, causes and consequences, Natural Resources: Conservation of Natural Resources,Soil Erosion and Conservation.
- Management and Conservation of Wildlife, Sustainable Development and its Goals.

Unit-III: Population and Public Health

Learning Outcomes

LO: Understand the correlation between population growth and issues of public health.
LO: Learn how to manage pandemic in modern times.
- Population dividend and population liability.
- Population Ecology: Individuals, Species, role of different sector in managing health disaster.
- Population Growth and Control, Community, Urbanization and its effects on Society.
- Communicable Diseases, Non-Communicable Diseases, Transmission and its effects.

Unit-IV: Environmental Movements and Environmental Laws

Learning Outcomes

LO: Trace environmental movements of India.

LO: Understand functions and role of Pollution Control Boards and know the basic laws of India relating to environment.

- Environmental Movements in India: Grass root Environmental movements in India, Role of women, Environmental Movements in Odisha.
- State Pollution Control Board, Central Pollution Control Board.
- Environmental Laws: Water Act, 1974, Air Act, 1981, The Wildlife (Protection) Act,1972, Environment Protection Act 1986.

Sample Questions

1. What is meant by environment? (1 Mark)
2. Write any two causes of noise pollution. (2 Marks, Within 50 words))
3. Discuss the causes and consequences of climate change (5 Marks, Within 300 words))
4. Critically reflect on the importance and purpose of SDGs with reference to the contemporary society.(8 Marks, 500 to 800 words).

Transaction Mode:

Workshop, ICT-Lab Learning, Lecture method, Seminar, Team teaching, Tutoring, Peer group discussion, Mobile teaching, Self-learning, Collaborative learning, Co-operative learning.

Practical/ Activities

Each student is required to submit Practical/Project report/Assignments selecting any one of the following:

1. Investigation of Major sources of micro- plastic pollutants in urban habitats.
2. Detection and characterisation of major water pollutants in river water.
3. Impact of growing urbanisation on wildlife habitat.

* It will be evaluated by both internal and external examiners.

Text Books

- ✓ *Anubha Kaushik and CP Kaushik, "Perspectives in Environmental Studies", 5th edition,*
- ✓ *2016.*
- ✓ *Benny Joseph, "Environmental studies", 2nd edition, McGraw Hill Education, 2015.*
- ✓ *Basics of Environmental Studies by Dr. N. S. Varandani, Books India Publications.*
- ✓ *Disaster Management by MukeshDhunna, Vayu Education of India, Delhi Publication.*

Reference Books

- ✓ *Dr. M. Chandrasekhar, "A Text book of Environmental Studies", HI-TECH publications,2006.*
- ✓ *Dr. M. Anji Reddy, "A Text book of environmental science and Technology", B S Publications, 2008.*
- ✓ *Dr. K. Mukkanti, "A Text book of Environmental Studies", S.CHAND and Company Ltd, 2009.*
- ✓ *EHILRS and ST, "Text book of Municipal and Rural Sanitation", M.S Hill, 1998.*

English

Introduction

This Course aims at providing students familiarity with all components of language learning; listening, speaking, reading, writing, grammar and vocabulary which will eventually help in development of communication skills. This is an activity-based, goal-oriented, functional course, which aims to make the students able and efficient communicators by helping them to be self-reflexive about English. This course has a predefined context of being supportive and complementary to the core courses in various disciplines. Therefore, unlike most other courses in English Communication on offer, it does not seek to build facile fluency that passes off as communicative competence. Rather, it intends to equip the students with the relevant skills of presentation and expression needed in the academic as well as in the professional domains. While reading skills exercises are meant to promote the acquisition of analytical and comprehension skills, writing skills exercises are centred on sentence construction, paragraph development and précis writing. In this course there is ample scope to build the speaking and listening skills of students with an emphasis on interactive learning and articulation.

Course Objectives

- Develop in students the required knowledge, skills, and judgement around human communication that facilitate their ability to work collaboratively with others.
- Enable the students to understand and practise different techniques of communication. Through this course, they will familiarise themselves with different types of communication. Enhance the employability of students by developing in them the required skills of communication in English, so as to enable them to: 2 i. Speak correctly, intelligibly and fluently as well as to listen and comprehend accurately when spoken to, so as to be able to communicate effectively and with confidence in a variety of social, academic and work-related situations; ii. Read and comprehend accurately the various kinds of written texts which they may be expected to deal with;

iii. Write effectively in a number of different genres (forms) of writing, relevant to social, academic and work-related needs;

- Develop interpersonal skills and the attitudes required for effective functioning in different social and work-related situations.
- Provide cognitive and cultural enrichment through exposure to a variety of humanistic learning experiences. General Pedagogical Principles 1. Instruction will essentially be activity-based. Each session will provide a variety and range of activities, pitched at different levels of linguistic competence. Group activities will be encouraged. The links between theory and practice will constantly be exemplified and highlighted. Theoretical inputs will be provided, as far as possible, in a non-technical manner. 2. Periodical tests may be conducted to assess skills and application of theoretical principles and not recalling information from memory. The skills of Listening and

Speaking may be tested through oral examinations in the classes, depending on time and scope. 3. An inventory of available software, including audio/ audio-visual materials should be made, and the use of such materials be standardised across all colleges. If necessary, software tailored to the requirements of the program should be produced in collaboration with appropriate agencies. 4. Although portions of selected texts will be used to develop the skills, a teacher is free to use material recommended by the experts. 5. The course cannot be effectively implemented unless all instructors are properly oriented. It should be ensured that orientation programs are organised before the curriculum is implemented. Handbooks must be produced and made available to all instructors. 3 6. Workshops for the development of instructional materials by members of college faculties should be organised periodically, as a part of on-going orientation.

Attention

The course drives away the myth that communicative competence in a language is honed, built and effectively practiced by learning and mastering the grammar, phonetics of a language or appropriating the accent and structures of the native tongue. Rather it is an adaptation with equal blend of the first language and the context in collaboration with the foreign tongue achieved by suitable use of texts from literature. So the teachers as well as students are advised to use as much literary texts as possible from the texts prescribed and other sources for providing an exposure to the students to be aware of the truth that literature enables skilful communication. The examination questions will be set according to the texts and topics prescribed.

Unit-I

English Language and Communication: Introduction (9 hours)

I. Communication, its importance and factors that determine communication (sender, receiver, channel, code, topic, message, context, feedback, barriers) models of communication, the information gap principle: given and new information; information overload, redundancy and cliches, the importance of audience and purpose ii. Types of communication: horizontal, vertical, interpersonal, lateral and grapevine iii. Verbal and nonverbal communication, body language and its manifestations in different cultures, written and oral communication, bias-free communication, political correctness. iv. Styles of Communication: formal, informal and semi formal Note: The topics listed above should be introduced briefly in the theory classes. The reflections of the students' understanding may be assessed by the facilitator through exercises. The teacher/facilitator can refer to the books recommended under 'prescribed readings' for teaching and exercise purposes. He/she can refer to valid and recognised web-resources and additional titles from renowned publishing houses for the same purpose.

Texts

- ✓ Communicative English OSHEC Publication. Chapters: Unit-I
- ✓ Literature and Art of Communication by Asima Ranjan Parhi, Madhusmita Pati, Subhra Prakash Das and Shakina Mohol, Cambridge University Press, 2019.
- ✓ The International Encyclopedia of Communication. Malden, MA: Blackwell Publishing. (ebook) 4

Suggested Readings

- ✓ A Cognitive Approach to Language Learning. Oxford University Press Donsbach, Wolfgang. (2008).
- ✓ 'Prospect of Electronic Media as Curriculum in Non-Native Contexts', by Parhi and Dutta in I-Manager's Journal on English Language Teaching, 4(2)2014. https://files.eric.ed.gov. pdf
- ✓ 21st CenturyCommunication: A Reference Handbook. Thousand Oaks, Calif: SAGE Reference. (e-book)
- ✓ Written and Spoken Communication in English published by Orient Blackswan
- ✓ Indian English through Newspapers, A R Parhi, Concept, New Delhi, 2008.
- ✓ An Introduction to Professional English and Soft Skills by Das et al
- ✓ *Communicative Competence.* T T Panigrahi, Notion Press, India, Singapore and Malaysia
- ✓ Soft Skills for Your Career, by Kalyani Samantaray. OUP
- ✓ An Anthology of English Prose 1400–1900 Cambridge University Press 2015.

Unit-II

English Language and Communication: Listening and Speaking (9 hours)

I.   Types of listening (active and passive), listening to respond (how, when and why), empathic listening and interactive listening ii. Speaking to communicate effectively: fluency, accuracy. intelligibility and clarity iii. Style of speaking in various situations:formal, informal and semi-formal, tentative and cautionary, simple and plain English iv. English pronunciation: vowel and consonant sounds, diphthong, IPA, syllable division and primary stress in words, stress shift, sentence rhythm and weak forms, contrastive stress in sentences, intonation: falling and rising tones, varieties of spoken Englishes: Standard Indian, American and British (R.P.); 'Neutral English' , newspapers, ad captions and their contribution to the shaping of Indian English as a standard language

Note: This unit does not go deep into phonetics. The objective is to train students to refer to a Learners' Dictionary to find out the correct pronunciation of words. Students will be introduced to phonemic transcription using IPA symbols in theory classes and further practice will be provided during exercises/practices.

The teacher/facilitator will include simple questions on phonemic transcription and the marking of stress in words and sentences. The teacher/facilitator can refer to the books recommended under both 'Texts' and 'Suggested Readings' for teaching and exercise purposes. He/she can refer to valid and recognised webresources and additional titles from renowned publishing houses for the same purpose.

Texts

- ✓ Communicative English OSHEC publication. Chapter-Unit I
- ✓ The Sound of English by www.pronunciationstudio.com
- ✓ 'Towards the Anti-Canon: A Brief Focus on Newspaper English in India', SHSS (Studies in Humanities and Social Sciences, UGC Care), Ed. T.R. Sharma, IIAS (Indian Institute of Advanced Study), Shimla, Vol. XIII, No.1, Summer 2006, pp.143-

155. http://14.139.58.200, iias.ac.in.journals Asima Ranjan Parhi.

Suggested Readings

- ✓ The Sounds of English Around the World: An Introduction to Phonetics and Phonology Cambridge University Press
- ✓ "Listening in the Language Classroom", pp. 58 - 76 DOI: https://doi.org/10.1017/CBO9780511575945.006, Cambridge University Press, Print publication year: 2009
- ✓ An Introduction to Professional English and Soft Skills by Das et al.
- ✓ Teaching the Spoken Language. Cambridge University Press Speaking. Oxford University Press
- ✓ *Communicative Competence.*Notion Press, India, Singapore and Malaysia
- ✓ Exploring Spoken English. Cambridge University Press English Conversation. Oxford University Press
- ✓ **The English Language in India: From Racial-Colonial to Democratic",** *EJBS (The European Journal of Behavioural Sciences)* **3 (1): page:8-16, Dec. 2020. DOI-10.33422/ejbs.v3i1.302**

Unit-III

English Language and Communication: Reading and Writing (9 hours)

I. Reading methods and techniques: fluency, accessing meaning, levels of competence, skimming and scanning, global and local reading, silent reading and reading aloud ii. Reading texts to understand literal, metaphorical and suggested meanings (essays, poems and stories), identifying the tone (admiring, accusatory, ironical, sympathetic, ambiguous and neutral etc.) of the writer iii. Writing process: brainstorming, pre-writing, writing and post writing, coherence, cohesion, style, iv. Writing short texts: paragraph writing; writing longer texts: literary writing, academic writing and media writing

Note: This unit will focus on the basic principles of reading and writing as forms of communication. The teacher/facilitator may use reading material from literary texts, media writings, non-fiction prose and other written discourses. He/she needs to adopt caution in selecting the reading materials. Reading and writing are related activities. The insights gained through training in reading can be utilised for effective writing. The teacher/facilitator must refer to the chapters and topics from

the books recommended under 'Prescribed Texts' for teaching and exercise purposes. From which questions will be set for the examination. He/she can refer to valid and recognised web-resources and additional titles from renowned publishing houses for the same purpose.

Prescribed Pieces/Texts

- ✓ *Communicative English* OSHEC Publication. Chapters:Unit-III
- ✓ From *The Winged Word,* David Greene, Macmillan.1974 and *Melodious Songs and Memorable Tales,* 2015:
- ✓ 'Daffodils' by William Wordsworth, 'When we two Parted' by Lord Byron, 'The Last Ride Together' by Robert Browning, "Self Portrait" by A K Ramanujan.
- ✓ From *The Widening Arc*. Kitab Bhavan, 2016, A R Parhi, S Deepika, P Jani :
- ✓ 'No Learning without Feeling' by Claire Needell Hollander and 'The Empty Page' by Steven Harvey, 'George V High School' by Dinanath Pathy

Suggested Readings

- ✓ The Oxford Essential Guide to Writing Oxford University Press 2000.
- ✓ An Introduction to Professional English and Soft Skills Das et al
- ✓ The Classic Guide to Better Writing: Step-by-Step Techniques and Exercises to Write Simply, Clearly and Correctly Oxford University Press, 1996
- ✓ Ways of Reading: Advanced Reading Skills for Students of Literature Routledge. 2007.
- ✓ 'Semantic Excess or New Canons? Exploring the Print Media', Journal of Media and Communication, 2010. Research Gate https://www.researchgate.net.237. A R Parhi
- ✓ An Anthology of English Prose 1400–1900Cambridge University Press 2015

Unit-IV

I. English Language and Communication: Grammar and Vocabulary (9hours) i. Grammar for meaning, multiplicity of meaning, grammar in communication ii. Stative and dynamic verbs, modals and auxiliaries, tense and time reference, aspect,voice, modality, negation, interrogation; reported questions and tag questions, complex noun phrases, concord phrasal verbs. iii. Sentence structure: simple, compound and complex, clauses, types of sentences:statement, questions, exclamations,commands iv. Functions of language,usage-oriented vocabulary, neutral vocabulary Note: The teaching of grammar and vocabulary in this unit need to be connected to communication teaching. Teachers/Instructors may select other areas of grammar for review depending on the needs. They will identify the grammatical errors commonly made by their students in speech as well as writing.

The remediation of these errors may require some explanations of grammar. Instructors should use many grammar and vocabulary related exercises and through them will provide all the grammatical information needed to explain the errors that are identified. The teacher/facilitator can refer to the books recommended under 'suggested readings' for teaching and exercise purposes. He/she can refer to valid and recognised web-resources and additional titles from renowned publishing houses for the same purpose.

Texts

- ✓ Communicative English OSHEC publication. Chapters: Unit-III Communicative Grammar of English by Geoffrey Leech. Routledge publications, 2002
- ✓ Oxford Practical English Usage (International Edition 2016) by Michael Swan

Suggested Readings

- ✓ The Widening Arc, Kitab Bhavan, Asima R Parhi, S Deepika, P Jani, 2016.
- ✓ Writing Skills Remapping: An Anthology for Degree Classes Orient Blackswan
- ✓ An Anthology of English Prose 1400–1900 Cambridge University Press 2015

Scheme of Evaluation

- ✓ Midterm test: 20 marks

5x1=5 (short answer, short notes, comprehension questions)
5x1=5 (Analytical, perspective-based and critical-analysis questions)
5x2=10 (activity/practice/reports/case studies/response papers/assignments etc.)

The teacher will have the flexibility of conducting internal examinations or assess the students' learning outcomes through activities, short projects, case studies etc. from all 20 marks/ in parts

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Final Examination: 80 marks

Unit1: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Unit 2: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Unit 3: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Unit 4: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Analytical Thinking and Logical Reasoning

Course Objectives

- To cover various forms of reasoning including deductive, inductive, and abductive, and integrate these with critical thinking skills.

- To explore logical sequences, coding-decoding, and arrangements as key elements of logical reasoning.

- To delve into complex logical reasoning constructs such as alphanumeric series, reasoning analogies, and calendars.

- To engage with arguments involving two or more premises and utilize connectives effectively.

Learning Outcomes

- To be acquainted with using facts, evidence, rules, and principles to draw valid conclusions and make sound judgments
- Able to practice pattern recognition, spatial reasoning, and decision-making as fundamental components of analytical reasoning

- Able to apply logical reasoning to practical scenarios involving cause and effect, dices, directions, and visual reasoning

- Able to master logical constructs such as statements and assumptions, conclusions, and syllogisms

Unit-I: Analytical Reasoning
Deductive Reasoning, Inductive Reasoning, Abductive Reasoning, Critical Thinking, Pattern Recognition- Data, Sequences, Structures, Logical Reasoning, Spatial Reasoning, Causal Reasoning, Decision Making.

Unit-II: Basic Logical Reasoning Concepts
Logical Sequence Series- patterns and sequences in reasoning. Coding- Coding decoding. Arrangements-Seating arrangements and data arrangement. Blood Relations-problems related to blood relations. Input and Output Patterns. Binary Logic Problems

Unit-III: Logical Reasoning
Alphanumeric series, Reasoning Analogies, Calendars, Cause and Effect, Clocks, Cubes and cuboids, Data Sufficiency, Decision Making, Deductive Reasoning/Statement Analysis, Dices, Directions, Mirror and Water Images,

Unit-IV: Logical Statements
Two premise argument. More than two premise argument using connectives. Statement and Assumptions. Statement and Conclusions. Syllogism.

BSc. CS 3RD SEMESTER (NEP 2020)

SUBJECT CODE	SUBJECT NAME
MAJOR-P-5	Discrete Mathematical Structures
MAJOR-P-6	Computer Organization
MAJOR-P-7	Operating Systems
MINOR-2-P-2	Introduction to Algebra & Number Theory
MDC-3	Professional Writing
VAC-2	Ethics & Values

Semester III
Core V   **Discrete Mathematical Structures**

Course Outcomes:

- To learn the mathematical foundations required for computer science.
- This course will help in understanding other courses in computer science.

Learning Outcomes:

Upon completion of this course, students will be able to:
1. Learn propositional logic and set theory
2. Learn concept of functions and recurrence relations
3. Learn counting techniques, and relations
4. Learn concepts of graphs and its applications

Unit-I:
Logic and Proofs: Propositional logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs.
Sets: Venn Diagrams, Subsets, The size of a set, Power Sets, Cartesian Products, Set Operations

Unit-II:
Functions: One-to-One and Onto Functions, Inverse Functions and Compositions of Functions Partial Functions. Sequences, Recurrence Relations, Summations.

Unit-III:
Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients and Identities.
Relations: Relations and their Properties, n-ary Relations and their Applications, Representing Relations, Closure of Relations, Equivalence Relations, partial Orderings.

Unit-IV:
Graph Terminology and Special Types of Graphs, Bipartite Graphs, Representing Graphs: Isomorphism of Graphs, Euler and Hamilton Paths, Shortest Path Problems: Dijkstra's Algorithm, Traveling Salesperson Problem, Planar Graphs, Graph Coloring. Tree Traversal, Minimum Spanning Trees

Text Books:

- ✓ *Kenneth H. Rosen, Discrete Mathematics and its Applications, Mc Graw Hills International Seventh Edition.*
- ✓ *C. L. Liu, "Elements of Discrete Mathematics", McGraw Hills International Second Edition.*

Reference Books:

- ✓ *Elements of Discrete Mathematics by C. L. Liu and D.P. Mohapatra, TMH, 2012*
- ✓ *J. P Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TMH, 1997.*

Core VI   Computer Organization

Course Objectives:
- To understand data representation techniques and used of various logic gates
- To understand the basic components of a digital computer and their working
- To know about various memory devices

Learning Outcomes:
Upon completion of this course, students will be able to:
- Use different number systems and know the function of basic logic gates
- Design various combinational circuits
- Understand the functioning of a digital computer
- Understand the use of various memory devices and their management

Unit-I:
Character Codes, Decimal System, Binary System, Decimal to Binary Conversion, Hexadecimal Notation, Boolean Algebra, Basic Logic Functions: Electronic Logic Gates, Synthesis of Logic Functions, Minimization of Logic Expressions, Minimization using Karnaugh Maps, Synthesis with NAND and NOR Gates, Tri-State Buffers.

Unit-II:
Designing of combinational circuits- Half Adder, Full Adder, Carry-Lookahead Addition, Decoders, Encoders, Multiplexers, Flip-Flops, Gated Latches, Master-Slave Flip-Flops, Edge-Triggering, T Flip-Flops, JK Flip-Flops. Registers and Shift Registers, Counters.

Unit-III:
Basic Structure of Computers - Computer Types, Functional Modules, Basic operational Concepts, Bus Structures, Performance, Multiprocessors and Multi-computers, Input/Output Organization - Accessing I/O devices, Interrupts, Processor examples, Direct memory access, Buses, Interface circuits, Standard I/O interfaces.

Unit-IV:
Memory System - Basic concepts, Semi-conductor RAM memories, Read-only memories, Speed, Size and Cost, Cache Memory: Computer Memory System, Cache Memory Principles, Performance considerations, Virtual Memories, memory management requirements, Secondary Storage.

Text Books:

- ✓ *M. Morris Mano, Michael D. Ciletti (2008), Digital Design, 4th edition, Pearson Education Inc, India.*
- ✓ *Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India*

Reference Books:
- ✓ *Computer Architecture and Organization: William Stallings, Pearson Education.*
- ✓ *Computer Architecture and Organization: John P. Hayes McGraw Hill.*

Core VII   **Operating Systems**

Course Objectives:
- To understand Operating system structure and services.
- To understand the concepts of Process, memory, storage, and I/O management.
- To explore different applications of data structures.

Learning Outcomes:
Upon completion of this course, students will be able to:

1. Understand various services offered by an OS as a resource manager
2. Understand the concept of a process and various CPU scheduling techniques
3. Learn the concepts on effective memory management and virtual memory
4. Learn various approaches to disk scheduling & file management techniques

Unit-I:
Introduction to Operating System, Computer System Architecture, System Structures: Operating system services, User and Operating-System Interface, system calls, system programs, Operating system design and implementation, Operating system structure, Batch processing, multi-programming, time-sharing and real-time systems

Unit-II:
Process Management: Process Concept, Operations on processes, Process scheduling, Inter-process Communication, Threads, Multithreading Models. CPU Scheduling algorithms: Scheduling Criteria, FCFS, SJF, Priority, Round Robin, Multilevel Queue, Multilevel Feedback Queue. Deadlocks: Deadlock detection, deadlock prevention, and deadlock avoidance fundamentals.

Unit-III:
Memory Management Strategies: Swapping, Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory Management: Concepts, Demand Paging, Page Replacement techniques: FIFO, LRU, Optimal, Thrashing.

Unit-IV:
Storage Management: Overview of Mass-Storage Structure, Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK, RAID technology.
File System concept, Access Methods, Directory and Disk Structure, File System systems, File, Sharing and File Protection.

Text Books:

- ✓ *Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, Eighth Edition, Wiley Student Edition 2009*
- ✓ *Operating Systems, Rajiv Chopra, S. Chand Pubs.*

Reference Books:

- ✓ *Modern Operating System, Tanenbaum, Pearson, 4/ed. 2014*
- ✓ *Operating Systems 5th Edition, William Stallings, Pearson Education India*
- ✓ *Richard Blum, Linux Command Line and Shell Scripting Bible, O' Reilly*

Core VII- Lab: Operating Systems

1. Basic Linux Commands and Overview (date, cal, who, tty, echo, bc, pwd, mkdir, rmdir, cd, cat, cp, mv, rm, ls, wc)
2. Shell Programming
    i. Write a shell script to perform the tasks of basic calculator.
    ii. Write a shell script to find the greatest number among the three numbers.
3. Shell Programming
    i. Write a shell script to check if the number entered at the command line is prime or not.
    ii. Write a shell script to display the multiplication table of any number.
4. Shell Programming
    i. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
    ii. Write a shell script to find the sum of digits of a given number.
    iii. Write a shell script to find the factorial of a given number.
5. Write a program (using fork() and/or exec() commands) where parent and child execute:
    i. Same program, same code.
    ii. Same program, different code.
    iii. Before terminating, the parent waits for the child to finish its task.
6. Write a program to copy files using system calls.
7. Write a program using C to implement FCFS scheduling algorithm.
8. Write a program using C to implement Round Robin scheduling algorithm.
9. Write a program using C to implement SJF scheduling algorithm.
10. Write a program using C to implement first-fit, best-fit, and worst-fit allocation strategies.

Introduction to Algebra & Number Theory

Course Objectives:

To present a systematic introduction to number theory and a basic course on algebra.

Learning Outcomes:

After completing the course the student will be able to

- Understand the equivalence relations and concept of group with different examples.
- Understand the properties of cyclic groups, rings, and integral domain.
- Know divisibility and division algorithm and find *gcd* using Euclidean Algorithm.
- Solve linear Diophantine equations, find least common multiples,solve linear congruence applying the Chinese   remainder theorem.

Unit I

Integers and equivalence relations**,** properties of integers, modular arithmetic, mathematical inductions, equivalence relations, Introduction to groups**,** symmetries of a square, the dihedral groups, definitions and examples of groups, elementary properties of groups, subgroups, examples of subgroups.

Unit II

Cyclic groups, properties of cyclic groups, classification of subgroups of cyclic groups, definitions and examples of normal subgroups, Introduction to rings, definition and examples of rings, properties of rings, subrings, definition and examples of integral domain and fields.

Unit III

Divisibility, division algorithms, prime and composite numbers, Fibonacci and Lucas numbers, Fermat numbers, greatest common divisor, Euclidean algorithm.

Unit IV

Fundamental theorem of arithmetic, least common multiple, linear Diophantine equations, congruence, linear congruence, Chinese remainder theorem, Wilson's theorem, Fermat little theorem, Euler's theorem.

Books Recommended:

- ✓ *Joseph A. Gallian, Contemporary Abstract Algebra (4th Edition), Narosa Publishing House, New Delhi, 1999.(IX Edition 2010).*
- ✓ *Thomas Koshy, Elementary Number Theory with Applications (2nd Edition), Academic Press, 2007.*

Books for Reference:

- ✓ *I. N. Herstein: Topics in Algebra, Wiley Eastern Limited, India, 1975.*
- ✓ *David M. Burton: Elementary Number Theory (6th Edition), Tata McGraw-Hill Edition, Indian Reprint, 2007.*
- ✓ *Suggested digital platform: NPTEL/SWAYAM/MOOCs.*
- ✓ *e-Learning Source http://ndl.iitkgp.ac.in ; http://ocw.mit.edu ; http://mathforum.org.*

Professional Writing

Course Objectives

- The course aims at teaching students to write grammatically correct, clear, effective prose and applies it to writing for the workplace.
- Its objective is to help students develop writing skills and acquire the knowledge to apply these skills in standard workplace document formats.
- It includes a study of writing in a variety of professional contexts with an emphasis on assessing rhetorical situations and crafting messages to inform and persuade diverse audiences in a variety of forms and formats.

Unit-1

Writing: Definition and Requirement

Writing Process: Prewriting, Writing and Post writing

Basic Writing Skills

Plain English

Unit-2

Genres of Writing: Persuasive, Expository, Narrative, Descriptive and Argumentative

Unit-3

Basic forms: Letters, Application, Memo, Notices and Minutes

Raising the Bar: Presentations, Proposal, and Report

Unit-4

The Elements of Style: Grammar, Usage, and Mechanics

Prescribed Texts

- ✓ *The Craft of Professional Writing***,** Second Edition by Michael S. Malone
- ✓ *Literature and Art of Communication*. Parhi, Pati, Mohol et al. Cambridge University Press, 2019.
- ✓ *Professional Writing Skills: A Write It Well Guide* by Natasha Terk

Suggested Readings

- ✓ *Huddleston R., and Geoffrey K. Pulia, eds. A Student's Introduction to English Grammar. CUP.2005*
- ✓ *MLA Handbook for Writers of Research Papers. Eighth edition. Modern Language Association of America. 2021*

- ✓ Excellence In Business Communication by John V. Thill and Courtland L. Bovee

  On Writing Well by William Zinsser

  https://communicationprogram.wharton.upenn.edu/library/

  https://www.osou.ac.in/eresources.php

ETHICS & VALUES

Credit point: 3   **Full mark -100**   **Total Hours: 45**

COURSE OUTCOME

- Development of a good human being and a responsible citizen
- Developing a sense of right and wrong leading to ethically correct behavior
- Inculcating a positive attitude and healthy work culture
- To equip the students to prepare themselves national and state level civil service and other competitive examination.

COURSE CONTENTS

UNIT-I- ETHICS AND HUMAN INTERFACE   [5 Hours]

Learning Outcome-

✓ *Understand the basic concept of ethics and its relevance in life*

- Ethics and Human Interface: Essence, Determinants and consequence of ethics and human action.
- Dimensions of Ethics in private and public relationship
- Human Values: Tolerance, Compassion, Rationality, Objectivity, Scientific Attitude Integrity, Respecting conscience and Empathy etc.
- Mahatma Gandhi and Ethical Practices: Non-Violence, Truth, Non-hatred and love for all, concern for the poorest, objective Nationalism and Education for man making. Relation between Ends and Means.

Subject Teacher: Philosophy/Political Science or Any other Teacher.

UNIT-II- ETHICS AND MAJOR RELIGIONS AND CIVILIZATIONS   [7 hours]

Learning Outcome-
✓ *Be familiar with ethical principles and values promoted by major   religious traditions and civilization*

- Hinduism- Dharma and Mokhya (out of 4 goals of life Dharma, Artha, Kama and Mokhya), Concept of Purusartha, Nisakama Karma(work without attachment to results), Concept of Basudev Kutumba and Peace (Whole world including all animals, plants, inanimate beings and human form one world)
- Ten Commandments: (Christianity and Judaism Tradition)
- Islamic Ethics: Justice, Goodness, Kindness, Forgiveness, Honesty, Purity and Piety
- Egyptian- Justice, Honesty, Fairness, Mercy, Kindness and Generosity
- Mesopotian-Non-indulgence in lying, stealing, defrauding, maliciousness, adultery, coveting possession of others, unworthy ambition, misdemeanors and injurious teaching.
- Buddhism-Arya Astangika Marg: Right View, Thought, Speed, Action, Livelihood, Efforts, Attention and Concentration.
- Jainism-Right faith, knowledge and conduct(Triralna)

- Chinese-Confucianism- Respect for Autonomy, Beneficence, non-maleficence and justice. Taoism: No killing, No stealing, No sexual misconduct, No false Speech and No taking of intoxicants.

Subject Teacher: History/Philosophy/Political Science or Any other Teacher.

UNIT-III- CONSTITUTIONAL VALUES, GOOD CITIZENSHIP, PATRIOTISM AND VOLUNTEERISM [10 Hours]

Learning Outcome-
✓ *Students Learns about constitutional values of India, Civic Sense and good Citizenship (both National and International) Patriotism and need for Volunteerism*

- Salient Values of Indian Constitution: Sovereign, Socialist, Secular, Democratic, Republic, Justice, Liberty, Equality and Fraternity
- Patriotic values and ingredients of National Building, Examples of great Patriots, Rani Laxmi Bai, Bhagat Singh, Mangal Pandey, Birsa Munda, Laxman Naik, Subhas Chandra Bose and Khudiram Bose.
- Law abiding citizenship
- Concept of Global citizenship in contemporary world
- Volunteerism- concept and facts of Volunteerism, building a better society through Volunteerism, Blood Donation, Social work, Helping the Aged, Promotion of Green Practices and Environment protection.

Subject Teacher: Philosophy/Political Science /History/ or Any other Teacher.

UNIT-IV- WORK ETHICS [6 hours]
Learning Outcome-
✓ *Understand the concept of work ethics, ethics in work place and ethical practices to be adopted by various professionals*

- The concept of professionalism.
- Professional ethics at work place
- Core values needed for all professionals. Reliability, Dedication, Discipline, Productivity, Co-operation , Integrity, Responsibility, Efficiency, Professionalism, Honesty, Purity and Time Management, Accountability, Respect Diversity, Gender Sensitivity, Respect for others, Cleanliness, Rational Thinking, Scientific Attitude, Clarity in Thinking . Diligence, cleanliness and Environment Consciousness.
- Codes of conduct for Students(both in College and Hostels),Teachers, Business professional, Doctors, Lawyers, Scientist, Accountants, IT professionals and Journalist.
- Practical ethics in day to day life.

Subject Teacher: Commerce/Philosophy/Education/History/ or Any other Teacher.

UNIT-V-ETHICS AND SCIENCE AND TECHNOLOGY [7 Hours]

Learning Outcome-

✓ *Understand how Science is related to ethics and values has ethical implications.*

- Ethics of Science and Technology. Are science and Technology ethically neutral? Are Science and Technology Value Free?
- Ethics of scientific Research ,Innovation and Technology
- Ethics of Social Media, Modern Gadgets

- AI and Ethics

Subject Teacher: Philosophy or Any Science Teacher

UNIT-VI- ETHICS AND VULNERABLE SECTIONS OF SOCIETY   [10 hours]
    Learning Outcome-
- ✓ *Understand how various vulnerable sections of our society are treated unequally and what needs to be done to address their inequality*
- ✓ *Understand dimensions of substance abuse*

1. **Women and family-**Gendered practices in the family, marriages (dowry, child marriage, women's consent).
   Women and work- women's work at home and at work place, pay gap, gendered roles, harassment at work place and working women and role conflict.
   Women and Society- Gender sensitive language, property right, marriage-divorce/Separation and women's right; violence against women
2. **Issues Relating to Children:** Nutrition and health , Child Exploitation: Child labour ,trafficking, sexual exploitation
3. **Issues Relating to Elderly Persons :** Abuse of Elders, Financial insecurity, Loneliness and Social insecurity, Health Care Issues, Needs for a happy and Dignified Ageing
4. **Issues Relating to persons with disability:** Rights of PWD, affirmative action, prevention of discrimination, providing equal opportunity, various scheme for empowering PWD and social justice for PWD.
5. **Issues Relating to Third Gender:** Understanding LGBTQ, Social justice for them, Removal of discrimination, Affirmative action and Acceptance of diversity of gender.

Subject Teacher: Sociology/political Science /Anthropology or Any Science Teacher

<u>**Sample Questions-**</u>

1. Birsa Munda belongs to which state of India?[1 mark]
2. Recall at least 4 constitutional values from the preamble to India constitution.[2 marks]
3. Explain utility of being Punctual.[5 marks]
4. Explain the ethical principles a scientist should follow.[8 marks]

Course material: To be developed by OSHEC and DDCE, Utkal University. Video Lectures will be also prepared by OSHEC and VTP, Utkal University. There shall be no internal examination for this course. The Term End Examination shall be conducted by the respective Universities. Student would engage in self-study and colleges shall conduct at least 4 doubt clearing session for each unit by engaging subject teachers as indicated above. The Principal may assign responsibility to any teacher.

5TH SEMESTER BSc. CS(H)			
	SUB CODE		**SUB NAME**
MAJOR	CORE-I	PAPER-11	Software Engineering
	CORE-I	PAPER-12	An Intron to AI/ Computer Graphics
	CORE-I	PAPER-13	Programming in JAVA
MINOR	CORE-III	PAPER-3	Real Analysis-I
SEC	PAPER-2		
VAC	PAPER-3		

Semester V
Core XI   **Software Engineering**

Course Objectives:
- To understand importance of Software engineering.
- To understand different software development models
- To understand various issues involved in a software development project

Learning Outcomes:
Upon completion of this course, students will be able to:
- Understand various software development lifecycle models
- Know the complexities involved in software development projects & how to deal with them
- Understand the software design process starting from requirement analysis
- Learn about software documentation, software testing and maintenance

Unit-I:
Introduction: Evolution of Software to an Engineering Discipline, Software Development Projects, Exploratory Style of Software Development, Emergence of Software Engineering, Changes in Software Development Practices, Computer Systems Engineering. Software Lifecycle Models: Waterfall Model and its Extensions, Rapid Application Development (RAD), Agile Development Models, Spiral Model.

Unit-II:
Software Project Management: Software Project Management Complexities, Responsibilities of a Software Project Manager, Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO, Halstead's Software Science, Staffing Level Estimation, Scheduling, Organization and Team Structures, Staffing, Risk Management, Software Configuration Management.

Unit-III:
Requirement Analysis and Specification: Requirements Gathering and Analysis, Software Requirement Specifications, Formal System Specification Axiomatic Specification, Algebraic Specification, Executable Specification and 4GL.

Software Design: Design Process, characterize a Good Software Design, Cohesion and Coupling, Layered Arrangements of Modules, Approaches to Software Design (Function Oriented & Object-Oriented).

Unit-IV:
Coding and Testing: Coding: Code Review, Software Documentation, Testing, Unit Testing, Black Box and White Box Testing, Debugging, Program Analysis Tools, Integration Testing, System Testing, Software Maintenance.

Text Book:
  ✓ *Fundamental of Software Engineering, Rajib Mall, Fifth Edition, PHI Publication, India.*

Reference Books:
  ✓ *Software Engineering– Ian Sommerville, 10/Ed, Pearson.*
  ✓ *Software Engineering Concepts and Practice – Ugrasen Suman, Cengage Learning India Pvt, Ltd.*
  ✓ *Software Engineering, R Khurana, Vikash Pubs.*

Core XI- Lab: Software Engineering

Students have to do at least two software development projects from the list of projects given below. They have to follow the complete software development lifecycle with the following details. UML can be used as a design tool. (Coding is optional).

1.   • Problem Statement
              • Process Model
2.   Requirement Analysis:
              • Creating a Data Flow
              • Data Dictionary, Use Cases
3.   Project Management:
              • Computing FP
              • Effort
              • Schedule, Risk Table, Timeline chart
4.   Design Engineering:
              • Architectural Design
              • Data Design, Component Level Design
5.   Testing:
              • Basis Path Testing

List of Projects:
  1. Criminal Record Management: Implement a criminal record management system for jailers, police officers and CBI officers.
  2. Route Information: Online information about the bus routes and their frequency and fares
  3. Car Pooling: To maintain a web-based intranet application that enables the corporate

employees within an organization to avail the facility of carpooling effectively.

4. Patient Appointment and Prescription Management System
5. Organized Retail Shopping Management Software
6. Online Hotel Reservation Service System
7. Examination and Result computation system
8. Automatic Internal Assessment System
9. Parking Allocation System
10. Wholesale Management System

Core XII (A): Introduction to Artificial Intelligence

Course Objectives:

- To learn the basic concepts of AI.
- To understand AI problem-solving approaches

Learning Outcomes:

Upon completion of this course, students will be able to:

1. Understand state space search as an approach to AI problem solving
2. Understand various Knowledge Representation techniques
3. Learn the complexity involved in NLP & role of learning in AI problem-solving
4. Understand the importance of Expert systems and the use of AI programming languages.

Unit-I:
Introduction to AI, Scope of AI, Characteristics of AI problems, Turing test, Concept of Intelligent agents, Approaches to AI problem-solving, State space search, production system, Uninformed search: Breadth-First, Depth-First, Iterative deepening, bidirectional and beam search.

UNIT-2:
Informed/Heuristic search: Generate-and-Test, Hill climbing, Best-first search, A^* algorithm, Problem reduction, AO^*, Constraint satisfaction, Solution of CSP using search, Means-End analysis.

UNIT-3:
Knowledge Representation: Propositional logic and Predicate logic along with their resolution principles, Unification algorithm, forward and backward chaining and conflict resolution, Semantic nets, Frames, Conceptual dependencies, Scripts.
Reasoning under uncertainty: Bayesian Belief networks, Dempster Shafer theory

UNIT-4:
Natural language processing: Introduction, Levels of knowledge in language understanding, , Phases of Natural language understanding, top-down and bottom-up parsing, transition networks.
Expert Systems: Introduction, Architecture, Expert system development cycle, Examples of ES: Mycin and Dendral.

Text Books:

- ✓ *Artificial Intelligence - A Modern Approach by Stuart J. Russell & Peter Norvig, Prentice Hall*
- ✓ *Artificial Intelligence by Rajiv Chopra, S. Chand Pubs.*

Reference Books:
- ✓ *D.W. Patterson, Introduction to A.I and Expert Systems, PHI Pub.*
- ✓ *Artificial Intelligence by Rich, Knight, and Nair, McGraw Hill*

Core XII (A) -Lab: Artificial Intelligence

1. Write a Python program to implement Depth-First Search (DFS) for a given graph. Test your program on a graph with at least 5 nodes. Verify your program by printing the order in which nodes are visited.
2. Write a Python program to implement Breadth-First Search (BFS) for a given graph. Use a queue to manage the nodes to be explored. Test your program on a graph with at least 5 nodes and print the order of node visits
3. Write a Python program to implement Uniform Cost Search (UCS) for finding the shortest path in a weighted graph. Test your program on a graph with at least 5 nodes and varying edge weights.
4. Write a Python program to implement the A* search algorithm. Your program should take a graph, a start node, a goal node, and a heuristic program as input. Test your implementation on a grid-based graph where the heuristic is the Manhattan distance.
5. Write a Python program to implement Greedy Best-First Search. Use a heuristic program to guide the search.
6. Write a Python program to solve a maze using the A* search algorithm. Represent the maze as a grid, where 0 indicates an open cell and 1 indicates a wall. Use Manhattan distance as the heuristic.
7. Write a Python program to implement the Minimax algorithm with Alpha-Beta pruning for a simple game (e.g., Tic-Tac-Toe).
8. Write a Python program to implement the Hill Climbing algorithm with random restarts. Test your program on a problem where the solution landscape has multiple peaks.
9. Write a Python program to represent the state of the 8-puzzle. Use a 2D list or a single list with 9 elements to represent the tiles. Implement a program to display the puzzle state.
10. Write a Python program to generate all possible moves (up, down, left, right) from a given state in the 8-puzzle. Ensure that your program checks for the boundaries of the puzzle.

Core XII (B) : Computer Graphics

Course Objectives:
- To understand basic concepts of computer graphics.
- To learn techniques for creating basic graphical structures
- To learn different transformation techniques

Learning Outcomes:

Upon completion of this course, students will be able to:
- Know the use of different graphics systems
- Learn different algorithms to draw geometrical figures
- Learn various geometric transformation techniques
- Learn techniques for clipping

Unit-I:

Computer Graphics: A Survey of Computer graphics, Overview of Graphics System: Video Display Devices, Raster-Scan Systems, Input Devices, Hard-Copy Devices, Graphics Software.

Unit-II:

Graphics Output Primitives: Point and Lines, Algorithms for line, circle & ellipse generation, Filled-Area Primitives. Attributes of Graphics Primitives: Point, line, curve attributes, fill area attributes, Fill methods for areas with irregular boundaries.

Unit-III:

Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Transformation Matrix, Types of transformation in 2-D and 3-D Graphics: Scaling, Reflection, shear transformation, rotation, translation. 2-D, 3-D transformation using homogeneous coordinates.

Unit-IV:

Two-Dimensional Viewing: Introduction to viewing and clipping, viewing transformation in 2-D, viewing pipeline, Clipping Window, Clipping Algorithms: Point clipping, Line clipping and Polygon clipping.

Text Books:
- ✓ *Donald Hearn & M. Pauline Baker, "Computer Graphics with OpenGL", Pearson Education.*
- ✓ *Mathematical Elements for Computer Graphics, D. F. Rogers & J. A. Adams, MGH, 2/ed.*

Reference Books:
- ✓ *Computer Graphics principles & practice, Foley, Van Dam, Feiner, Hughes Pearson Education*
- ✓ *Computer Graphics by Zhigang Xiang, Roy A Plastic, McGraw-Hill*

Core XII (B) - Lab: Computer Graphics using OpenGL

1. Write a program to implement Bresenham's line drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to fill a polygon using Scan line fill algorithm.
6. Write a program to apply various 2D translation transformation.
7. Write a program to apply 2D object homogenous coordinates translation.
8. Write a program to apply various 2D rotation transformation.
9. Write a program to apply 2D object homogenous coordinates rotation.
10. Write a program to apply various 2D scaling transformation.
11. Write a program to apply 2D object homogenous coordinates scaling transformation.
12. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.

Core-XIII   Programming in Java

Course Objectives:

- To learn Java for writing object-oriented programs
- To understand the use of different Java programming constructs
- To learn exception handling in Java and use of threads.

Learning Outcomes:
Upon completion of this course, students will be able to:
- Learn the basics of Java programming
- Create classes/objects and implement different forms of inheritance
- Use arrays and files in Java
- Learn about exception handling

Unit-I:

Introduction to Java: Java History, Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords (super, this, final, abstract, static, extends, implements, interface) , Data Types, Wrapper class, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods). Input through keyboard using Command line Argument, the Scanner class, BufferedReader class.

Unit-II:

Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes, Class Variables & Methods, Objects, Object reference, Objects as parameters, final classes, Garbage Collection. Constructor- types of constructors, this keyword, super keyword. Method overloading and Constructor overloading. Aggregation vs Inheritance, Inheritance: extends vs implements, types of Inheritance, Interface, Up-Casting, Down-Casting, Auto-Boxing, Enumerations, Polymorphism, Method Overriding and restrictions. Package: Pre-defined packages and Custom packages.

Unit-III:

Arrays: Creating & Using Arrays (1D, 2D, 3D and Jagged Array), Array of Object, Referencing Arrays Dynamically. Strings and I/O: Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability& Equality, Passing Strings To & From Methods, StringBuffer Classes and StringBuilder Classes. IO package: Understanding StreamsFile class and its methods, Creating, Reading, Writing using classes: Byte and

Character streams, FileOutputStream, FileInputStream, FileWriter, FileReader, InputStreamReader, PrintStream, PrintWriter. Compressing and Uncompressing File.

Unit-IV:

Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

Text Book:

E. Balagurusamy, "Programming with Java", TMH, 4/Ed

Reference Book:

Herbert Schildt, "The Complete Reference to Java", TMH, 10/Ed.

Core XIII- Lab: Programming in Java

1. To find the sum of any number of integers entered as command line arguments.
2. To find the factorial of a given number.
3. To convert a decimal to binary number.
4. To check if a number is prime or not, by taking the number as input from the keyboard.
5. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument.
6. Write a program that show working of different functions of String and StringBufferclasss like setCharAt( ), setLength( ), append( ), insert( ), concat( )and equals( ).
7. Write a program to create a – "distance" class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
8. Modify the – "distance" class by creating constructor for assigning values (feetandinches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
9. Write a program to show that during function overloading, if no matching argument is found, then Java will apply automatic type conversions (from lower to higher data type).
10. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword.

11. Write a program to show the use of static functions and to pass variable length arguments in a function.
12. Write a program to demonstrate the concept of boxing and unboxing.
13. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
14. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.
15. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
16. Write a program – "DivideByZero" that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
17. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
18. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
19. Write a program to demonstrate priorities among multiple threads.
20. Write a program to demonstrate different mouse handling events like mouseClicked( ), mouseEntered( ), mouseExited( ), mousePressed( ), mouseReleased( ) & mouseDragged( ).
21. Write a program to demonstrate different keyboard handling events.

4TH SEMESTER BSc. CS(H)			
	SUB CODE		**SUB NAME**
MAJOR	CORE-I	PAPER-8	Web Technologies
	CORE-I	PAPER-9	OOP Using C++
	CORE-I	PAPER-10	Computer Network
MINOR	CORE-III	PAPER-2	Mechanics
	INTERNSHIP		

Core VIII

Web Technologies

Course Objectives:

- To understand the essentials of Web Technologies.
- To understand frontend (HTML, CSS, JavaScript) and backend Technologies (PHP) for developing Web Sites.

Learning Outcomes:
Upon completion of this course, students will be able to:

1. Learn the basics of Internet protocols and HTML
2. Learn the use of CSS
3. Learn the use of Java Scripts
4. Learn the use of PHP and design a Website

Unit-I:

Introduction to the Internet, Internet Protocols, World Wide Web (WWW): Introduction, History, HTTP and HTTP methods, Web Browser, Web Server and their examples, Web page, working principles of WWW. Web Development: Introduction, Front-end and Backend Development Technologies. Concepts of Client-Server communication.
HTML: Introduction, characteristics, basic structure of an HTML document, understanding basic HTML tags and attributes, creating an HTML document. Working with tags for text-formatting, lists, hyperlink, images, tables, frames, multimedia. HTML forms and its basic elements.

Unit-II:
Cascading Style Sheets (CSS): Introduction, Benefits of using CSS, Understanding the Syntax, CSS Selectors, Using CSS: External, Internal Inline CSS. Comments in CSS. Basic CSS Properties: Color, Background, Text, Font, List, Table, Display.
CSS Box Model: Introduction, working with Margin, Border, and Padding. Pseudo-class & element, working with block elements, Scrolling text, Navigation Bar and Drop Downs.

Unit-III:

JavaScripts: Introduction, Features, Benefits, Creating Simple JavaScript. Using JavaScript in HTML. Exploring Popup Boxes: alert, confirm, prompt box. Displaying outputs in JavaScript. Programming using JavaScript: Data types, Variables, Operators, Expressions (Arithmetic, String, Logical), Comments. Control Statements: Conditional, Looping and Jump Statements. Functions (built-in & user defined) and their usage. Working with Array and Date Objects. Introduction to DOM, Event handling and Form validation in JavaScript.

Unit-IV:

PHP: Features, Print/echo statement, Data Types, Variables, Constants, Strings, Arrays, Operators. Control Structures: Conditional, Looping & Jump Statements. Brief overview of Arrays, Functions: String, Date-Time, Mathematical and User-defined functions.
Embedding PHP in HTML, Reading Form data of a Web Page. Introduction to PHP with Database: Connecting to Database, Creating Table, inserting records, modifying data and retrieving data and displaying in HTML.

Text Book:
> *Web Technologies (Black Book), DreamTech Press*

Reference Books:

- ✓ *Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP 4th Edition by Ivan Bayross.*
- ✓ *HTML, XHTML and CSS Bible, 5ed, Willey India-Steven M. Schafer.*

Core VIII- Lab: Web Technologies

1. Create a Web Page to display "Hello HTML".
   - Display the same using different headings: h1 to h6
   - Apply bold, italic formats
   - Change text color, background of the page

2. Create a Web Page to display the list of Fruits using both ordered and unordered list. Recreate the lists using images of the same items.
3. Use the web page created in Question Number 2. When the user clicks on the image of a Fruit, it should open a new page that contains an image of the Fruit along with its benefits (use multiple paragraphs, and make sure the image is aligned properly).
4. Create a web page that displays details of the Fruits in Tabular format. Use serial no., name, color, taste, price/kg.
5. Create a Web Page that displays a video file (record/create a video of your own).
   - Apply various controls such as paly, pause, volume.
   - Apply autoplay, muted and both.
   - Display a Youtube Video in your Web Page.

6. Design a Student registration form to collect various data about a Student which includes Name, Age, Gender (M, F, O), Mobile No., Email ID, Stream (Science/Arts/Commerce in drop-drown), Choice for participating in NCC, NSS, YRC (use check box), and two buttons for reset and submit respectively. Display the form at the center of the page with proper alignment of each item in the form.
7. Use the web page created in Question no. 4. Use CSS and apply various styling to the text, colors to each row of the table, styling to borders and background color of the table.
8. Create a Web page with a Horizontal Navigation bar containing four items such as Home, College, Students, Teachers. The first item should be active, by default. The background color of the item changes when the user moves the mouse over it.
9. Create a Web Page that asks the user to enter the number of Students, and then iteratively ask the details of each Student and display them in a list, using JavaScript.
10. Modify the above program (Q. 9) to display the details in a tabular format, dynamically using JavaScript.
11. Create a Web Page with two text fields and four buttons to perform arithmetic operations such as Addition, Subtraction, Multiplication and Division. The user has to enter numbers in the text fields and press any of the above buttons. The JavaScript progrm shoud perform corresponding operations and display the result in the same page. [NOTE: Use different functions for each operation]
12. Use JavaScript and validate the form data in the Student registration Page (created in Q. no. 6). When the user clicks the Submit button, the program has to validate that every field contains valid data. [NOTE: validate name, age, gender, email, mobile number]
13. Write a PHP program that asks the user to enter a number and finds the factorial of it.
14. Write a PHP program that creates a Table in a database with a number of columns as determined by the fields in the Student registration form created above.
15. Write a PHP program to store the data of the Student registration form in a Database.
16. Write a PHP program that asks the user to enter a Student name and display the Student details retrieved from the database in the same page.
17. Students are required to combine the Student Registration form, and PHP program (s) [which interact with Database] to see the dynamic updation of the Student registration data in the Database when a new Student is registered.

Core-IX   Object Oriented Programming using C++

Course Objectives:

- To know about the Object-Oriented Programming concepts.
- To write object-oriented programs using C++ constructs

Learning Outcomes:
Upon completion of this course, students will be able to:
- Understand OOPs concepts as a programming style
- Use class/objects in programs and functions of different types
- Learn the concept of inheritance and overloading of functions and operators
- Use files in C++

Unit-I:

Principles of Object-Oriented Programming: Object-Oriented Programming (OOP) Paradigm, Basic Concepts of OOP, Benefits of OOP, Characteristics of OOPS, ObjectOriented Languages, Applications of OOP.
Introduction to C++, Difference between C & C++, Tokens, Data types, Operators, Structure of C++ Program, C++ statements, Expressions and Control Structures.
Functions in C++: Argument passing in function, Inline Functions, DefaultArguments, Const. Arguments, Friend function.

Unit-II:

Classes and Objects: Defining Member Functions, Making an outside Function Inline, Nested Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions.
Constructors & Destructors: Constructors, Parameterized Constructors, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructors, Destructors.

Unit-III:

Inheritance: Basics of Inheritance, Type of Inheritance, Virtual Base Classes, Abstract Classes, Member Classes, Nesting of Classes. Polymorphism: Pointers, Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions, Function Overloading, Operator Overloading.

Unit-IV:

Managing Console I/O Operations: C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators.

Files: Classes for File Stream Operations, Opening and Closing a File, Detecting end-of-file, File Modes, File Pointers and their Manipulations, Sequential Input and OutputOperations, Updating a File: Random Access, Error Handling during File Operations, Command-line Arguments.

Text Books:

- ✓ *E. Balgurusawmy, Object Oriented Programming with C++, 4/e (TMH).*
- ✓ *Paul Deitel, Harvey Deitel, "C++: How to Program", 9/e. Prentice Hall.*

Reference Books:

- ✓ *Bjarne Stroustroup, Programming - Principles and Practice using C++, 2/e, Addison-Wesley*
- ✓ *Herbtz Schildt, C++: The Complete reference, McGrawHill.*

Core IX- Lab: Programming using C++

1. Write a Program for Swapping of two numbers.
2. Write a Program to find sum of four numbers using default argument passing.
3. Write a Program to find square and cube of a number using inline function.
4. Write a Program to find the factorial of a number.
5. Write a Program to find reverse of a number.
6. Write a program to find sum of four numbers using default argument passing inmember function.
7. Write a Program to find area of circle, triangle and rectangle using functionoverloading.
8. Write a program to distinguish the properties of static and non-static ata members.
9. Write a program to show the method of accessing static private member function.
10. Write a program to show the ways of calling constructors and destructors.
11. Write a program to perform ++ operator overloading using member function.
12. Write a program to perform ++ operator overloading using friend function.
13. Write a program to perform + operator overloading for two complex number addition.
14. Write a program to perform + operator overloading for string concatenation.
15. Write a program to perform single inheritance.
16. Write a program to perform multiple inheritance.
17. Write a program to create an integer array using new operator and find the sum andaverage of array elements.
18. Write a program to implement virtual destructor.

19. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
20. Write a program to Copy the contents of one file to other.

Core-X   **Computer Network**

Course Objectives:
- To understand data communication and network concepts.
- To learn about different communication standards
- To understand different network protocols

Learning Outcomes:

Upon completion of this course, students will be able to:
- Understand concepts on data communication and the use of communication devices
- Learn about analog and digital signals and basic components of data communication
- Learn about errors during data communication & access control mechanisms
- Learn various network protocols and network security issues

Unit-I:

Introduction to Data Communications and Network Models: Protocols and Standards, Layers in OSI Models, Analog and Digital Signals, Transmission Modes, Transmission Impairment, Data Rate Limits, Performance, Digital Transmission, Network Devices & Drivers: Router, Modem, Repeater, Hub, Switch, Bridge (fundamental concepts only).

Unit-II:

Signal Conversion: Digital-to-Digital Conversion, Analog-to-Digital Conversion, Digital-to-analog Conversion, Analog-to-Analog Conversion. Transmission Media: Guided Media, Unguided Media, Switching Techniques: Packet Switching, Circuit Switching, Datagram Networks, Virtual-Circuit Networks, and Structure of a Switch.

Unit-III:

Error Detection and Correction: Checksum, CRC, Data Link Control: Framing, Flow and Error Control, Noiseless Channels, Noisy channels, (Stop and Wait ARQ, Sliding Window Protocol, Go Back N, Selective Repeat) HDLC, Point-to-Point Protocol. Access Control: TDM, CSMA/CD, and Channelization (FDMA, TDMA, and CDMA).

Unit-IV:

Network Layer: Logical Addressing, IPv4 Addresses, IPv6 Addresses, Virtual-Circuit Networks: Frame Relay and ATM, Transport Layer: Process-Process Delivery: UDP, TCP. Application layers: DNS, SMTP, POP, FTP, HTTP, Basics of WiFi (Fundamental concepts only), Network Security: Authentication, Basics of Public Key and Private Key, Digital Signatures and Certificates (Fundamental concepts only).

Text Book:
- ✓ *Data Communications and Networking, Fourth Edition by Behrouza A. Forouzan, TMH.*

Reference Book:
- ✓ *Computer Networks, A. S. Tanenbaum, 4th edition, Pearson Education.*

Core X- Lab: Computer Network

1. Use the *ipconfig* (Windows) or *ifconfig* (Linux/Mac) command to display the current network configuration.
    i. Identify and document the IP address, subnet mask, and default gateway of the system.
    ii. Change the IP address of the system using *netsh* (Windows) or *ifconfig* (Linux/Mac). Verify the change using the same command.
    iii. Experiment by configuring static IP, dynamic IP.
2. Use the *ping* command
    i. to check connectivity between Systems in your Lab.
    ii. to a remote server (e.g., google.com).
    iii. Analyze the round-trip time and packet loss.
3. Use the *tracert* (Windows) or *traceroute* (Linux/Mac) command to trace the path to a remote server. Document the intermediate hops and their IP addresses.
4. Use the *netstat* command to display active connections, listening ports, and network statistics.
    i. Document and explain the various parameters and their significance.
    ii. Use *netstat -r* or *route* to display the routing table of your system. Identify the default gateway and other routes.
5. Use the *arp -a* command to display the ARP table of your system.
    i. Identify the MAC addresses corresponding to different IP addresses.
    ii. Clear the ARP cache using *arp -d* and verify the cache is cleared. Re-populate the ARP table by pinging different hosts on the network and verify the entries.
6. Use the *nslookup* command to query the DNS records of a domain (e.g., google.com).
    i. Identify and document the IP addresses associated with the domain.
    ii. Use the *dig* command (Linux/Mac) for a more detailed DNS query and compare the output with *nslookup*
7. Use the *nmcli* command (Linux) or *netsh wlan show networks* (On Windows) to scan for available Wi-Fi networks and connect to a specified network. Document the steps and verify the connection.
8. Use the *tcpdump* command (Linux) or *Wireshark* to capture network packets.
    i. Capture and analyze traffic for a specific protocol (e.g., HTTP) and identify key details like source and destination IPs, ports, and packet content.
    ii. Filter captured packets to display only traffic to/from a specific IP address or port using *tcpdump* for Wireshark filters.
9. Use the *nmap* command to perform a network scan of your local network.
    i. Identify active hosts, open ports, and running services.
    ii. Perform a more detailed scan with service/version detection using *nmap -sV* and analyze the results.
10. Use the *iptables* command (Linux) to set up basic firewall rules. On Windows, use *netsh advfirewall.*Block all incoming traffic except for SSH and HTTP, and verify the rules are working.
11. Use the *route* command to add a static route to a specific network.
    i. Verify the route using *route -n* (Linux) or *route print* (Windows).

ii.   Set up IP forwarding on a Linux system using ***sysctl*** to enable packet forwarding. Test the configuration by pinging through the system acting as a router.

6TH SEMESTER BSc. CS(H)			
	SUB CODE		**SUB NAME**
MAJOR	CORE-I	PAPER-14	Algorithm Design Techniques
	CORE-I	PAPER-15	Project Work-I
MINOR	CORE-III	PAPER-3	Electricity & Magnetism
SEC	PAPER-3		
VAC	PAPER-4		

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Semester- VI

Core XIV   **Algorithm Design Techniques**

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Course Objectives:

- To understand the importance of algorithm design.
- To learn ways to analyze algorithms
- To learn about adoption of different algorithmic styles for solving different types of problems

Learning Outcomes:
Upon completion of this course, students will be able to:
- Learn approaches to algorithm analysis & design
- Learn different searching and sorting techniques
- Learn greedy techniques for problem-solving
- Learn graph-based techniques for practical problem-solving

Unit-I:

Algorithm specification: Pseudo code, Asymptomatic Analysis, Space complexity and time complexity, Analysis and design of Insertion sort algorithm, Divide and Conquer paradigm, Recurrence relations, Solving Recurrences: Substitution methods, Recursion tree method, and Master method.

Unit-II:

Searching and Sorting: Analysis of Linear Search, Binary Search, Merge Sort and Quick Sort, Heap Sort. Hashing: Hash functions, Hash table, Collision resolution: Chaining and Open Addressing (Linear probing, Quadratic probing, Double hashing).

Unit-III:

Greedy Technique: General Method, Applications: Fractional Knapsack Problem, Job Sequencing with Deadlines, Huffman Codes.
Dynamic Programming: General Method, Applications: Matrix Chain Multiplication, longest common subsequence, 0/1 Knapsack.

Unit-IV:

Graph Algorithms, Topological sort, Minimum Spanning Trees: Prim's and Kruskal's algorithm, Single-source shortest paths: Bellman-Ford algorithm, Dijkstra's algorithm.

Text Book:

- ✓ *Introduction to Algorithms, by Thomas H, Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI.*
- ✓ *Fundamentals of Computer Algorithms. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, University Press*

Reference Book:

Algorithm Design, by Jon Kleinberg, Eva Tardos.

Core XIV- Lab: Algorithm Design Techniques

1.   Write C / C++ Program to implement Insertion Sort

2.   Write C / C++ Program to implement Merge Sort

3.   Write C / C++ Program to implement Quick Sort

4.   Write C / C++ Program to implement Heap Sort

5.   Write C / C++ Program to implement Hashing

6.   Write C / C++ Program to implement Fractional Knapsack

7.   Write C / C++ Program to implement Matrix Chain Multiplication

8.   Write C / C++ Program to implement Longest Common Subsequence

9.   Write C / C++ Program to implement Prim's Algorithm

10.   Write C / C++ Program to implement Krushkal's Algorithm

11.   Write C / C++ Program to implement Dijkstra's Algorithm

Core - XV   **Project Work-I**

A student has to do a Project work under the guidance of a faculty member. After completing the project, the student has to submit a project report which has to be evaluated by an external examiner. The model template for the project report can be as follows:

1. Title of the project
2. Declaration (by the student)
3. Certificate (of the project guide)
4. Acknowledgement
5. Abstract
   [Provide a brief summary of your project, including its objectives, methods, and key findings.]
6. Table of Contents
   Introduction
   Literature Review
   Methodology
   Results
   Discussion
   Conclusion
   References
7. Introduction
   [Describe the background and context of your project, including the problem statement and objectives.]
8. Literature Review
   [Review relevant literature related to your project, discussing previous research, theories, and concepts.]
9. Methodology/
   [Explain the methods you used to conduct your research or project, including data collection, analysis techniques, and any tools or software used.]
10. Implementation/Software development
11. Results
    [Present the findings of your research or project, using tables, figures, or graphs as needed to illustrate key points.]
12. Discussion
    [Interpret your results and discuss their implications, relating them back to your research objectives and the broader context of your field.]
13. Conclusion
    [Summarize the main findings of your project and their significance, as well as any recommendations for future research or applications.]
14. References
    [List all sources cited in your project using a consistent citation style (e.g., APA, MLA).]

The evaluation pattern of the project will be as follows:
   i.   Problem formulation and definition
   ii. Execution of code & results
   iii. Documentation
   iv. Clarity in presentation
   v.   Performance in the Viva voce

UTKAL UNIVERSITY

VANI VIHAR, BHUBANESWAR - 751004

B.Sc. Data Science
B.Sc. (Honours)

COMMON SYLLABUS FOR B.Sc. DATA SCIENCE

B. Sc. (Honours) Data Science (CBCS)

PREAMBLE

Information and Communication Technology (ICT) has today become integral part of all industry domains as well as fields of academics and research. The industry requirements and technologies have been steadily and rapidly advancing. Organizations are increasingly opting for open source systems. The students too these days are thinking beyond career in the industry and aiming for research opportunities. A genuine attempt has been made while designing the new syllabus for this 3-year B.Sc. Data Science (H) course. Not only does it prepare the students for a career in Software industry, it also motivates them towards further studies and research opportunities. The core philosophy of overall syllabus is to:

a.   Form strong foundation of Data science,

b.   Introduce emerging trends to the students in gradual way,

c.   Groom the students for the challenges of ICT industry

The Government of Odisha has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of the State of Odisha in line with the University Grants Commission (UGC). The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching- learning process, examination and evaluation systems, besides governance and other matters.

The Government of Odisha has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Universities & Colleges in Odisha in line with UGC. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system. However, due to lot of diversity in the system of higher education, there are multiple approaches followed by universities towards examination, evaluation and grading system. While the Universities and Colleges must have the flexibility and freedom in designing the examination and evaluation methods that best fits the curriculum, syllabi and teaching–learning methods, there is a need to devise a sensible system for awarding the grades based

on the performance of students. Presently the performance of the students is reported using the conventional system of marks secured in the examinations or grades or both. The conversion from marks to letter grades and the letter grades used vary widely across the Universities and Colleges in the states as well as the country. This creates difficulty for the academia and the employers to understand and infer the performance of the students graduating from different universities and colleges based on grades.

The grading system is considered to be better than the conventional marks system and hence it has been followed in the top institutions in India and abroad. So, it is desirable to introduce uniform grading system. This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students. To bring in the desired uniformity, in grading system and method for computing the cumulative grade point average (CGPA) based on the performance of students in the examinations, the UGC has formulated these guidelines, which is being adopted by the state of Odisha.

CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in Odisha. This will benefit the students to move across institutions within Odisha to begin with and across states and countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

PROGRAMME LEARNING OUTCOMES

The Bachelor of Science Honours in Data Science (B.Sc. (Hons) in DS) programme enables students to attain, by the time of graduation:

❖ Demonstrate the aptitude of Computer Programming and Computer based problem solving skills.

❖ Display the knowledge of appropriate theory, practices and tools for the specification, design, and implementation.

❖ Display ethical code of conduct in usage of Internet and Cyber systems.

❖ Ability to pursue higher studies of specialization and to take up technical employment.

❖ Ability to formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate.

❖ Ability to operate, manages, deploy, and configure Computer Network, Hardware, and Software operation of an organization.

  Ability to appreciate emerging technologies and tools.

❖ Apply standard Software Engineering practices and strategies in real-time Software Project Development.

❖ Design and develop computer programs/computer-based systems in the areas related to Algorithms, Networking, Web Design, Cloud Computing, IoT and Data Analytics.

❖ Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems.

❖ The ability to work independently on a substantial software project and as an effective team member.

OUTLINE OF CHOICE BASED CREDIT SYSTEM

1.   **Core Course**: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2.   **Elective Course**: Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

Dissertation/Project: An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.

Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.

P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

3. **Ability Enhancement Courses (AEC)/Competency Improvement Courses/Skill Development Courses/Foundation Course**: They ((i) Environmental Science, (ii) English/MIL Communication) are mandatory for all disciplines. AEC courses are value-based and/or skill- based and are aimed at providing hands-on-training, competencies, skills, etc.

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.

GUIDELINES FOR PROJECT FORMULATION

As the project work constitutes a major component in most of the professional programs and it is to be carried out with due care and should be executed with seriousness by the candidates.

TYPE OF PROJECT

As majority of the students are expected to work out a real-life project in some industry/research and development laboratories/educational institutions/software companies, it is suggested that the project is to be chosen which should have some direct relevance in day-to-day activities of the candidates in his/her institution. It is not mandatory for a student to work on a real-life project. The student can formulate a project problem with the help of Guide.

PROJECT PROPOSAL (SYNOPSIS)

The project proposal should be prepared in consultation with the guide. The project proposal should clearly state the project objectives and the environment of the proposed project to be undertaken. The project work should compulsorily include extraction, manipulation and screening, data visualization, modeling, analysis and interpretation. It can also include recommendations as well as limitations of study. The project proposal should contain complete details in the following form:

I. Title of the Project

II. Introduction and Formulation of the problem

III. Review of literature and identification of the study gap

IV. Research questions and Objectives

V. Research Hypothesis

VI. Methodology and Data Source

VII. Statistical tools and techniques used

VIII. Analysis, Interpretation and model development

IX. Limitations and suggestions

X. Conclusion

XI. References

B. Sc. (Honors) Data Science (CBCS)

SEMESTER	COURSE OPTED	COURSE NAME	CREDITS
I	Ability Enhancement Course-1	AECC-1: Environmental Studies & Disaster Management	4
	Core Course-1	Basic Statistics for Data Science	4
	Core Course-1 Practical	Basic Statistics for Data Science LAB	2
	Core Course-2	Introduction to Programming & Web Technology	4
	Core Course-2 Practical	Introduction to Programming & Web Technology Lab	2
	Generic Elective-1	GE-1: Linear Algebra and Calculus	4
	Generic Elective-1 Practical	GE-1 Lab	2
II	Ability Enhancement Course-2	AEC-2 (English Communication/MIL)	4
	Core Course-3	Programming using R	4
	Core Course-3 Practical	Programming using R LAB	2
	Core Course-4	Probability and Distributions	4
	Core Course-4 Practical	Probability and Distributions Lab	2
	Generic Elective-2	Data Structure and Algorithms	4
	Generic Elective-2 Practical	Database Management and Data Structure Lab (SQL and PL/SQL Lab)	2
	AECC/EV-I	Microeconomics / Principles of Management	1
III	Core Course-5	Data Warehousing	4
	Core Course-5 Practical	Data Warehousing Lab	2
	Core Course-6	Optimization Techniques	4
	Core Course-6 Practical	Optimization Techniques Lab	2
	Core Course-7	Data Science Using Python	4
	Core Course-7 Practical	Data Science Using Python LAB	2
	Skill Enhancement Course-1	Digital System Design	4
	Generic Elective-3	Big Data Analysis	4
	General Elective-3 Practical	Big Data Analysis Lab	2
	AECC/EV-I	Database Management Systems	1
IV	Core Course-8	Numerical Methods and Statistical Inference	4
	Core Course-8 Practical	MATLAB Programming	2
	Core Course-9	Artificial Intelligence	4
	Core Course-9 Practical	Artificial Intelligence LAB	2
	Core Course-10	Cloud Computing	4
	Core Course-10 Practical	Cloud Computing LAB	2
	Skill Enhancement Course-2	Data Visualization with Power BI / Tableau	4
	Generic Elective-4	Data Mining	4
	General Elective-4 Practical	Data Mining Lab	2
	AECC/EV-I	Business Research Methods	1
V	Core Course-11	Machine Learning	4
	Core Course-11 Practical	Machine Learning LAB	2
	Core Course-12	Internet of Things	4
	Core Course-12 Practical	Internet of Things Lab	2
	Discipline Specific Elective-1	Time Series Analysis and Business Forecasting	4

	Discipline Specific Elective-1 Practical	Business Forecasting Lab	2
	Discipline Specific Elective-2	Applied Regression Analysis	4
	Discipline Specific Elective-2 Practical	Applied Regression Analysis Lab	2
	AECC/EV-I	Robotic Process Automation	1
VI	Core Course-13	Reinforcement Learning	4
	Core Course-13 Practical	Reinforcement Learning LAB	2
	Core Course-14	Social Media Analytics and Knowledge Management	4
	Core Course-14 Practical	Social Media Analytics and Knowledge Management LAB	2
	Discipline Specific Elective-3	Deep Learning and Natural Language Processing	4
	Discipline Specific Elective-3 Practical	Deep Learning and Natural Language Processing Lab	2
	Discipline Specific Elective-4	Project Work	6
	Discipline Specific Elective-4 Practical	Data Security and Compliance	1

CORE PAPERS (Credits: 06 Each)

CORE – 1: Basic Statistics for Data Science

CORE – 2: Introduction to Programming & Web Technology

CORE – 3: Programming using R

CORE – 4: Probability and Distributions

CORE – 5: Data Warehousing

CORE – 6: Optimization Techniques

CORE – 7: Data Science Using Python

CORE – 8: Numerical Methods and Statistical Inference

CORE – 9: Artificial Intelligence

CORE – 10: Cloud Computing

CORE – 11: Machine Learning

CORE – 12: Internet of Things

CORE – 13: Reinforcement Learning

CORE – 14: Social Media Analytics and Knowledge Management

DISCIPLINE SPECIFIC ELECTIVES (DSE) PAPERS
(Credits: 06 Each)

DSE–1: Time Series Analysis and Business Forecasting

DSE–2: Applied Regression Analysis

DSE–3: Deep Learning and Natural Language Processing

DSE–4: Project Work

SKILL ENHANCEMENT COURSES (SEC)

SEC – 1: Digital System Design
SEC – 2: Data Visualisation with Power BI / Tableau

ABILITY ENHANCEMENT COURSES (AEC)

AEC– 1: Environmental Studies & Disaster Management
AEC – 2: English Communication/MIL.

GENERIC ELECTIVE (GE): (Credit: 06 each)

Papers offered by Computer Science/IT Departments for other disciplines. It is recommended that the other departments must offer the following papers as GE.
GE – 1: Linear Algebra and Calculus
GE – 2: Data Structure and Algorithms
GE – 3: Big Data Analysis
GE – 4: Data Mining
However, the students from **Data Science** discipline shall choose **four papers of anyone discipline** as their GE papers from the following list**.**

GE-1:	GE-2:
Mathematics–1 Physics–1 Statistics–1 Electronics –1	Mathematics–2 Physics–2 Statistics–2 Electronics –2
GE-3:	**GE-4:**
Mathematics–3 Physics–3 Statistics–3 Electronics –3	Mathematics–4 Physics–4 Statistics–4 Electronics –4

SEMESTER - I

SEMESTER-I
ENVIRONMENTAL STUDIES & DISASTER MANAGEMENT (AECC I)
FOR UNDER-GRADUATE COURSES ARTS, SCIENCE AND COMMERCE (2021-22)
FULL MARK-100 (Credit - 4)

Course Objectives:

The following objectives have been framed for the proposed curriculum to:

1. Find out solutions for a sustainable Earth for future generation
2. Make the stakeholders aware of their rights, responsibilities, consequences of their conduct towards nature and build resilience
3. Develop a sense of equitable use of resources and their preservation for the future generation
4. Sensitize the stakeholders on Disaster and Pandemic preparedness

Learning Outcomes:

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

1. Identify the historical origins of destructive attitudes and practices toward the natural environment;
2. Know the compatibility of human and environmental/ecological values
3. Know the natural resources available on earth and how to conserve and manage them
4. Understand the disasters and pandemic they are facing and empower the new generation to face the new challenges

Pedagogy/Teaching Transaction

1. Classroom teaching
2. Self-Study
3. E-Learning
4. Guest Lectures
5. Case Study Analysis and Discussion
6. Field Trip/Visit
7. Seminars
8. Audio, Video, Film Based Discussion/Analysis
9. Group Exercises
10. Group Discussions

Detailed Syllabus

UNIT - I

1. Environment (13 periods x 45 min)

The Environment: The Atmosphere, Lithosphere, Hydrosphere, Biosphere (01 period)

Ecosystem: Energy flow in the ecosystem (01 period)

Biogeochemical Cycle: Water Cycle, Carbon Cycle, Nitrogen Cycle (02 periods)

Pollution: Water Pollution, Air Pollution, Soil Pollution, Radiation Pollution, Industrial Pollution, Light Pollution, Sound Pollution (05 periods)

Environmental Laws (Water Act 1974, Air Act 1981, The Wildlife Protection Act 1972, The Environment Protection Act 1986), The Forest Conservation Act 1980 (04 periods)

UNIT – II

2. Climate Change & Sustainable Development (13 periodsx45 min)

Population Ecology: Individuals, Species, Population, Community (01 period)

Human Population Growth, Population Control Methods (01 period) Urbanization and its effect on society (01 period)

Climate Change. Causes, effect, Global Warming. Carbon footprint and Environmental protection (05 periods) Steps taken towards sustainable development: Ban of single use plastics, Automobile Scrapping Policy, Promotion of Electrical Vehicles (03 periods)

Brief idea on Sustainable Development Goals (SDGs), Agenda 21 of Rio Earth Summit (02 periods)

UNIT - III

3. Disaster Management (13 periods x 45 min)

Disaster Management: Types of disasters (Natural and Man-made) and their causes and effect) (02 periods)

Vulnerability Assessment and Risk Analysis: Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves and Lightning) (02 periods)

Institutional Framework: Institutional arrangements for disaster management (National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), District Disaster Management Authority (DDMA), National Disaster Response Force (NDRF) and Odisha Disaster Rapid Action Force (ODRAF) (02 periods)

Preparedness Measures: Disaster Management Cycle, Early Warning System, Pre-Disaster and Post-Disaster Preparedness, Strengthening of SDMA and DDMA, Community Preparedness, Stakeholder participation, Corporate Social Responsibility (CSR) (05 periods)

Survival Skills: Survival skills adopted during and after disaster (Flood, Fire, Cyclone and Lightening) (02 periods)

UNIT - IV

4. Public Health Management (13 periods x 45min)

Brief idea on Epidemics and Pandemics (01 period)

Non-communicable diseases with special reference to Cardiovascular diseases, Cancer, Diabetes, Hypertension and Obesity and their Prevention (02 periods)

Communicable diseases with special reference to Covid-19, Flu, Hepatitis, AIDS and Tuberculosis and their transmission (02 periods)

Dynamics of Disease Transmission: Mode of transmission (Direct/Indirect), Events after infection: Immunity (Active vs Passive. Innate vs Acquired, Herd Immunity), Incubation Period (02 periods)

Prevention of Epidemics/Pandemics Diseases: Preventing Measures (Quarantine, Sanitization, Personal Protective measures such as Hand washing and use of protective devices, Vaccination); Control Measures (Surveillance, Isolation, Contact Tracing) (03 Periods)

Life Style management (Diet, Physical Exercise, Yoga and sleeping habit) (02 periods)

Role of Different Sectors in Managing Health Disaster: Role of Government (Centre and State), Community, Civil Society, Student mass, NGOs (01 period)

Books Recommended:

1. Asthana DK and Asthana M: A Text Book of Environmental Studies, S. Chand, New Delhi
2. Bharucha E: A Text Book of Environmental Studies, New Delhi: UGC
3. Dash MC and Mishra PC: Man and Environment, McMillan, London
4. Disaster Management and Mitigation Plan,2013 of Dept. of Health & Family Welfare, Govt. of Odisha
5. Mishra DD: Fundamental Concepts in Environmental Studies, S. Chand, New Delhi
6. National Policy on Disaster Management,2009* 7. National Disaster Management Plan, 2019
7. Odum EP: Fundamentals of Ecology, Natraj Publications
8. State Disaster Management Plan, 2019 of Government of Odisha
9. Standard Operating Procedure (SOP) issued by Govt. of India and Govt. of Odisha on Public Health Managements in the websites: www.mohfw.gov.in and health.odisha.gov.in*
10. The Disaster Management Act, 2005 of Government of India"

[Note: Star (*) marked References, published by the State as well as Central Government are available in the open sources]

CORE–1: Basic Statistics for Data Science

UNIT - I

1. Introduction to Statistics and Use in Business:

a)   Meaning of Statistics as a Science, Importance of Statistics,

b)   Scope of Statistics: In the field of Industry, Biological Sciences, Medical Sciences, Economics Sciences, Social, Sciences, Management Sciences, Agriculture, Insurance, Information Technology, Education and Psychology.

2. Types of Data and Data Condensation:

a)   Method of sampling: Concept of population and sample. Finite, Infinite population, Notion of SRS, SRSWOR and SRSWR

b)   Types of Characteristics, Different types of scales: nominal, ordinal, interval and ratio scale. Linear and circular scale.

c)   Types of Data: Primary data, Secondary data, Collection of data and concept of a questionnaire and a schedule, Cross-sectional data, time series data, failure data, industrial data, and directional data.

d)   Tabulation.

e)   Dichotomous classification - for two and three attributes, Verification for consistency.

f)   Association of attributes: Yule's coefficient of association Q. Yule's coefficient of Colligation,

g)   Notion of a statistical population: Finite population infinite population, homogeneous population and heterogeneous population. Notion of sample, random sample and non-random sample.

UNIT - II

3. Presentation of Data

a)   Univariate frequency distribution of discrete and continuous variables. Cumulative frequency distribution and relative frequency distribution.

b)   Graphical representation of frequency distribution by Histogram, frequency polygon, Cumulative frequency curve. Stem and leaf diagram

c)   Check sheet, Pareto diagram

4. Measures of central tendencies

a)   Concept of central tendency of data. Requirements of good measure

b)   Locational averages: Median, Mode, and Partition Values: Quartiles, Deciles, and Percentiles, Box Plot, Percentile ranks

c)   Mathematical averages Arithmetic mean (Simple, weighted mean, combined

mean), Geometric mean, Harmonic mean

d)   Empirical relation between mean, median and mode

e)   Merits and demerits of using different measures & their applicability

f)   Partition Values: Quartiles, Deciles and Percentiles, Box Plot, Percentile ranks

UNIT - III

5. Measures of Dispersion, Skewness & Kurtosis

a)   Concept of dispersion. Requirements of good measure.

b)   Absolute and Relative measures of dispersion: Range, Quartile Deviation, Mean absolute deviation, Standard deviation.

c)   Variance and Combined variance, raw moments and central moments and relations between them. Their properties

d)   Concept of Skewness and Kurtosis: Measures of Skewness: Karl Pearson's, Bowley's and Coefficient of skewness based on moments. Measure of Kurtosis

6. Mean square deviation:

a)   Definition, minimality property of mean square deviation (with proof),

b)   Variance and standard deviation: Definition, merits and demerits, effect of change of origin and scale, combined variance (derivation for 2 groups), combined standard deviation, generalization for n-groups.

c)   Measures of dispersion for comparison: coefficient of range, coefficient of quartile deviation and coefficient of mean deviation, coefficient of variation (C.V.)

UNIT - IV

7. Correlation and regression analysis

a)   Scatter Diagram, Product moment correlation coefficient and it's properties. Spearman's Rank correlation. (With and without ties)

b)   Concept of linear regression. Principle of least squares. Fitting a straight line by method of least squares.

c)   Relation between regression coefficients and correlation coefficient.

d)   Fitting of curves reducible to linear form by transformation. Concept and use of coefficient of determination(R^2)

e)   Fitting a quadratic curve by method of least squares.

f)   Case study

References:

1.   Statistical Methods, An Introductory Text, Medhi J., New Age International Ltd.

2.   Basic Statistics, Agarwal B.L., New Age International Ltd.

3.   Theory and Problems of Statistics, Spiegel M.R., Tata Mc-Graw Hill.

4. Fundamentals of Statistics, Volume II, Goon A.M., Gupta M.K., Dasgupta B., The World Press Private Limited, Calcutta.

5. Complete Business statistics, Aczel Sounderpandian, Tata Mc-Graw Hill

6. Excel Data Analysis Modeling and simulation, Hector Gurrero, Springer, Second Edition

7. Data Analysis and Decision-Making Albright, Wilston, Zappe Thomson

List of Practical: (Can be done in MS-Excel-or any Spreadsheet)

1. **Introduction to Excel**
   a. Understanding Data Tools
   b. Understanding Formula Tools, insert functional library using insert function
   c. Add-Ins Analysis Tool packs
2. Using Formulae and Charts
   a. Formula writing, Functions, using Cell reference
   b. Understanding Insert Tool: Chart Tools, Different types of charts and their use
3. Data Entry and manipulation
   a. Tools for data entry and accuracy: Quick Access Tool bar customization, Form tool.
   b. Data Transposition to Fit Excel (as an Array).
   c. Data Conversion with the Logical IF, VLOOKUP, HLOOKUP. Pivot table, Pivot chart.
   d. Data Conversion of Text from Non–Excel Sources, Using Text to Column (From Data tool)
   e. Data Queries with Sort, Filter, and Advanced Filter Exact function data entry comparison
4. Data Validation
   a. Specifying a valid range of values for a cell
   b. Specifying a list of valid values for a cell
   c. Specifying custom validations based on formula for a cell
5. Measures of central tendency
   a. Calculating Mean, Median, Mode, Minimum, Maximum, range with cell reference
   b. Using Summary statistics
   c. Calculate A.M., G.M., H.M.
   d. State the Finding so fall above exercise.
6. Measures of Dispersion, Skewness & Kurtosis
   a. Calculate Range, Quartile Deviation, Mean absolute deviation, Standard deviation with cell reference
   b. Using summary statistics Measures of Skewness, Coefficient of skewness based on moments .Measure of Kurtosis.
   c. Graphical representation of Skewness.
   d. State the Finding of exercise.
7. Graphical Presentation with Excel -1
   a. Producing a Histogram
   b. Improving the Graph
   c. Producing a Cumulative Frequency Diagram
   d. Producing a Histogram of subgroups of data

8. Graphical Presentation with Excel–2
    a. Producing a bar chart of subgroups of data
    b. Pareto chart
    c. Combined variance (derivationfor2groups), combined standard deviation.
    d. Coefficient of variation (C.V.).
9. Correlation
    a. Use of formula for calculating correlation and Co-variance.
    b. Use of error checking (Using Exact (), IF)
    c. Use of frequently used financial functions (e.g.NPV) with suitable example of correlation.
    d. State the Finding so fall above exercise.
10. Regression analysis
    a. Using Summary statistics/Cross sectional Data: Descriptive Statistic
    b. Linear Regression and visual analysis (Chart)
    c. Multiple Regression equation with coefficient standard error and visual chart
    d. State the Finding so fall above exercise.

CORE – 2: Introduction to Programming & Web Technology

UNIT-I

Introduction to Python Language: Overview, Features of Python, Execution of a Python Program, Innards of Python, Frozen Binaries, Python Interpreter, Comparison of Python with C and Java, Installing Python, Writing & Executing, IDLE
Data Types, Variables and Other Basic Elements: Comments, Docstrings, Data types-Numeric, Compound, Boolean, Dictionary, Sets, Mapping, Basic Elements of Python, Variables
Input and Output Operations: Input Function, Output Statements, Command Line Arguments
Control Statements: Control Statements- Loop Statement, The else Suite, break Statement, continue Statement, pass Statement, assert Statement, return Statement

UNIT-II

Functions: Defining &Calling a Function, Returning Results, Returning Multiple Values, Built in Functions, Parameters and Arguments, Recursive Functions, Anonymous or Lambda Functions
Operators: Arithmetic operators, Assignment operators, Unary minus operator, Relational operators, Logical operators, Bitwise operators, Membership operators, Identity operators, Precedence of Operators, Associativity of Operators
Arrays: Creating Arrays, Indexing and Slicing, Basic Array Operations, Arrays Processing, Mathematical Operations on Array, Aliasing Arrays, Slicing and Indexing in NumPy Arrays, Basic Slicing. Advanced Indexing. Dimensions of Arrays, Attributes of an Array
Strings: Creating Strings, Functions of Strings, Working with Strings, Length of a String, Indexing & Slicing, Repeating & Concatenation of Strings, Checking Membership, Comparing Strings, Removing Spaces, Finding Substrings, Counting

Substrings, Strings are Immutable, Splitting and Joining Strings, Changing Case, Checking Starting and Ending of a String, Sorting & Searching in the Strings, Formatting the Strings, Working with Characters
Lists and Tuples: Lists, List Functions and Methods, List Operations, Tuples

UNIT-III

Web Essentials: Clients, Servers and Communication: The Internet –Basic Internet protocols–The WWW, HTTP request message –response message, web clients web servers – case study.
Introduction to HTML: HTML, HTML domains, basic structure of an HTML document–creating an HTML document, mark up tags, heading, paragraphs, line breaks, HTML tags. Elements of HTML, working with text, lists, tables and frames, working with hyperlink, images and multimedia, forms and controls.

Introduction to cascading style sheets: Concepts of CSS, creating style sheet, CSS properties, CSS styling (background, text format, controlling fonts), working with the block elements and objects. Working who lists and tables, CSS ID and class. Box model (introduction, border properties, padding properties, margin properties), CSS colour, groping, Dimensions, display, positioning, floating, align, pseudo class, Navigation bar, image sprites.

UNIT-IV

Java scripts: Client side scripting, what is java script, simple java script, variables, functions, conditions, loops and repetitions. Java scripts and objects, java script own objects, the DOM and web browser environment, forms and validations.
DHTML: Combining HTML, CSS, java scripts, events and buttons, controlling your browser.
1. Programming through Python, M. T. Savaliya, R. K Maurya, G.M Magar , Staredu Solutions 1st 2018
2. Python Data Science Handbook Jake Vander Plas O'Reilly Media 1st 2016
3. Let Us Python Y. Kanetkar, BPB 1st 2019
4. HTML 5 Step by Step Faithe Wempen Microsoft Press 2011
5. Web Design The Complete Reference Thomas Powell TMH 2009
6. Head First HTML 5 programming Eric Freeman O'Reilly 2013

List of Practical:
1. Write a Python program to explore various data types including numeric types, Boolean types and compound types.
2. Write a Python program to perform Input and Output Operations.
3. Write a Python program to demonstrate looping in python and use of break statement and continue statement
4. Write a Python program to define and use functions
5. Write a Python program to demonstrate the use of Built-in Functions.
6. Write a Python Program to implement Lambda Functions.
7. Write a Python Program to implement arrays for storing homogeneous data items. Apply indexing and slicing operations to access elements of array.
8. Write a Python Program to demonstrate operations and properties of string data types.
9. Write a Python Program implement and demonstrate the use of Membership operators and Identity operators
10. Write a Python Program to implement Numpy for handling multidimensional arrays.
11. Write a Python Program to create list, apply various functions to it.
12. Write a Python Program to demonstrate concept of aliasing and cloning.

13. Write a Python Program to implement tuples for storing data. Verify the immutability property on tuples.
14. Use of Basic Tags
15. Navigation, list and paragraph
16. Lists, images and semantics
17. CSS with list, link sand table
18. CSS with font, paragraph and types
19. Java Script: Validating User fields
20. JavaScript: Handling the events

GE-1: Linear Algebra and Calculus

COURSE OBJECTIVES:

This course introduces students to some basic mathematical ideas and tools which are at the core of any engineering course. A brief course in Linear Algebra familiarizes students with some basic techniques in matrix theory which are essential for analyzing linear systems. The calculus of functions of one or more variables taught in this course are useful in modelling and analyzing physical phenomena involving continuous change of variables or parameters and have applications across all branches.

COURSE OUTCOMES:

Upon completion of this course, the students should be able to:
1. Apply the Matrix Methods to solve the system of linear equations
2. Test the convergence and divergence of the infinite Series.
3. Determine the extreme values of functions of two variables.
4. Apply the vector differential operator to scalar and vector functions.
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.

UNIT-I

Rank of a matrix, Echelon form, consistency of linear System of equations, Linear dependence of vectors, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II

Vector spaces, subspaces, examples, algebra of subs paces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces. Linear transformations, null space, range, rank and nullity of a linear transformation.

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UNIT-III

Differential Calculus: Limits of function, continuous functions, properties of continuous functions, partial differentiation and total differentiation. Indeterminate forms: L-Hospital's rule, Leibnitz rule for successive differentiation. Euler's theorem on homogeneous functions. Maxima and minima of functions of one and two variables. Partial derivatives, transformations and Jacobians.

UNIT-IV

Integral Calculus: Review of integration and definite integral. Differentiation under integral sign, double integral, change of order of integration, transformation of variables. Beta and Gamma functions: properties and relationship between them.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2010.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, Reprint, 2017. 4. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCE BOOKS:

1. Sastry, S.S, —Engineering Mathematics, Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
2. Wylie, R.C. and Barrel, L.C., —Advanced Engineering Mathematics —Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

ETHICS AND VALUES

COURSE OBJECTIVES:

To enable the students to create an awareness on Engineering Ethics and Human Values, to instil Moral and Social Values and Loyalty and to appreciate the rights of others.

COURSE OUTCOMES:

Upon completion of this course, the students should be able to:
• After successful completion of the course, the student will be able to:
• Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

UNIT-I

HUMAN VALUES
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage –

Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT-II

ENGINEERING ETHICS
Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moraldilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest –Customs and Religion – Uses of Ethical Theories

UNIT-III

ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT-IV

SAFETY, RESPONSIBILITIES AND RIGHTS
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights(IPR) – Discrimination

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, NewDelhi, 2017.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics –Concepts and Cases", Cengage Learning, 2009
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003

SEMESTER - II

AECC-2 (English Communication/MIL)

Introduction:

The paper is focused upon developing one fundamental skills of Language learning; reading which needs a thorough rethink and revision. In order to build a strong base for acquisition of the communication skills, suitable reading content is selected from diverse areas in prose form. This would boost the learner's competence in expressive and comprehension skills. The well-researched language exercises in the form of usage, vocabulary and grammar is the other area that should attract the teacher and learner to work out for giving decent shape to the mastery of English language.

UNIT 1: Short Story

(i) Jim Corbett-The Fight between Leopards
(ii) Dash Benhur- The Bicycle
(iii) Dinanath Pathy- George V High School (iv)Alexander Baron- The Man who knew too much
(v) Will f Jenkins- Uneasy Homecoming

UNIT 2: Prose

(i) Mahatma Gandhi- The way to Equal Distribution
(ii) S Radhakrishnan- A Call to Youth
(iii) C V Raman-Water- The Elixir of Life
(iv) Harold Nicolson- An Educated Person
(v) Claire Needell Hollander- No Learning without Feeling

UNIT 3:
(i) Comprehension of a passage and answering the questions

UNIT 4:
(i) Language exercises-test of vocabulary, usage and grammar

Text Books

All Stories and Prose pieces

Reference Books

- The Widening Arc: A Selection of Prose and Stories, Ed. A R Parhi, S Deepika, P Jani, Kitab Bhavan, Bh ubaneswar.
- A Communicative Grammar of English, Geoffrey Leech.
- A University Grammar of English, Randolph Quirk and Sidney Greenbaum
- Developing Reading Skills. F. Grellet. Cambridge: Cambridge University Press, 1981.

UG Honours/Pass Syllabus in English

Scheme of examination

For Core English Honours Papers :CC & DSE

Midterm: 20 marks (to be conducted by the respective college)
Final examination: 80 marks
(A) 4 long questions of 14 marks each to be set from unit 1-4 with internal choice [4x14=56]
(B) 4 Short notes/annotation/analysis of 6 marks each covering all the units [4x6=24]
Scheme of examination

For SEC (English Communication)

Midterm: 20 marks (to be conducted by the respective college)
Final examination: 80 marks
A. 2 long questions of 20 marks each to be set from unit 1-2 with internal choice [2x20=40]
B. Students have to answer 2 questions of 10 marks each based on (unit 4):Précis writing/note taking/writing reports/official correspondences/writing letters etc
(A) 1. 10 bit questions of one mark each to be set exclusively from unit 3 section (i): grammar portion [1x10=10]
1. 1 question of 10 marks to be set on methods of developing a paragraph/expansion of idea into an essay [10]
Scheme of examination

For AEEC-II (MIL Alternative English)

Midterm: 20 marks (to be conducted by the respective college)
Final examination: 80 marks
(A) 5 short questions of 4 marks each to be set from unit 1-2 covering all prescribed stories and prose pieces [10x4=40]
(B) An unknown passage to be set with 5 questions carrying 4 marks each [5x4=20]
(C) 10 bit questions carrying 2 marks each from grammar/vocabulary and usage [10x2=20]

For pass courses
*The scheme of evaluation for rest of the pass courses (DSC+ DSE) will remain the same as that of the core honours papers

CORE – 3: Programming using R

UNIT-I

Introduction to R Programming
Overview of R – Installation of R – Installation and Loading of R Packages – R—Basic Syntax – Data Types and Objects – Variables – Constants – Comments – Debugging in R. Data Definition and Categorization: Overview of Data – Source of Data – Big Data – Data Categorization – Data Cube,

Operators: Introduction to Operator – Arithmetic Operators – Relational Operator – Logical Operators – Miscellaneous Operators – Precedence and Associativity of Operators – String Manipulation – Solved Example of Regular Expressions,

Control Statement and Functions: The if Statement – The for Statement – The while Loop – The repeat and break Statement – The repeat and Break Statements – the next Statement – The switch Statement – Functions

Interfacing with R: Introduction to Extending R – Interfacing R with C/C++ - Interfacing R with Python, Vectors: Overview of vectors – Creating a Vector – Accessing the Elements of a Vector – Vector Manipulation and Vector Arithmetic – Deleting a Vector – Vector Element Sorting,

UNIT-II

Matrices: Creating a Matrix – Coercion of Matrix Elements – Matrix Sub-setting – Matrix Operations – Combining Matrices – Special Matrices – Eigenvector and Eigenvalues – Arrays,

Lists: Introduction to Lists – Creating a List – General List Operations – Accessing the Elements of a lists – Manipulating the elements of a lists – Merging Lists – Applying Functions to a List – Recursive List – Sorting and Searching

Data Frames: Introduction to Data Frame – Creating a Data Frame – General Operations on Data Frames – Expanding a Data Frame – Applying Functions to Data Frame,

Factors and Tablets: Introduction to Factors – Creating a Factor – Factor Levels – Summarizing a Factor – Ordered Factor – Converting Factors – Common Functions Used with Factors.

Introduction to Tablets and Creating Tables – Table-related Function, Regular Expression and String Manipulation in R :Introduction to Regular Expression – Regular Expressions and Pattern Matching – String Manipulation – Solved Example of Regular Expression, S3 and S4 Classes and Objects: Introduction to S3 and S4 Classes and Objects – S3 Classes – S4 Classes.

Accessing Input and Output: Introduction to Files and Input / Output – Accessing the Keyboard and Monitor- File Function

UNIT-III

Graphs in R Programming :Introduction to Graphs – Creating Graphs – Histograms and Density plots – Bar Plots – Line Charts – Pie Charts – Box Plots – Scatter Plots – Saving Graphs to a file – Creating Three-Dimensional Plots. R Apply Family: Introduction to the Apply Family – The apply () Function – The lapply () Function – The sapply () Function – Slicing a Vector – The tappy () Function – The Rep () Function – The mapply () Function – The vapply() Function. The R Profile: Introduction – Using system.time() Function – timing Longer Expressions – Using the R Profiler – Using the summaryrprof () Function. Descriptive Statistics using R: Introduction to Statistical Analysis in R – Measure of Central Tendency or Location – Measures of Shape

UNIT-IV

Correlation and Regression Analysis: Introduction to Correlation and Regression Analysis – Correlation Analysis – Regression Analysis: lattice package in R - 1D, 2D, 3D plots using lattice ggplot2 package in R- 1D, 2D, 3D plots using ggplot2, Statistical Inference : Introduction to Statistical Inference – Hypothesis Testing. Analysis of Variance: Introduction to Analysis of Variance – Implementing Analysis of Variance – Variants of ANOVA – ANOVA in R.

Programming using R LAB

<u>**LIST OF PROGRAMS:**</u>

1. Demonstrate the usage of Numbers and Vectors in R
2. Simple manipulations on Numbers and Vectors, Objects- modes and attributes, Ordered and unordered Factors.
3. Implement the concepts of Arrays and Matrices.
4. Demonstrate the usage of Data Frames and Lists and its attributes -attach, detach, scan and importing a file.
5. Implement the concept of grouping and conditional execution on Data Frames and Lists
6. Demonstrate the usage of apply () functions.
7. Implement the usage of dplyr package
8. Utilize a lattice package to plot 1D, 2D and 3D plots for a given dataset.
9. Utilize ggplot2 package to plot 1D, 2D and 3D plots for a given dataset.
10. Demonstrate Pearson correlation and regression analysis.

CORE – 4: Probability and Distributions

UNIT-I

Theory of Probability: Introduction, history, different terms, mathematical tools, Axiomatic approach to probability, Mathematical notation, multiplication and conditional probability, Baye's theorem, Geometric probability.
Random Variables and Distribution Functions: Random Variable, distribution function, discrete random variable, continuous random variable, joint probability law, transformation of one dimensional random variable, transformation of two dimensional random variable

UNIT-II

Mathematical Expectation and Generating Functions: Mathematical expectation, Expectation of a Function of a Random Variable, Addition Theorem of Expectation, Multiplication Theorem of Expectation, Expectation of a Linear Combination of Random Variables, Covariance, Variance of a Linear Combination of Random Variables, Moments of Bivariate Probability Distributions, Conditional Expectation and Conditional Variance, Moment Generating Function, Cumulants, Characteristic Function, Chebychev's Inequality, Convergence in- Probability, Weak Law of Large Numbers, Borel Canteli Lemma, Probability Generating Function

UNIT-III

Theoretical Discrete Distributions: Introduction, Bernoulli Distribution, Binomial Distribution, Poisson Distribution, Negative Binomial Distribution, Geometric Distribution, Hyper geometric Distribution, Multinomial Distribution, Discrete Uniform Distribution

UNIT-IV

Theoretical Continuous Distributions: Rectangular or Uniform Distribution, Normal Distribution, Gamma Distribution, Beta Distribution of First Kind, Beta Distribution of Second Kind, The Exponential Distribution, Laplace Double Exponential Distribution Weibul Distribution, Cauchy Distribution, Central Limit Theorem

Books and References:
1. Fundamentals of Mathematical statistics, S.C, Gupta and V. K. Kapoor, S. Chand and Sons, Tenth Edition 2002
2. Applied Statistics and Probability for Engineers Douglas C. Montgomery and George C. Runger, Wiley, Sixth Edition 2014
3. Probability, Statistics, and Stochastic Processes Peter Olofsson and Mikael Andersson, Wiley,   Second Edition 2012

Probability and Distributions Lab

List of Practical: (Can be done in MS-Excel-or any Spreadsheet)
1. Introduction to Probability:
a. Formulate and apply Bayes' Theorem Calculations for problems like The "Two Supplier Example". [Hint: Use Prior Probabilities and Conditional Probabilities to compute Joint and Posterior Probabilities.]
b. Design spreadsheet to demonstrate the association Between Two Variables by Computing the Covariance and Correlation Coefficient.[Hint: Use COVAR and C ORREL)]
2. Discover Probability using formulas:
a. Design and spread sheet experiment to compute the probability using the geometric distribution formula.
b. Create a spread sheet application to compute the Conditional Probability. Also determine the probability that a randomly chosen event.
3. Random Variables and Distribution Functions:
a. Create spread sheet application to Compute the Expected Value, Variance, and Standard Deviation
b. Create a spread sheet application to Compute Binomial Probabilities. [Hint Use BINOM DIST]
4. Probability Distribution and Law:
a. Create a spread sheet application to Poisson Probability Distribution.[Hint: Use POISSO N]
b. Create a spread sheet application to implement joint probability law.
5. Mathematical Expectation and Chebychev's Theorem:
a. Create a spread sheet application to compute the expectation of a Function of a Random Variable
b. Create a spread sheet application to apply Chebychev's Theorem.
6. Conditional Expectation and Generating Functions:
a. Create a spread sheet application to compute Conditional Expectation and Conditional Variance.
b. Create a spread sheet application to demonstrate the use of Generating Functions
7. Theoretical Discrete Distributions1:
a. Create spread sheet application to demonstrate Bernoulli distribution.
b. Create spread sheet application to use excel function for computing hyper geometric probabilities.
8. Theoretical Discrete Distributions 2:

a. Create spread sheet application to Calculate Binomial Distribution in Excel. [Hint: Use BINOM.DIST]
b. Create suitable spread sheet application to work with Power Series Distribution.

9. Theoretical Continuous Distributions 1:
a. Create spread application for computing probabilities and z values for the standard normal distribution. [Use NORMSDIST and NORMSINV]
b. Create spread application for computing probabilities for the exponential probability distribution. [Hint: Use EXPONDIST]
10. Theoretical Continuous Distributions 2:
   a.   Create spread application for demonstrating Weibull Distribution to obtain a model for data sets. [Hint: Use WEIBULL.DIST]
   b.   Create spread application for demonstrating Pearson's Distributions.

GE-2: Data Structure and Algorithms

UNIT-I

Introduction of algorithms, analyzing algorithms, Arrays: Representation of Arrays, Implementation of Stacks and queues, Application of Stack: Evaluation of Expression - Infix to postfix Conversion - Multiple stacks and Queues, Sparse Matrices.
Linked list: Singly Linked list - Linked stacks and queues - polynomial addition - More on linked Lists - Doubly linked List and Dynamic Storage Management - Garbage collection and compaction.

UNIT-II

Trees: Basic Terminology - Binary Trees - Binary Tree representations - Binary trees - Traversal - More on Binary Trees - Threaded Binary trees - counting Binary trees. Graphs: Terminology and Representations - Traversals, connected components and spanning Trees, Single Source Shortest path problem.

UNIT-III

Symbol Tables: Static Tree Tables - Dynamic Tree Tables - Hash Tables Hashing Functions - overflow Handling. External sorting: Storage Devices -sorting with Disks: K-way merging - sorting with tapes.

UNIT-IV

Internal sorting: Insertion sort - Quick sort - 2 way Merge sort - Heap sort - shell sort - sorting on keys. Files: Files, Queries and sequential organizations - Index Techniques - File organization.

Text Book:

Ellis Horowitz, Sartaj Shani, ―Fundamentals of Data Structuresǁ, Galgotia publication

Reference Book:

1. Data structures Using C‖ Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J.Augenstein, Kindersley (India) Pvt. Ltd.,
2. Data structure and Algorithms‖, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Pearson Education Pvt. Ltd.

Database Management and Data Structure Lab
(SQL and PL/SQL Lab)

LIST OF PROGRAMS:
1. Array implementation of Stack.
2. Array implementation of Linear Queue.
3. Array implementation of Circular Queue.
4. Linked list implementation of Stack.
5. Linked list implementation of Queue.
6. Polynomial representation using linked list.
7. To implement a Binary Search Tree.
8. To represent a Sparse Matrix.
9. To perform binary search operation.
10. To perform Insertion sort.
11. To perform Quick sort.
12. To perform Merge sort.

NOTE: Demonstrate the following SQL commands and can take any back end RDBMS system for implementation purpose.
1. Data Definition of Base Tables.
2. DDL with Primary key constraints.
3. DDL with constraints and verification by insert command.
4. Data Manipulation of Base Tables and Views.
5. Demonstrate the Query commands.
6. Write a PL/SQL code block that will accept an account number from the user and debit an amount of Rs. 2000 from the account if the account has a minimum balance of 500 after the amount is debited. The Process is to fired on the Accounts table.
7. Write a PL/SQL code block to calculate the area of the circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in a table Areas. Areas – radius, area.
8. Write a PL/SQL block of code for reversing a number. (Example: 1234 as 4321).
9. Create a transparent audit system for a table Client_master (client_no, name, address, Bal_due). The system must keep track of the records that are being deleted or updated. The functionality being when a record is deleted or modified the original record details and the date of operation are stored in the audit client (client_no, name, bal_due, operation, user-id, update) table, then the delete or update is allowed to go through.

AECC/EV-I: Principles of Management
OBJECTIVES
- To understand the basic principles of management.

- To provide a basis of understanding towards working of business organization through the process of management.

Unit-1

Nature of Management: Meaning, Definition, it's nature purpose, importance & Functions, Management as Art, Science & Profession- Management as social System Concepts Of management-Administration-Organization. Evolution of Management Thought: Contribution of F.W. Taylor, Henri Fayol, Elton Mayo, Chester Barhard & Peter Drucker to the management thought. Various approaches to management (i.e. Schools of management thought) Indian Management Thought.

Unit-2

Functions of Management (Part-I) Planning - Meaning - Need & Importance, types levels– advantages& limitations, Forecasting - Need & Techniques, Decision making - Types - Process of rational decision making &techniques of decision making, Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation – Decentralization.

Unit-3

Functions of Management (Part-II) Staffing - Meaning & Importance, Direction - Nature – Principles, Communication – Types & Importance, Motivation - Importance – theories, Leadership - Meaning - styles, qualities & functions of leaders Controlling- Need, Nature, importance, Process & Techniques, Coordination - Need, Importance.

Unit-4

Strategic Management: Definition, Classes of Decisions, Levels of Decision, Strategy, Role of different Strategist, Relevance of Strategic Management and its Benefits, Strategic Management in India.

Text Books:
1. Horold Koontz and Iteinz Weibrich, Essential of Management, McGraw-Hill International
2. K.Aswathapa, Essential of Business Administration, Himalaya Publishing House

Reference Books:
1. L.M.Parasad Principles & practice of management - Sultan Chand & Sons - New Delhi
2. Tripathi, Reddy, Principles of Management, Tata McGraw Hill

SEMESTER – III

CORE-5: Data Warehousing

UNIT-I

Introduction to Data Warehouse

Data warehouse Introduction-Data warehouse components-operational database vs data warehouse-Data warehouse Architecture-Three tier data warehouse Architecture-Autonomous data warehouse-Autonomous data warehouse vs snowflake-modern data warehouse

UNIT-II

ETL AND OLAP TECHNOLOGY

What is ETL-ETL vs ELT- Types of data warehouses-Data warehouse design and modelling - Delivery process-online analytical processing(OLAP) – characteristics of OLAP-online transaction processing(OLTP) vs OLAP-OLAP Operations- Types of OLAP –ROLAP vs MOLAP vs HOLAP

META DATA, DATA MART & PARTITION STRATEGY

Meta data-category of Meta data-Role of Meta data- Meta data Repository-Challenges in meta data management-Data mart-Need of data mart-Cost effective data mart-Designing data marts- cost of data marts- partitioning strategy- vertical partition-Normalization- Row splitting-horizontal partition.

UNIT-III

DIMENSIONAL MODELING AND SCHEMA

Dimensional modelling- multi dimensional data modelling – Data cube- star scheme-snow fall schema- star is snow flake schema- fact constellation schema- schema definition- process architecture- types of database parallelism-Data warehouse tools

UNIT-IV

SYSTEM AND PROCESS MANAGERS

Data warehousing system managers; System configuration manager- system scheduling manager- system event manager- system database manager - system backup recovery manager- data warehousing process managers: load manger-ware house manager-query manager-Tuning-Testing

Text Books:
1. Alex Berson & Stephen J. Smith, " Data Warehousing Data Mining & OLAP" ,TMH, 13th reprint edition 2008
2. Ralph Kimball, " The Data Warehouse toolkit: The Complete Guide to Dimensional Modelling", 3rd edition 2013

Data Warehousing LAB

1. Data exploration and integration with WEKA

2. Apply WEKA tool for data validation

3. Plan the architecture for real time application

4. Write the query for schema definition

5. Design data warehouse for real time application

6. Analyze the dimensional modeling

7. Case study using OLAP

8. Case study using OTLP

9. Implementation of warehouse testing

CORE – 6: Optimization Techniques

COURSE OBJECTIVES:
To impart knowledge on various categories of existing engineering problems and solutions to such problems through different optimization techniques and approaches

COURSE OUTCOMES:
At the end of the course, the students should be able to:
1. Relate key concepts and applications of various optimization techniques
2. Identify the appropriate optimization technique for the given problem
3. Formulate appropriate objective functions and constraints to solve real life optimization problems

UNIT-I

INTRODUCTION
Statement of an optimization problems – classification of optimization problem – classical optimization techniques; Single variable optimizations, Multi variable optimization, equality constraints, inequality constraints, No constraints.

UNIT-II

LINEAR PROGRAMMING
Graphical method for two dimensional problems – central problems of Linear Programming – Definitions – Simples – Algorithm – Phase I and II of simplex Method – Revised Simplex Method. Simplex Multipliers – Dual and Primal – Dual Simplex Method – Sensitivity Analysis– Transportation problem and its solution – Assignment problem and its solution – Assignment problem and its solution by Hungarian method – Karmakar's method – statement, Conversion of the Linear Programming problem into the required form, Algorithm.

UNIT-III

NON LINEAR PROGRAMMING
Non linear programming (one dimensional minimization: Introduction – Unrestricted search – Exhaustive search – interval halving method – Fibonacci method. NON LINEAR PROGRAMMING: (UNCONSTRAINED OPRIMIZATION): - Introduction – Random search method – Uni variate method – Pattern search methods – Hooke and jeeves method, simplex method- Gradient of a function – steepest descent method – Conjugate gradient method. NON LINEAR PROGRAMMING – (CONSTRAINED OPTIMIZATION): Introduction – Characteristics of the problem – Random search method – Conjugate gradient method.

DYNAMIC PROGRAMMING
Introduction – multistage decision processes – Principles of optimality – Computation procedures. Decisions under uncertainty, under certainty and under risk – Decision trees – Expected value of perfect information and imperfect information.

Text Books:

1. Kalynamoy Deb, "Optimization for Engineering Design, Alogorithms and Examples", Prentice Hall, 2012.
2. Hamdy A Taha, "Operations Research – An introduction", Pearson Education, 2017

Reference Books:

1. Hillier / Lieberman, "Introduction to Operations Research", Tata McGraw Hill Publishing company Ltd, 2002.
2. Singiresu S Rao, "Engineering optimization Theory and Practice", New Age International, 1996.
3. Mik Misniewski, "Quantitative Methods for Decision makers", MacMillian Press Ltd., 1994.
4. Kambo N S, "Mathematical Programming Techniques", Affiliated East – West press, 1991.

Optimization Techniques LAB

List of Experiments

1. Matrix operations in Matlab
2. Differentiation of a vector and matrix in Matlab
3. Integration of a vector and matrix in Matlab
4. Simplex algorithm in Matlab
5. Implementation of Newton's method in Matlab
6. Implementation of Secant method in Matlab
7. Implementation of Lagrange multiplier method in Matlab
8. Implementation of KKT theorem in Matlab
9. Implementation of BFGS method in Matlab

CORE – 7: Data Science Using Python

UNIT-I

Introduction: Data Science- A Brief History of Data Science - A History of Data Analysis -The Emergence and Evolution of Data Science. Where Is Data Science Used? What Are Data, and What Is a Data Set? Perspectives on Data. A Data Science Ecosystem: Moving the Algorithms to the Data - The Traditional Database or the Modern Traditional Database.

UNIT-II

Learning from Data with Your Machine: Defining Machine Learning and Its Processes

-Learning Styles - Selecting algorithms based on function. Math, Probability, and Statistical Modeling: Exploring Probability and Inferential Statistics - Quantifying Correlation -Reducing Data Dimensionality with Linear Algebra - Introducing Time Series Analysis.

UNIT-III

Data Visualizations: The Big Three - Picking the Most Appropriate Design Style – Selecting the Appropriate Data Graphic Type - WebBased Applications for Visualization Design: Designing Data Visualizations for Collaboration - Visualizing Spatial Data with Online Geographic Tools.

UNIT-IV

Web Services in Python: Parsing XML, JSON, Application Programming Interfaces NumPy Libraries for Arrays, Pandas Library for Data Processing Matplotlib for Visualization, Seaborn Library for Visualization, SciPy Library for Statistics

Text Books:

1. John D. Kelleher and Brendan Tierney, ―Data Science‖, First Edition, The MIT Press, London, 2018. Unit I (Text Book 1): Chapter 1.1, 1.2, 1.3, 2.1, 3.1, 3.2.
2. Lillian Pierson, ―Data Science for Dummies‖, 2nd Edition, John Wiley & Sons publications, 2017. Unit II (Text Book 2): Chapter 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7. Unit III (Text Book 2): Chapter 9.1, 9.3, 9.5, 11.1, 11.2.
3. Wesley J Chun, Core Python Applications Programming, 3rd Edition. Pearson 4. Michael Bowles, Machine Leaning in Python, Essential techniques for predictive analysis, Wiley

Reference Books:

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, ―Introducing Data Science‖, Manning Publications Co, 2016.
2. Ramesh Sharda, DursunDelen, Efraim Turban, ―Business Intelligence, Analytics, and Data Science: A Managerial Perspective‖, Pearson Education, Fourth edition, 2019.
3. Alex Martelli, Python Cookbook, O'REILLY

Data Science using Python LAB

LIST OF PROGRAMS:
1. Write a program using generator function.
2. How to call same function with decorator and without decorator.
3. Construct an XML formatted data and Write Python Program to Parse that XML data.
4. Construct a JSON formatted data and Write Python Program to Parse that XML data.
5. Implement a program using Pandas.
6. Accessing Array index using NumPy
7. Aggregation function using NumPy.
8. Implement
a) Matplotlib
b) Seaborn
9. Implement a program using SciPy

SEC-I: Digital System Design

COURSE OBJECTIVES
- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

COURSE OUTCOMES
Upon completion of this course, the students should be able to:
1. Explain the fundamentals of number system, Codes and digital logic families
2. Develop combinational circuits.
3. Design synchronous sequential circuits using flip-flops.
4. Demonstrate Asynchronous Sequential circuits and Programmable Logic Devices.
5. Apply simulation tools for designing digital logic circuits.

UNIT-I

Boolean Algebra and Logic Gates
Number Systems – Arithmetic Operations – Binary Codes- Boolean Algebra and Logic Gates – Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Simplification of Boolean Functions using Karnaugh Map – Logic Gates – NAND and NOR Implementations.

UNIT-II

Combinational Logic
Combinational Circuits – Analysis and Design Procedures – Binary Adder-Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Introduction to HDL – HDL Models of Combinational circuits.

UNIT-III

Synchronous Sequential Logic
Sequential Circuits – Storage Elements: Latches , Flip-Flops – Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design Procedure – Registers and Counters – HDL Models of Sequential Circuits.
Asynchronous Sequential Logic
Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNIT-IV

Memory and Programmable Logic
RAM – Memory Decoding – Error Detection and Correction – ROM – Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

Text Books:

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

Reference Books:
1. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
4. Donald D. Givone, Digital Principles and Design‖, Tata Mc Graw Hill, 2003.

GE-3: Big Data Analysis

UNIT-I

Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach, Bigdata Challenges, Case Study of Big Data Solutions.

UNIT-II

HADOOP: Introducing Hadoop – Why Hadoop – Why not RDBMS – RDBMS versus Hadoop – History of Hadoop – Hadoop Overview – Hadoop Distributed File System (HDFS) – Processing Data with Hadoop – Managing Resources and Applications with Hadoop YARN – Interacting with Hadoop Ecosystem

UNIT-III

No SQL DATA MODEL: Introduction to NoSQL – NoSQL Business Drivers – NoSQL Data Architectural Patterns – Variations of NoSQL Architectural Patterns – Using NoSQL to Manage Big data – Case study of NoSQL MAP REDUCE Programming: Introduction to MapReduce – Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.

UNIT-IV

Hadoop streaming with R: Understanding the basics of Hadoop streaming – How to run Hadoop streaming with R – Understanding a MapReduce application – Understanding how to code and run a Map-Reduce application – how to explore the output of Map Reduce application.

Text Books:

1. Radha Shankarmani,   M   Vijayalakshmi, ―Big Data Analytics‖,   Wiley publications,first Edition 2016.
2. Seema Acharya, Subhashini Chellappan, ―Big Data and Analytics‖, Wiley Publication, first edition. Reprint in 2016.
3. Vignesh Prajapati, ―Data analytics with R and Hadoop‖, Copyright © 2013, Packt Publishing.

Reference Books:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, Big Data, —Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businessesǁ, Wiley, 2013
2. Bill Franks, Taming, —The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analyticsǁ, Wiley

Big Data Analysis LAB
List of Experiments

1. (i) Perform setting up and Installing Hadoop in its two operating modes: Pseudo distributed, fully distributed.

(ii) Use web based tools to monitor your Hadoop setup.
2. (i) Implement the following file management tasks in Hadoop: Adding files and directories• Retrieving files• Deleting files
(ii) Benchmark and stress test an Apache Hadoop cluster
3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm. Find the number of occurrence of each word appearing in the input file(s) Performing a MapReduce Job for word search count (look for specific keywords in a file.
4. Stop word elimination problem:

Input:
A large textual file containing one sentence per line
A small file containing a set of stop words (One stop word per line)   Output:
A textual file containing the same sentences of the large input file without the words appearing in the small file.
5. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented. Data available at: https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all.

Find average, max and min temperature for each year in NCDC data set?
Filter the readings of a set based on value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.
6. Purchases.txt Dataset
Instead of breaking the sales down by store, give us a sales breakdown by product category across all of our stores. What is the value of total sales for the following categories? Toys Consumer Electronics
Find the monetary value for the highest individual sale for each separate store
What are the values for the following stores? Reno Toledo Chandler   Find the total sales value across all the stores, and the total number of sales.

7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
8. Write a Pig Latin scripts for finding TF-IDF value for book dataset (A corpus of eBooks available at: Project Gutenberg)
9. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

10. Install, Deploy & configure Apache Spark Cluster. Run apache spark applications using Scala.

11. Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together.

Write a single Spark application that:

Transposes the original Amazon food dataset, obtaining a Pair RDD of the type: <USER_ID>

(list of the product_ids reviewed by user_id>

Counts the frequencies of all the pairs of products reviewed together;

Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

AECC/EV-I: Database Management Systems

COURSE OBJECTIVES:

1.   To explain basic database concepts, applications, data models, schemas and instances.

2.   To demonstrate the use of constraints and relational algebra operations.

3. Describe the basics of SQL and construct queries using SQL.

4.   To emphasize the importance of normalization in databases.

5.   To facilitate students in Database design

6.   To familiarize issues of concurrency control and transaction management

 COURSE OUTCOMES:

Upon completion of this course, the students should be able to:

1.   Recall the basic concepts of database systems.

2.   Identify the SQL queries for a given scenario.

3.   Illustrate relational database theory, and be able to write relational algebra expressions for queries.

4.   Summarize the various data storage devices and types of indexes.

5.   Demonstrate transaction processing and concurrency control.

6.   Explain Object oriented dB, Distributed dB, XML, data warehousing and Mobile database.

UNIT-1

INTRODUCTION AND CONCEPTUAL MODELING

Introduction to File and Database systems- Database system structure – Data Models – Introduction to Network and Hierarchical Models – ER model – Relational Model – Relational Algebra and Calculus.

RELATIONAL MODEL

SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design – Functional dependencies and Normalization for Relational Databases (up to BCNF).

UNIT-3

DATA STORAGE AND QUERY PROCESSING

Record storage and Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files – Different types of Indexes- B-Tree - B+Tree – Query Processing.

UNIT-4

TRANSACTION MANAGEMENT

Transaction Processing – Introduction- Need for Concurrency control- Desirable properties of Transaction- Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Recovery Techniques.

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan- ―Database System Concepts, seventh Edition, 2019.

Reference Books:

1. Ramez Elmasri and Shamkant B. Navathe, ―Fundamental Database Systems‖, Seventh Edition,Pearson Education,2016.

2. Raghu Ramakrishnan, ―Database Management System, Tata McGraw-Hill Publishing Company, Third Edition, 2014.

3. Jiawei Han, Micheline Kamber, Jian Pei -Data Mining Concepts and Techniques,Morgan Kaufmann, Third Edition, 2012.

SEMESTER – IV

CORE – 8: Numerical Methods and Statistical Inference

COURSE OBJECTIVES:
❖ To introduce the fundamental principles of numerical and statistical methods.
❖ To provide various methods of solving algebraic/transcendental equations and system of simultaneous equations.
❖ To identify the areas applied in numerical interpolation, differentiation, integration and differential equations and method of finding solutions.
❖ To have knowledge in probability distributions and testing of hypothesis

COURSE OUTCOMES:
Upon completion of the course the students will be able
❖ To solve problems using numerical methods.
❖ To obtain the solution of system of equations using matrix theory.
❖ To identify real life problems into Mathematical Models.
❖ To apply the probability theory in the field of Computer Science Applications.

UNIT-I

Solution of Equations: Fundamental principles of Numerical Methods - Solution of algebraic/transcendental equations: method of false position, Newton Raphson method – Solution of simultaneous linear equations – direct methods: Gauss elimination and Gauss Jordan methods – iterative methods: Gauss Jacobi and Gauss Seidel methods.

UNIT-II

Numerical Interpolation, Differentiation & Integration: Interpolation: difference table - Newton's forward and backward interpolation – Lagrange's interpolation – Differentiation formulae –Integration: Trapezoidal, Simpson's one-third rule and Gaussian quadrature in one dimension.
Ordinary Differential Equations: Solution of first order ordinary differential equations – Taylor Series and Euler methods, Runge-Kutta method of fourth order.

UNIT-III
Estimation: Concepts of point estimation, Criterion of a good estimator, unbiasedness, sufficiency, consistency and efficiency. Methods of Estimation: Method of moments, method of maximum likelihood estimation, confidence intervals.

UNIT-IV

Principles of test of significance: Null and alternative hypotheses (simple and composite), Type-I and Type-II errors, critical region, level of significance, size and power, best critical region, most powerful test, uniformly most powerful test, Neyman

Pearson Lemma (statement only). Sampling distributions –Small sample tests: t-test for single mean and double mean, F-test, chi-square test for goodness of fit and independence of attributes

Text Books:

1. Grewal B.S, "Numerical methods in Engineering and Science", Khanna Publishers, 2013. (Units - 1, 2 & 3).
2. John.E..Freund, Irwin Miller, Marylees Miller, "Mathematical Statistics with Applications", Prentice Hall of India, Seventh Edition, 2004. (Units - 4).

Reference Books:

1. Gupta, S. K. "Numerical Methods for Engineers", New age International Publishers, 2012.
2. Gupta S.C. & Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 2011.

Numerical Techniques Practical:

1.   Basics of MATLAB programming
2.   Array operations in MATLAB
3.   Loops and execution control
4.   Working with files: Scripts and Functions
5.   Plotting and program output
6.   Linear algebra in MATLAB
7.   Gauss Elimination
8.   LU decomposition and partial pivoting
9.   Iterative methods: Gauss Siedel
10.   Newton-Raphson in single variable
11.   MATLAB function fsolve in single and multiple variables
12.   Newton-Raphson in multiple variables
13.   Linear least squares regression(including lsqcurvefit function)
14.   Functional and nonlinear regression (including lsqnonlin function)
15.   Interpolation in MATLAB using spline and pchip
16.   Second-Order Runge-Kutta Methods
17.   Higher order Runge-Kutta methods
18.   Error analysis of Runge-Kutta method

CORE – 9: Artificial Intelligence

UNIT-I

Introduction: AI Problems – AI techniques – Criteria for success. Problems, Problem Spaces, Search: State space search – Production Systems – Problem Characteristics – Issues in design of Search.

UNIT-II

Heuristic Search techniques: Generate and Test – Hill Climbing – Best-Fist, Problem Reduction, Constraint Satisfaction, Means-end analysis.

Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – Frame Problem.

UNIT-III

Using Predicate Logic: Representing simple facts in logic – Representing Instance and Isa relationships – Computable functions and predicates – Resolution – Natural deduction.

UNIT-IV

Representing knowledge using rules: Procedural Vs
Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge Brief explanation of Expert Systems-Definition-Characteristics- architecture- Knowledge Engineering- Expert System Life Cycle-Knowledge Acquisition Strategies- Expert System Tools.

Text Books:
Elaine Rich and Kevin Knight, Shiva Shankar Nair, ―Artificial Intelligence‖, McGraw-Hill Companies, 3rd edition.

Reference Books:
1. Stuart Russell & Peter Norvig , ―Artificial Intelligence A Modern Approach‖, Perason, 2ndEdition.
2. George F Luger , ―Artificial Intelligence‖, Pearson 2002, 4th Edition.
   V S Janaki Raman, K Sarukesi, P Gopalakrishnan, ―Foundations of Artificial Intelligent and Expert Systems‖, MacMillan India limited.

Artificial Intelligence LAB

List of Experiments:
1. Write a Program to Implement Breadth First Search using Python.
2. Write a Program to Implement Depth First Search using Python.
3. Write a Program to Implement Tic-Tac-Toe game using Python.
4. Write a Program to implement 8-Puzzle problem using Python.
5. Write a Program to Implement Water-Jug problem using Python.
6. Write a Program to Implement Travelling Salesman Problem using Python.
7. Write a Program to Implement Tower of Hanoi using Python.
8. Write a Program to Implement Monkey Banana Problem using Python.
9. Write a Program to Implement Alpha-Beta Pruning using Python.
10. Write a Program to implement 8-Queens Problem using Python.

CORE – 10: Cloud Computing

COURSE OBJECTIVE:
This course gives students an insight into the basics of cloud computing along with

virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

UNIT-I

Cloud Computing Overview: Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT-II

Cloud Insights: Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

UNIT-III

Cloud Architecture- Layers and Models : Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT-IV

Cloud Simulators- CloudSim and GreenCloud: Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud. **Introduction to VMWare Simulator:** Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines- understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

Text Books:

1.   Cloud computing a practical approach‖ - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
2.   Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online‖ - Michael Miller - Que 2008

Reference Books:

1.   Cloud computing for dummies‖- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
2.   Cloud Computing (Principles and Paradigms)‖, Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

Practical:

List of Exercises

1. Study and Usage of Google Apps.
2. Implement Virtual OS using virtual box.
3. Simulate VM allocation algorithm using CloudSim.
4. Simulate Task scheduling algorithm using CloudSim.
5. Simulate Energy-conscious model using CloudSim.
6. Setup a Private Cloud Using Open Stack or Eucalyptus.
7. Install and configure Open Stack Object Storage - Swift in Ubuntu.
8. Implement Open Stack Nova-Compute.
9. Implement Open Stack Image services – Glance.
10. Implement Map Reduce concept for an application.

SEC-2: Data Visualization with Power BI / Tableau

COURSE OBJECTIVE:

❖   Students will explore story telling with data by develop skills to both design and critique visualization.

❖   Understand why visualization is an important part of data analysis by understands the components involved in visualization design. 3. Exploring the type of data impacts and type of visualization.

UNIT-I

Introduction to Data Visualization
Why Data Visualization? What Can You Believe? Some Pictures Are More Persuasive, Different Shades of the Truth in visualization, Start Sketching Your Data Story, Recommended Tools for data visualization and demonstration of Tools.

Data Management for data visualization
Select Your Spreadsheet Tools, Download to CSV or ODS Format, Make a Copy of a Google Sheet, Share Your Google Sheets, Upload and Convert to Google Sheets, Geocode Addresses in Google Sheets, Collect Data with Google Forms, Sort and Filter Data, Calculate with Formulas, Summarize Data with Pivot Tables Match Columns with VLOOKUP, Spreadsheet Versus Relational Database

UNIT-II

Data sources and Data processing for data visualization
Open Data Repositories, Source Your Data, Recognize Bad Data Smart Cleanup with Google Sheets, Find and Replace with Blank, Transpose Rows and Columns, Split Data into Separate Columns, Combine Data into One Column, souring data and processing data for Banking data, Retail data and Healthcare data.

Advanced Data processing and Basic Charting
Extract Tables from PDFs with Tabula, Clean Data with OpenRefine, Set Up OpenRefine, Load Data and Start a New Project, Convert Dollar Amounts from Text to Numbers, Cluster Similar Spellings Precisely Describe Comparisons, Normalize Your Data Chart Design Principles, Deconstruct a Chart, Some Rules Are More Important Than Others, Chart Aesthetics, Google Sheets Charts, Bar and Column Charts

UNIT-IV

Interactivity Charting and Storyboard
Visualization: Histograms, Pie, Line, and Area Charts, Datawrapper Charts, Annotated Charts, Range Charts, Scatter and Bubble Charts. Map Design Principles: Deconstructing a Map, Clarify Point-Versus-Polygon Data, Map One Variable, Not Two, Choose Smaller Geographies for Choropleth Maps **Storyboard**: Build a Narrative on a Storyboard, Draw Attention to Meaning, Acknowledge Sources and Uncertainty Decide on Your Data Story Format

Text Book:

Hands-On Data Visualization— by Jack Dougherty, Ilya Ilyankou

Reference Books:
1.   The Truthful Art: Data, Charts, and Maps for Communication‖, Pearson Education, 2016.
2.   Few, Stephen —Show Me the Numbers: Designing Tables and Graphs to Enlighten‖, Second edition, Burlingame, CA: Analytics Press, 2012.

GE-4: DATA MINING

COURSE OBJECTIVE:

❖   To introduce the basic concepts and techniques of Data Mining.
❖   To study the basic concepts of cluster analysis.
❖   To study a set of typical clustering methodologies, algorithms and applications.

UNIT-I

Introduction: Data mining application – data mining techniques – data mining case studies- the future of data mining – data mining software - Association rules mining: basics- task and a naïve algorithm- Apriori algorithm – improve the efficient of the Apriori algorithm – mining frequent pattern without candidate generation (FP-growth) – performance evaluation of algorithms.

UNIT-II

Classification : Introduction – decision tree – over fitting and pruning - DT rules- Naive

bayes method- estimation predictive accuracy of classification methods - other evaluation criteria for classification method – classification software.

Cluster analysis: cluster analysis – types of data – computing distances-types of cluster analysis methods- partitioned methods – hierarchical methods – density based methods – dealing with large databases – quality and validity of cluster analysis methods - cluster analysis software.

UNIT-III

Web data mining: Introduction- web terminology and characteristics- locality and hierarchy in the web- web content mining-web usage mining- web structure mining – web mining software - Search engines: Search engines functionality- search engines architecture – ranking of web pages.

UNIT-IV

Data warehousing: Introduction – Operational data sources- data warehousing - Data warehousing design – Guidelines for data warehousing implementation - Data warehousing metadata - Online analytical processing (OLAP): Introduction – OLAP characteristics of OLAP system – Multidimensional view and data cube - Data cube implementation - Data cube operations OLAP implementation guidelines.

Text Book:

G.K. Gupta, —Introduction to Data mining with case studies‖, 2nd Edition, PHI Private limited, New Delhi, 2011
Reference Book:

Arun K Pujari, —Data Mining Techniques‖, 10th impression, University Press, 2008.

Data Mining Practical

LIST OF EXPERIMENTS:

1. Creation of a Data Warehouse.

2. Apriori Algorithm.

3. FP-Growth Algorithm.

4. K-means clustering.

5. One Hierarchical clustering algorithm.

6. Bayesian Classification.

7. Decision Tree.

8. Support Vector Machines.

9. Applications of classification for web mining.

10. Case Study on Text Mining or any commercial application.

AECC/EV-I: Business Research Methods

COURSE OBJECTIVES:
- ❖ Research methodology provides a decision making base to managers to take sound managerial decisions.
- ❖ Developing in them a core competence of the managers tomorrow.
- ❖ To give knowledge about the process of research to students

UNIT-1

Introduction: Meaning-objectives – Research Categories(Basic Research and Applied Research)-Types of research(Descriptive, Analytical, Applied, Fundamental, Quantitative, Qualitative, Conceptual and Empirical research) - research approaches(Quantitative and Qualitative Approaches) - research methods Vs research methodology- Research Process

UNIT-2

Defining the Research Problem: Meaning - selecting the problem –techniques involved in defining the problem- formulating of the problem-formulation of hypothesis (concept only) - Developing the research plan

UNIT-3

Research Design: Meaning - need - features important concepts relating to research design -types of research design (Exploratory and Conclusive Research Design) - basic principles of experimental designs
Sampling: Meaning - need - census and sample survey - sampling designs -probability sampling (simple random, systematic, stratified, cluster, area multistage, sequential sampling methods)- nonprobability sampling (convenience, snowball, judgmental, case study. Quota sampling methods)

UNIT-4

Data collection and processing: Collection of primary data - collection of data through questionnaire- construction of a questionnaire- and schedules - secondary data - qualitative techniques of data collection – interview, Case study Method, observation - tabulation of data- Difference between primary and secondary data.

Reference Books:

1. C.R. Kothari, Research Methodology.
2. O.R. Krishna Swamy, Research Methodology
3. Wilkinson and Bhandarkar, Methodology and techniques of social research
4. Sadhu Sing, research methodology in social sciences
5. V.P. Michael, Research Methodology in Management
6. Willium M.K. Trochim, Research Methods, Bzantra.

SEMESTER – V

CORE – 11: Machine Learning

<u>**COURSE OBJECTIVE:**</u>

❖   To study the basics of machine learning.
❖   Learn about supervised and unsupervised learning techniques
❖   Learning how to build a machine learning model from the scratch.
❖   To understand the Implementation of genetic algorithms.

UNIT-I

Introduction to machine learning: Introduction, Types of machine learning, Applications of Machine Learning, Perspectives and issues in machine learning, Tools in machine learning, basic types of data in machine learning, exploring structure of data, data preprocessing. Performance metrics - accuracy, precision, recall, sensitivity, specificity, AUC, RoC, Bias Variance decomposition.

UNIT-II

Probabilistic and Stochastic Models: Bayesian Learning – Bayes theorem, Concept learning, Maximum likelihood, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Expectation maximization and Gaussian Mixture Models, Hidden Markov models.
Supervised learning: Introduction, Regression, Linear regression, Classification: Decision trees, k-Nereast Neighbours, Support Vector Machine, Logistic regression, Naïve Bayes, Random Forest. Artificial Neural Network: Introduction, Perceptrons, multi-layer networks and back propagation.

UNIT-III

Unsupervised learning: Introduction, Supervised vs Unsupervised Cluster Analysis, K-means clustering, Hierarchical clustering. Dimension reduction: Principal Component Analysis, Linear Discriminant Analysis.

UNIT-IV

Modelling, evaluation and Genetic algorithms: Building the model, Training a model, evaluating a model, improving a model. Genetic Algorithms – Representing hypothesis, Genetic operators and Fitness function and selection, Simple applications of the Genetic Algorithm.

Text Books:

1   SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, ―Machine Learning‖, Pearson Education. **Chapters 1-3, 6-10. (unit I,II,III,IV,V)**
2   ShaiShalev-Shwartz, Shai Ben-David, ―Understanding Machine Learning: From Theory to Algorithms‖, Cambridge University Press. **Chapters 20, 23-24 (Unit III,IV)**

Reference Books:

1. T. Hastie, R. Tibshirani and J. Friedman, —Elements of Statistical Learning‖,

Springer.
2. Charu C. Aggarwal, —DATA CLUSTERING Algorithms and Applications‖, CRC Press, 2014.
3. C. Bishop, —Pattern Recognition and Machine Learning‖, Springer. Ethem Alpaydin,"Introduction to Machine Learning‖, MIT Press, Prentice Hall of India, Third Edition 2014.

Machine Learning Practical

LIST OF EXPERIMENTS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

5. Write a program to implement the naïve Bayesian classifier for a sample training data set

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.

8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program. 9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem. 10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

CORE – 12: Internet of Things

COURSE OBJECTIVES:

❖ To explain about the definition and usage of Internet of things

❖ To explain the key components of IoT system

UNIT-I

Introduction to IoT

Introduction – Definition and Characteristics of IoT, Physical Design of IoT; Things in IOT, Logical Design of IoT; IoT Functional Blocks, IoT Communication APIs, IoT Enabling Technologies; WSN, Cloud Computing, Big Data Analysis, Communication Protocols, Embedded Systems

UNIT-II

IoT Hardware

IoT Hardware, Devices and Platforms – Basics of Arduino Hardware, The Arduino IDE, Basic Arduino Programming, Basics of Raspberry pi; Introduction to Raspberry pi, Programming with Raspberry pi, CDAC IoT devices: Ubimote, Wi-Fi mote, BLE Mote, WINGZ gateway, Introduction to IoT Platforms, IoT Sensors and actuators

UNIT-III

IoT Protocols

IoT Protocols – IoT Data link Protocols, Network Layer Routing Protocols, Network Layer Encapsulation Protocols, Session Layer Protocols, IoT Security Protocols, Service Discovery Protocols, and Infrastructure Protocols.

UNIT-IV

IoT Programming

IoT Programming – Arduino Programming: Serial Communications – Getting Input from Sensors, Visual, Physical and Audio Outputs, Remotely Controlling External Devices, Wireless Communication, Programming with Raspberry pi: Basics of python Programming, Python Packages of IoT, IoT Programming with CADC IoT devices.

Domain Specific IoT

Domain Specific IoT – Home automation, smart cities, Smart Environment, IoT in Energy, Logistics, Agriculture, industry and Health & Life style sensors.

TEXT BOOKS

1. Vijay Madisetti and ArshdeepBahga, ―Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.

REFERENCE BOOKS

1. Margolis, Michael. ―Arduino CooK book: Receipes t obegin, Expand and Enhance Your Projects‖. O'Reilly Media Inc.2011.

2. Monk, Simon. Raspberry Pi Cookbook: Software and hardware problems and Solutions. O'Reilly Media,Inc. 2016.

Internet of Things Practical

List of Experiments:

1. Study and configure the development board
2. Write a program to establish database connectivity using Python and perform basic query operations
3. Write a program to implement client-server interaction
4. Study the working of different types of sensors using IoT Training Kit
5. Write a program to prepare a humidity data logger and access the logs over Wifi/Ethernet
6. Write a program to collect temperature data and turn on/off actuator like servo motor, led etc. based on some fixed threshold value of the temperature. The collected temperature data should be stored in the database and displayed to the user upon request.
7. Allocation of mini projects
8. Write a program to display a warning message if fire is detected using flame sensor
9. Write a program to control led lights using motion sensor
10. Write a program to access, capture and store the image feed from serial camera
11. Study and Implement MQTT Protocol
12. Study the functionalities and working of drones
13. Write a program to collect sensor data using drone and send the data to the users using MQTT protocol
14. Study the functionalities and working of a mobile robot

DSE-1: Time Series Analysis and Business Forecasting

Course Objectives:

❖ Students will have a command of business theory and practice in the field of business forecasting.
❖ To learn different forecasting models/techniques both quantitative and qualitative.
❖ Students will use reasoned and ethical judgment when analyzing problems and making decisions.
❖ Students will be able to understand complex business situations and provide solutions to improve current business practices.
❖ Students will be effective communicators.

UNIT-I

Introduction to times series data, applications, components of a times series, Decomposition of time series. Trend: Estimation of trend by free hand curve method, method of semi averages, fitting various mathematical curves, and growth curves,

Method of moving averages. Detrending. Effect of elimination of trend on other components of the time series. Seasonal Component: Estimation of seasonal component by Method of simple averages, Ratio to Trend, Ratio to Moving Averages and Link Relative method, Deseasonalization.

UNIT-II

Time series as discrete parameter stochastic process. Auto-covariance and autocorrelation function and their properties. Exploratory Time Series Analysis, Tests for trend and Seasonality. Exponential and Moving Average Smoothing, Holt and Winters smoothing. Forecasting based on smoothing, Adaptive smoothing.

UNIT-III

Detailed study of the stationary processes: (1) moving average (MA), (2) Auto regressive (AR)., (3) ARMA and (4) AR integrated MA (ARIMA) models, Box Jenkins models, Discussion (without proof) of estimation of mean, auto covariance and autocorrelation functions under large sample theory, Choice of AR and MA periods. Estimation of ARIMA model parameters.

UNIT-IV

Fundamental Considerations in Business Forecasting, Methods of Statistical Forecasting, Data Mining for Forecasting: An Introduction, Process and Methods for Data Mining for Forecasting, Forecasting Performance Evaluation and Reporting, Process and Politics of Business Forecasting, Artificial Intelligence and Machine Learning in Forecasting: Deep Learning for Forecasting, Deep Learning For Forecasting: Current Trends And Challenges, Neural Network–Based Forecasting Strategies

Time Series Analysis and Business Forecasting Practical

List of Practical

1. Estimation of trend by free hand curve method, method of semi averages, fitting various mathematical curves (linear, parabolic and exponential), and growth curves
2. Method of moving averages
3. Detrending
4. Estimation of seasonal component by Method of simple averages, Ratio to Trend, Ratio to Moving Averages and Link Relative method
5. Deseasonalization
6. Moving average (MA), Auto regressive (AR)., ARMA and ARIMA models, Box

Jenkins models

7. Estimation of mean, auto covariance and autocorrelation functions

8. Statistical Forecasting

9. Data Mining for Forecasting

10. Artificial Intelligence and Machine Learning in Forecasting

Text Books:

1. Box, G.E.P., Jenkins, G. M. and Reinsel, G. C.: Time Series Analysis, Pearson Edition
2. Burr, I.W.: Engineering Statistics and Quality Control, McGraw-Hill
3. Grant, E.L. and Leavenworth, R.S.: Statistical Quality Control, McGraw-Hill.
4. Anderson, T.W. (1971).The Statistical Analysis of Time Series, Wiley, N.V.
5. Business Forecasting Michael Gilliland, Len Tashman, et.al. Wiley, 1st, 2021
6. Demand-Driven Forecasting: A Structured Approach to Forecasting Charles W. Chase, Jr. Wiley, 2nd, 2013

DSE-2: Applied Regression Analysis

Course Objectives:

❖ Develop an understanding of regression analysis and model building.

❖ Provide the ability to develop relationship between variables

❖ Investigate possible diagnostics in regression techniques

❖ Formulate feasible solution using regression model for real-life problems

UNIT-I

Simple Regression Analysis: Introduction to a linear and nonlinear model. Ordinary Least Square methods. Simple linear regression model, using simple regression to describe a linear relationship. Fitting a linear trend to time series data, validating simple regression model using t, F and p test. Developing confidence interval. Precautions in interpreting regression results.

Multiple Regression Analysis: Concept of Multiple regression model to describe a linear relationship, Assessing the fit of the regression line, inferences from multiple regression analysis, problem of over fitting of a model, comparing two regression model, prediction with multiple regression equation.

UNIT-II

Fitting Curves and Model Adequacy Checking: Introduction, fitting curvilinear

relationship, residual analysis, PRESS statistics, detection and treatment of outliers, lack of fit of the regression model, test of lack of fit, Problem of autocorrelation and heteroscedasticity. Estimation of pure errors from near neighbors.

Transformation techniques: Introduction, variance stabilizing transformations, transformations to linearize the model, Box Cox methods, transformations on the repressor's variables, Generalized and weighted least squares, Some practical applications.

UNIT-III

Multi collinearity: Introduction, sources of multi collinearity, effects of multi collinearity. Multi collinearity diagnostics: examination of correlation matrix, variance Inflation factors (VIF), Eigen system analysis of X1X. Methods of dealing with Multi collinearity: collecting additional data, model, re-specification, and ridge regression

Generalized Linear Models: link functions and linear predictors, parameter estimation and inference in the GLM, prediction and estimation with the GLM, Residual Analysis, and concept of over dispersion.

UNIT-IV

Model building and Nonlinear Regression: Variable selection, model building, model misspecification. Model validation techniques: Analysis of model coefficients, and predicted values, data splitting method. Nonlinear regression model, nonlinear least squares, transformation to linear model, parameter estimation in nonlinear system, statistical inference in nonlinear regression.

Contemporary issues: Research and Analytical problems on various applications of the regression analysis and predictive modeling.

TEXT BOOKS:

1.   Introduction to Linear Regression Analysis, Douglas C.Montgomery,Elizabeth A. Peck, G. Geoffrey Vining Wiley IndiaPvt. Ltd 3rd 2016

2.   Applied Regression Analysis, Norman R. Draper,Harry Smith, Wiley India Pvt. Ltd, 3rd, 2016

Applied Regression Analysis LAB

Practical:

Correlation coefficient, various types of correlation coefficients, partial and multiple, testing of hypotheses; Multiple linear regression analysis, partial regression

coefficients, testing of hypotheses, residuals and their applications in outlier detection; Handling of correlated errors, multicollinearity; Fitting of quadratic, exponential and power curves, fitting of orthogonal polynomials.

AECC/EV-I: Robotic Process Automation

Course Objectives:

❖ To make the students aware about the automation today in the industry.
❖ To make the students aware about the tools used for automation.
❖ To help the students automate a complete process

Unit-I

Robotic Process Automation: Scope and techniques of automation, About UiPath Record and Play: UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio, Task recorder, Step-by-step examples using the recorder. Sequence, Flowchart, and Control Flow: Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, Stepby-step example using Sequence and Flowchart, Step-by-step example using Sequence and Control flow

Unit-II

Data Manipulation: Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example, CSV/Excel to data table and vice versa (with a step-by-step example) Taking Control of the Controls : Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR, Avoiding typical failure points

Unit-III

Tame that Application with Plugins and Extensions: Terminal plugin, SAP automation, Java plugin, Citrix automation, Mail plugin, PDF plugin, Web integration, Excel and Word plugins, Credential management, Extensions – Java, Chrome, Firefox, and Silverlight Handling User Events and Assistant Bots: What are assistant bots?, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger ,Monitoring image and element triggers, An example of monitoring email, Example of monitoring a copying event and blocking it, Launching an assistant bot on a keyboard event.

Unit-IV

Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, Debugging techniques, Collecting crash dumps, Error reporting, Managing and Maintaining the Code: Project organization, Nesting workflows, Reusability of workflows, Commenting techniques, State Machine, When to use Flowcharts, State Machines, or Sequences, Using config files and examples of a config file, Integrating a TFS server Deploying and Maintaining the Bot: Publishing using publish utility, Overview of Orchestration

Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots, License management, Publishing and managing updates

TEXT BOOKS:

1. Learning Robotic Process Automation Alok Mani Tripathi   Packt 1st 2018
2. Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation Srikanth Merianda Createspace Independent Publishing, 1st, 2018
3. The Simple Implementation Guide to Robotic Process Automation (Rpa): How to Best Implement Rpa in an Organization, Kelly Wibbenmeyer , iUniverse ,1st 2018

SEMESTER – VI

CORE – 13: Reinforcement Learning

Course Objectives:

❖ To present the mathematical, statistical and computational challenges of building neural networks
❖ To study the concepts of deep learning
❖ To enable the students to know deep learning techniques to support real-time applications

UNIT-I

Applied Math and Machine Learning Basics: Linear Algebra: Scalars, Vectors, Matrices and Tensors , Multiplying Matrices and Vectors , Identity and Inverse Matrices, Linear Dependence and Span, norms, special matrices and vectors, Eigen decompositions. Machine Learning Basics: Learning Algorithms, Capacity, Over fitting and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, building a Machine Learning Algorithm, Challenges Motivating Deep Learning

UNIT-II

Deep Networks: Deep feed forward network, regularization for deep learning, Optimization for Training deep models

UNIT-III

Deep Networks: Convolutional Networks, Advanced Convolution network, Sequence Modelling, Applications. Deep Learning Research: Linear Factor Models, Auto encoders

UNIT-IV

Fundamentals of Reinforcement Learning: introduction, reinforcement learning as MDP, learnable functions in reinforcement learning, deep reinforcement learning algorithms, deep learning for reinforcement, reinforcement learning and supervised learning.

TEXT BOOKS:
1. Deep Learning Ian Goodfellow, Yoshua Bengio, Aaron Courvile, An MIT Press book 1st 2016
2. Fundamentals of Deep Learning, Nikhil Buduma O'Reilly 1st 2017
3. Deep Learning: Methods and Applications, Deng & Yu Now Publishers 1st 2013
4. Deep Learning Cook Book, Douwe Osinga O'Reilly 1st 2017

Reinforcement Learning Practical
List of Practical:

1.   To Write a program to implement Perceptron.
2.   To write a program to implement AND OR gates using Perceptron.
3.   To implement Crab Classification using pattern net

4.	To write a program to implement Wine Classification using Back propagation.
5.	To write a MatLab Script containing four functions Addition, Subtraction, Multiply and Divide functions
6.	Write a program to implement classification of linearly separable Data with a perceptron
7.	To study Long Short Term Memory for Time Series Prediction
8.	To study Convolutional Neural Network and Recurrent Neural Network
9.	To study ImageNet, GoogleNet, ResNet convolutional Neural Networks
10.	To study the use of Long Short Term Memory / Gated Recurrent Units to predict the stock prices based on historic data.

CORE – 14: Social Media Analytics and Knowledge Management

Course Objectives:

❖	Understand the fundamentals of social media analytics and its relevance in today's digital landscape.
❖	Learn different types of social media analytics and their applications, including customer profiling, location analytics, action analytics, mobile/app analytics, and Google Analytics.
❖	Gain knowledge of social network analysis, including network structure, egocentric networks, network metrics, and clustering techniques.
❖	Explore text analytics techniques used in social media, including data types, deployment models, and text mining algorithms.
❖	Develop practical skills in building recommender systems in social media using techniques such as association rule mining, collaborative filtering, and similarity measures

UNIT-I
Introduction to Social Media : Social Media Data, Social Media Intelligence & Listening, Social Media Monitoring Metrics, Types of Social Media tools, Theories in Media Research, Long Tail, electronic word-of-mouth (eWOM), Power Law& Popularity.

UNIT-II
Types of Social Media Analytics, Knowing your customers –Seven layer Approach, Location Analytics, Action Analytics, Mobile/App Analytics, Google Analytics.

UNIT-III
Social Network Analysis
Introduction to Networks, Common network terms, Network structure, Types of Networks, Egocentric Networks, Network analysis metrics, Strong and Weak Ties, Clustering and Grouping.
Text Analytics in Social Media: Text Analytics data types, Deployment models, Purpose of text analytics, Text analytics value creation cycle, Text Mining algorithms.

UNIT-IV
Recommender Systems in Social Media: Overview – Association rule mining – Collaborative filtering – User based similarity – Item-based similarity Hands-on: Recommender System.

Social Media Analytics and Knowledge Management Practical
List of Practical:
1. Social Media Intelligence & Listening
2. Social Media Monitoring Metrics
3. Tap into data from diverse social media platforms using the R ecosystem
4. Use social media data to formulate and solve real-world problems
5. Analyze user social networks and communities using concepts from graph theory and network analysis
6. Learn to detect opinion and sentiment, extract themes, topics, and trends from unstructured noisy text data from diverse social media channels
7. Understand the art of representing actionable insights with effective visualizations
8. Analyze data from major social media channels such as Twitter, Facebook, Flickr, Foursquare, Github, StackExchange, and so on
9. Learn to leverage popular R packages such as ggplot2, topicmodels, caret, e1071, tm, wordcloud, twittR, Rfacebook, dplyr, reshape2

TEXT BOOKS:

1. "Networks, Crowds, and Markets: Reasoning about a Highly Connected World" , David Easley and Jon Kleinberg, Cambridge University Press, 3rd Edition, 2017
2. "Analysing Social Media Networks with Node XL", "Derek Hansen Ben Shneiderman Marc Smith ItaiHimelboim, Morgan Kaufmann, 2nd Edition, 2019
3. "Social Media Mining: An Introduction", Huan Liu, Mohammad Ali Abbasi, and Reza Zafarani, Cambridge University Press, 1st Edition, 2014
4. Learning Social Media Analytics with R, Sarkar, Bali & Sharma, Packt

DSE-3: Deep Learning and Natural Language Processing

COURSE OBJECTIVES:

The main aim of this course is to provide fundamental knowledge of neural networks and deep learning. On successful completion of the course, students will acquire fundamental knowledge of neural networks and deep learning, such as Basics of neural networks, shallow neural networks, deep neural networks, forward & backward propagation process and build various research projects

UNIT – I

ARTIFICIAL NEURAL NETWORKS: The Neuron – Activation Function – Gradient Descent – Stochastic Gradient Descent – Back Propagation – Business Problem.
CONVOLUTIONAL NEURAL NETWORKS: Convolution Operation – ReLU layer – Pooling – Flattening – Full Conversion Layer – Softmax and Cross-Entropy.

UNIT – II

RECURRENT NEURAL NETWORKS: RNN intuition – Tackling Vanishing Gradient Problem – Long Short-Term Memory – Building a RNN – Evaluating the RNN – Improving the RNN – Tuning the RNN.

OVERVIEW AND LANGUAGE MODELING: Overview, Origins and challenges of NLP Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modeling: Various Grammar- based Language Models-Statistical Language Model.
WORD LEVEL AND SYNTACTIC ANALYSIS: Word Level Analysis: Regular Expressions Finite-State Automata-Morphological Parsing Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging.
Syntactic Analysis: Context-free Grammar Constituency- Parsing-Probabilistic Parsing.

UNIT – IV

Extracting Relations from Text: From Word Sequences to Dependency Paths: Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation. Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations. A Case Study in Natural Language Based Web Search: In Fact System Overview, The GlobalSecurity.org Experience.

TEXT BOOKS:

1. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly Media, 2017.
2. Li Deng and Dong Yu "Deep Learning Methods and Applications", Foundations and Trends in Signal Processing, 2013

Practical:

List of Experiments:

1. Implementing word similarity

2. Implementing simple problems related to word disambiguation

3. Simple demonstration of part of speech tagging.

4. Lexical analyzer.

5. Semantic Analyzer.

6. Sentiment Analysis.

AECC/EV-I: Data Security and Compliance

UNIT-I

- Introduction to digital data

- Types and states of digital data

UNIT-II

- Security vulnerabilities and breaches

- Detection, mitigation, and resilience

UNIT-III

- Privacy and anonymity concerns, Technical and ethical approaches

- Data Analytics and Machine learning

- Protecting the data models and analytics

UNIT-IV

- Laws and policies for data management

- Tools and processes for compliance

1ST SEMESTER BSC. ITM			
	SUB CODE		**SUB NAME**
MAJOR	CORE-I	PAPER-1	Data Structure Using C
	CORE-I	PAPER-2	Operating System
MINOR	CORE-II		Calculus & Analytic Geometry
	MULTI DISCIPLINARY		Physics
	AEC		Odia
	VAC		Environmental Studies And Disaster Management

Semester-I

Core I (PAPER-1)   **Data structure Using C**

Course Objectives:

The course is designed to provide complete knowledge of C language and its use in data structure. Students will be able to develop logics which will help them to write programs C. Also, by learning the basic programming constructs they can easily switch over to any other programming languages in future. It strengthens the ability of the students to identify and apply the suitable data structure for the given real-world problems. It enables them to gain knowledge in practical applications of data structures.

Course Outcome:
On completion of this course, the students will be able to
- Learn various elements of C language including data types, Operators, expressions, decision making implementation in programs.
- Write complex programs using arrays, structure, pointer & functions.
- Know the concept of stack, queue, linked list to represent data in various ways to solve real time applications.
- Search and sort the data using various searching and sorting methods.

Unit-I:

Introduction: Introduction to Programming Language, Character sets, Keywords & Identifiers, Constants, Variables, Input   and Output statements (Formatted and Unformatted), Data types and modifiers, Types of Operators, Precedence and associativity of operators.
Control statements (Simple IF Statement, IF…ELSE, Nested IF…ELSE, IF...ELSE...IF Ladder), Switch Statement. Looping: Do…WHILE, WHILE and FOR Loop. Array Concept (1D and 2D Array).
Outcome: Students will able to understand the basics of C language to write programs and to store the data using array.

Unit-II:
Pointers and its types, Pointer arithmetic, Array of Pointers, Pointer to pointer. Storage classes. Functions: Types, Function Calls, Recursion, String, Structure, Self-Referential Structure, Array of Structures, Union.

Outcome: Students will be able to understand the use of Pointers in data structures, can learn the reusability of codes through functions, can be able to write complex programs in C.

Unit-III:

Dynamic Memory allocation (calloc, malloc, realloc &, free). **Stack:** Definition, Representation, Stack operations, Applications (Infix– Prefix– Postfix Conversion & Evaluation). **Queues:** Definition, Representation, queue operations & Applications. **Linked Lists:** Definition, Types (Single and Doubly Linked List), representation, and Linked list insertion and deletion operations.
Outcome: Students will be aware of data arrangements and accessing those data for various real-time applications.

Unit-IV:

Trees: Tree Terminologies, Binary Tree, Representation, Binary search Tree, Traversing BST, Operations on BST, Heap Tree (max-Heap & Min-Heap). Sorting: Bubble Sort, Insertion Sort, Selection Sort, Quick Sort. Searching: Linear Search, Binary Search.
Outcome: Students will be able to search and sort the data and will come to know about the arrangements of data in a hierarchical manner.

Text Books:

- *E. Balagurusamy, "Programming in ANSIC",4/e, (TMH)*
- *Classic Data Structure, P. Samanta, PHI,2/ed*

Reference Books:
- *B. Kernighan &Dennis Ritchie, "The C Programming Language",2/ePHI*
- *Paul Deitel, Harvey Deitel, "C: How to Program",8/prentice Hall.*
- *P.C. Sethi,P.K. Behera,"Programming using C",Kalyani Publisher,Ludhiana*
- *Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Publications, 2000.*
- *Sastry C.V.,Nayak , R,Ch. Rajaramesh, Data Structure & Algorithms, I.K. International Publishing House Pvt .Ltd, New Delhi.*

Practical

Tutorial C & Data Structure Lab Write C'

- Basic programs in C language.
- Programs using conditional statements (if. else, else if ladder, nested if, switch case)
- Programs using various loops
- Programs using 1D, 2D and multidimensional array.
- Program based on pointers.
- Programs using functions, recursion and strings.
- Programs based on structure and union.
- Programs on command line arguments.
- To search an element and print the total time of occurrence in the array.
- To delete all occurrence of an element in an array.
- Array implementation of Stack.
- Array implementation of Linear Queue.
- To implement linear linked list and perform different operations such as node insert and delete, search of an item, reverse the list.
- To implement double linked list and perform different operations such as node insert and delete.
- Linked list implementation of Stack.
- Linked list implementation of Queue.
- To implement a Binary Search Tree.
- To perform binary search operation.
- Bubble sort, Insertion sort, Selection sort, Quicksort.

Core-I (PAPER-2)

Operating Systems

Course Objectives:

This course has two components: a theory component to teach you the concepts and principles that underlie modern operating systems, and a practice component to relate theoretical principles with operating system implementation. In the theory component, you will learn about processes and processor management, concurrency and synchronization, memory management schemes, file system and secondary storage management, security and protection, etc.

Course Outcome: On completion of this course, students will be able to

- Understand the different services provided by Operating System at different level.
- Learn real life applications of Operating System in every field.
- Understand the use of different process scheduling algorithm and synchronization techniques to avoid deadlock.
- Learn different memory management techniques like paging, segmentation and demand paging etc.

Unit-I:

Introduction to Operating System, System Structures: Operating system services, system calls, system programs, Operating system design and implementation, Operating system structure.
Outcome: Students will be able to know the basic components and services of operating system.

Unit-II:

Process Management: Process Concept, Operations on processes, Process scheduling and algorithms, Inter-process Communication, Concepts on Thread and Process, Deadlocks: Deadlock detection, deadlock prevention and deadlock avoidance fundamentals.
Outcome: Students will be able to discuss various scheduling algorithms and know the concept of deadlock.

Unit-III:
Memory Management Strategies: Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory Management: Concepts, implementation (Demand Paging), Page Replacement, Thrashing.
Outcome: Students will be able to comprehend how an operating system virtualizes CPU and memory.

Unit-IV:

Storage Management: File System concept, Access Methods, File System Mounting, File Sharing and File Protection, Implementing File Systems, Kernel I/O Systems.
Outcome: Students will be able to understand the functionality of file systems.

Text Books:
- *Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, Eighth Edition, WileyStudentEdition2009.*

Reference Books:
- *Modern Operating System, Tanenbaum, Pearson,4/Ed.2014.*
- *Richard F Ashley, Linux with Operating System Concepts, Chapman and Hall/CRC Published, August 26, 2014.*
- *Richard Blum, Linux Command Line and Shell Scripting Bible, O' Reilly.*

Core II- Operating Systems Lab
- Write a program (using *fork()* and/or *exec()* commands) where parent and child execute: same program, same code. same program, different code. Before terminating, the parent waits for the child to finish its task.
- Write a program to report behavior of Linux kernel including kernel version, CPU type and model. (CPU information)
- Write a program to report behavior of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
- Write a program to print file details including owner access permissions, file access time, where file name is given as argument.
- Write a program to copy files using system calls.
- Write a program using C to implement FCFS scheduling algorithm.
- Write a program using C to implement Round Robin scheduling algorithm.
- Write a program using C to implement SJF scheduling algorithm.
- Write a program using C to implement non-preemptive priority-based scheduling algorithm.
- Write a program using C to implement preemptive priority-based scheduling algorithm.
- Write a program using C to implement SRTF scheduling algorithm.
- Write a program using C to implement first-fit, best-fit and worst-fit allocation strategies.

MINOR Core I

Calculus & Analytic Geometry

Course Objective:

The main emphasis of this course is to equip the student with necessary analytic and technical skills to handle problems of mathematical nature as well as practical problems. More precisely, main target of this course is to explore the different tools for higher order derivatives to plot the various curves and to solve the problems associated with differentiation and integration of vector functions.

Learning Outcomes:

After completing the course the student will be able to

- Trace a curve and find asymptotes.
- Talculate integrals of typical type using reduction formulae, etc.
- Calculate arc length, surface of revolution and know about conics
- Calculate triple products, gradient divergence, curl, etc.

Unit I

Hyperbolic functions, higher order derivatives, Leibnitz rule and its applications to problems of the type $e^{ax+b}sinx$, $e^{ax+b}cosx$, $(ax + b)^n sinx$, $(ax + b)^n cosx$, concavity and inflection points, asymptotes, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves, L'Hospital rule, application in business, economics and life sciences.

Unit II

Riemann integration as a limit of sum, integration by parts, reduction formulae, derivations and illustrations of reduction formulae of the type $\int sin^n x dx, \int cos^n x dx, \int tan^n x dx, \int sec^n x dx,$ $\int (logx)^n dx, \int sin^n x cos^n x dx$, definite integral, integration by substitution.

Unit III

Volumes by slicing, disks and washers methods, volumes by cylindrical shells, parametric equations, parameterizing a curve, arc length, arc length of parametric curves, area of surface of revolution, techniques of sketching conics, reflection properties of conics, rotation of axes and second degree equations, classification into conics using the discriminant, polar equations of conics.

Unit IV

Triple product, introduction to vector functions, operations with vector-valued functions, limits and continuity of vector functions, differentiation, partial differentiation, div, curl and integration of vector functions, tangent and normal components of acceleration.

Books Recommended:

- ✓ *H. Anton, I. Bivens and S. Davis: Calculus,10th Ed., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.*

- ✓ *Shanti Narayan, P. K. Mittal: Differential Calculus, S. Chand, 2014.*
- ✓ *R. J. T Bell: An elementary Treatise on coordinate geometry, MacMillan and Company Limited, 2005.*

Books for Reference:
- ✓ *James Stewart: Single Variable Calculus, Early Transcendental, 8th edition, Cengage Learning, 2016.*
- ✓ *G.B. Thomas and R. L. Finney: Calculus, 9th Ed., Pearson Education, Delhi, 2005.*
- ✓ *M. J. Strauss, G. L. Bradley and K. J. Smith: Calculus, 3rd edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.*
- ✓ *Suggested digital platform: NPTEL/SWAYAM/MOOCs.*
- ✓ *e-Learning Source http://ndl.iitkgp.ac.in ; http://ocw.mit.edu ; http://mathforum.org*

<div align="center">**MULTI DISCIPLINARY**</div>

Physics

Course objective:

The course has objectives to provide Basic knowledge of Physics with a special reference to electronics part. Students will be able to know the fundamentals of electronics devices.

Course Outcome:

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

- Understand the basic of electric current as they have to deal with electronic devices.
- Get idea regarding semiconductor and components like diode.
- Know the fundamentals of transistor

UNIT-I

Electric Current, Electric Currents in Conductors, Ohm's law, Drift of Electrons and the Origin of Resistivity, Limitations of Ohm's Law, Resistivity of Various Materials, Temperature Dependence of Resistivity, Electrical Energy, Power, Cells, emf, Internal Resistance, Cells in Series and in Parallel, Kirchhoff's Rules, Wheatstone Bridge

UNIT-II

Semiconductor: Bonds in Semiconductors, Crystals, Commonly Used Semiconductors, Energy Band Description of Semi- conductors, Effect of Temperature on Semi-conductors, Hole Current, Intrinsic & Extrinsic Semiconductor, n-type & P-Type Semiconductor, Charge on n- type and p-type Semiconductors, Majority and Minority, Carriers.

UNIT-III

Properties of pn-Junction, Applying D.C. Voltage across pn- Junction or Biasing a pn-Junction, Current Flow in a Forward Biased pn-Junction, Volt-Ampere Characteristics of pn Junction, Important Terms, Limitations in the Operating Conditions of pn- Junction.

UNIT-IV

Transistor, Some Facts about the Transistor, Transistor Symbols, Transistor Connections, Characteristics of Common Base Connection, Measurement of Leakage Current, Common Collector Connection, Commonly Used Transistor Connection, Transistor Load Line Analysis, Practical Way of Drawing CE Circuit, Performance of Transistor, Amplifier, Power Rating of Transistor, Semiconductor Devices Numbering System

ସାମର୍ଥ୍ୟବର୍ଦ୍ଧକ ପାଠ୍ୟକ୍ରମ

Ability Enhancement Course (AEC)

ପରିଶୁଦ୍ଧ ଭାଷା ଓ ଲିଖନ ଧାରା

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ସାହିତ୍ୟର ଶିକ୍ଷଣ ଓ ଅଧ୍ୟୟନ କ୍ଷେତ୍ରରେ ଭାଷାର ପରିଶୁଦ୍ଧତା ନିତାନ୍ତ ଆବଶ୍ୟକ । ସାହିତ୍ୟକର୍ମ ବାଡ଼ିରେଖ ଦିଧିନକ୍ଷେତ୍ରରେ ନିର୍ଭୁଲଭାଷା ବ୍ୟବହାର ହେବା ବାଞ୍ଛନୀୟ । ଭାରତର ସମ୍ବିଧାନସ୍ୱୀକୃତ ଭାଷାମାନଙ୍କ ମଧ୍ୟରେ ଓଡ଼ିଆଭାଷାର ସ୍ଥାନ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ । ଶିକ୍ଷାର୍ଥୀମାନେ ନିର୍ଭୁଲ ଭାଷା ପ୍ରୟୋଗକ୍ଷେତ୍ରରେ ଦିପଟି ସମର୍ଥ ହେବେ, ସେଥିନିମିତ୍ତ ଏହି ପାଠ୍ୟପଦ୍ଧତି ପରିକଳ୍ପିତ । ଦିଜିଟ ପ୍ରତିଯୋଗିତାମୂଳକ ତଥା ପ୍ରଣାଳୀକ ସେବାମୂଳକ ନିଯୁକ୍ତ ହେବାପାଇଁ ସମ୍ବୁଖୀନ ହେଉଥିବା ପରୀକ୍ଷାନିମିତ୍ତ ମଧ୍ୟ ଏହା ଶିକ୍ଷାର୍ଥୀଙ୍କୁ ସାହାଯ୍ୟ କରିବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି):

୧ମ ଏକକ: କ) ଶବ୍ଦ ଗଠନରେ ଶୁଦ୍ଧତା

ଖ) ତୃଦ୍ଧିର ଅର୍ଥ ଅବଗତି

ଗ) ତୃଦ୍ଧିର ପ୍ରୟୋଗବିଧି ଶିକ୍ଷା

୨ୟ ଏକକ: କ) ବାକ୍ୟର ଗଠନରୀତି ଶିକ୍ଷା

ଖ) ବିବିଧ ପ୍ରକାର ବାକ୍ୟ ସମ୍ପର୍କରେ ଧାରଣା

ଗ) ନିର୍ଭୁଲ ବାକ୍ୟଲିଖନ ବିଦ୍ୟା

୩ୟ ଏକକ: କ) ବୃହତ୍ ଅନୁଚ୍ଛେଦକୁ ସଂକ୍ଷିପ୍ତ କରିବାର କୌଶଲ

ଖ) ବିଷୟଗତ ଶୀର୍ଷକ ନିର୍ଦ୍ଧାରଣ କଳା

ଗ) ଅନୁଚ୍ଛେଦରୁ ବିବିଧ ପ୍ରଶ୍ନର ଉତ୍ତର ପ୍ରଦାନ

୪ର୍ଥ ଏକକ: କ) ଜ୍ଞଲିଖନ ଜ୍ଞାନ

ଖ) ଫିଚର୍ ପ୍ରସ୍ତୁତି

ଗ) ନିର୍ଭୁଲ ପତ୍ରଲିଖନ ଓ ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି କଳା

ପାଠ୍ୟ ବିଷୟ

ପ୍ରଥମ ଏକକ: (କ) ଶବ୍ଦର ସଂଜ୍ଞା, ଶୁଦ୍ଧ ଶବ୍ଦ ଓ ବର୍ଣ୍ଣାଶୁଦ୍ଧି

(ଖ) ତୃଦ୍ଧିର ଅର୍ଥ ଓ ପ୍ରୟୋଗ ବିଧ

ଦ୍ୱିତୀୟ ଏକକ: ବାକ୍ୟ ଗଠନରୀତି ଓ ପ୍ରକାର ଭେଦ

ତୃତୀୟ ଏକକ: ଅନୁଚ୍ଛେଦ ସଂକ୍ଷେପଣ, ଶୀର୍ଷକ ନିର୍ଦ୍ଧାରଣ ଓ ପ୍ରଶ୍ନୋତ୍ତର

ଚତୁର୍ଥ ଏକକ: ନିର୍ଭୁଲ ଲିଖନ ପଦ୍ଧତି, ଜ୍ଞ ଲିଖନ, ଫିଚର୍, ପତ୍ର ଲିଖନ, ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି

ସହାୟକ ଗ୍ରନ୍ଥସୂଚୀ (Book of reference) :

୧. ସର୍ବସାର ବ୍ୟାକରଣ - ଶ୍ରୀଧର ଦାସ, ଗ୍ରନ୍ଥ ମନ୍ଦିର, କଟକ ।

୨. ସାରସ୍ୱତ ବ୍ୟାବହାରିକ ବ୍ୟାକରଣ - କୃଷ୍ଣଚନ୍ଦ୍ର ପ୍ରଧାନ, ସତ୍ୟ ନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର ।

୩. ବୃହତ ଓଡ଼ିଆ ବ୍ୟାକରଣ- ତ୍ରିଲୋଚନ ଦେହେରୀ, ଗୋବିନ୍ଦ ଚନ୍ଦ୍ର ଲେଙ୍କା, ଫ୍ରେଣ୍ଡସ୍ ପବ୍ଲିଶର୍ସ, କଟକ ।

୪. ଆଧୁନିକ ଓଡ଼ିଆ ବ୍ୟାକରଣ- ଧନେଶ୍ୱର ମହାପାତ୍ର, କିତାବ୍ ମହଲ, କଟକ ।

୫. ସାଧାରଣ ଓଡ଼ିଆ ବନାନ ଶୁଦ୍ଧି- ଓଡ଼ିଆ ଭାଷା ପ୍ରତିଷ୍ଠାନ, ଭୁବନେଶ୍ୱର ।

୬. ଗଣମାଧମ ଓ ଗଣଯୋଗାଯୋଗ – ଶିଶିର ଦେହେରୀ, ଫ୍ରେଣ୍ଡସ୍ ପବ୍ଲିଶର୍ସ, କଟକ ।

୭. ଯୋଗାଯୋଗ ମୂଳକ ମାତୃଭାଷା – ଦିବ୍ୟସିଂ ନାରାୟଣ ସାମଲ, ସତ୍ୟନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର, କଟକ ।

୮. ଯୋଗାଯୋଗର ଭାଷା – ସୁଧୀର ଚନ୍ଦ୍ର ମହାନ୍ତି, ପ୍ରାଚୀ ପ୍ରକାଶନ, କଟକ ।

୯. ନିର୍ଭୁଲ ଲେଖାର ମୂଳସୂତ୍ର, ନୀଳାଦ୍ରି ଭୂଷଣ ହରିଚନ୍ଦନ, କିତାବ ମହଲ, କଟକ ।

୧୦.ଓଡ଼ିଆ ଭାଷା ବ୍ୟାକରଣ ସୌରଭ, ଚନ୍ଦ୍ରଶେଖର ପତି, ଓଡ଼ିଶା ବୁକ୍ ଏମ୍ପୋରିୟମ୍, କଟକ ।

ନମୁନା ପ୍ରଶ୍ନ (Sample Questions) :

୧. ଶବ୍ଦ କାହାକୁ କୁହାଯାଏ ? (୧ ମାର୍କ)

୨.ପର୍ବତର ଦୁଇଟି ପ୍ରତିଶବ୍ଦ ଲେଖ । (୨ ମାର୍କ)

୩.ବାକ୍ୟର ପ୍ରକାରଭେଦ ଦର୍ଶାଅ। (୫ ମାର୍କ)

୪.ତୁମ ମହାବିଦ୍ୟାଳୟରେ ଏକ ଶିକ୍ଷକ ନିଯୁକ୍ତିପାଇଁ କୌଣସି ସମ୍ବାଦପତ୍ରରେ ଓଡ଼ିଆ ଭାଷାରେ କିପରି ବିଜ୍ଞାପନ ଦିଆଯିବ,

ତାହାର ଏକ ନମୁନା ଲେଖ । (୮ ମାର୍କ)

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SEMESTER-I

AEC

प्रयोजनमूलक हिंदी

UNIT - I

प्रयोजनमूलक हिंदी :

प्रयोजनमूलक हिंदी का स्वरूप और परिभाषा, प्रयोजनमूलक हिंदी के भेद, प्रयोजनमूलक हिंदी की विशेषताएँ, प्रयोजनमूलक हिंदी की समस्याएँ और संभावनाएँ

UNIT - II

राजभाषा हिंदी की संवैधानिक स्थिति:

राजभाषा समिति, 1957, राजभाषा के संबंध में राष्ट्रपति के आदेश, 952, 1955, 1960, राजभाषा अधिनियम 1963, राजभाषा अधिनियम 1967, राजभाषा अधिनियम 1976

UNIT - III

कार्यलयी हिंदी:

हिंदी के विविध रूप : राजभाषा, राष्ट्रभाषा, संपर्क भाषा, संचार भाषा, मातृभाषा, सर्जनात्मक भाषा राष्ट्रभाषा और राजभाषा में अंतर, मानक हिंदी

कार्यालयी हिंदी के प्रमुख प्रकार्य

आलेखन: परिभाषा, स्वरूप, विशेषता, प्रारूप

टिप्पण: परिभाषा, स्वरूप, विशेषता, प्रारूप

पत्रलेखन, पल्लवन, संक्षेपण

पारिभाषिक शब्दावली : पारिभाषिक शब्दावली का स्वरूप एवं महत्त्व पारिभाषिक शब्दावली निर्माण के सिद्धांत, पारिभाषिक शब्दावली के भेद, ज्ञान-विज्ञान के विभिन्न क्षेत्रों में प्रयुक्त कुछ निर्धारित पारिभाषिक शब्दाबली

UNIT – IV

हिंदी में कंप्यूटर का अनुप्रयोग:

कंप्यूटर का परिचय, कंप्यूटर की संरचना, कंप्यूटर के प्रकार, कंप्यूटर की उपयोगिता, हिंदी में शब्द संसाधन, हिंदी में डाटा संसाधन, वेब पब्लिशिंग, वेब पेज डिजाइनर

इंटरनेट :

इंटरनेट स्वरूप और विकास इंटरनेट : कार्यप्राणाली, इंटरनेट के संपर्क उपकरणों का परिचय, इंटरनेट एक्सप्लोटर, इंटरनेट की अनुप्रयुक्तता।

लिंक, ई-मेल, ब्राउजिंग, अपलोडिंग, डाउनलोडिंग, न्यू मीडिया, वेब पत्रकारिता, ब्लागिंग, इंटरनेट रिलै चैट, हिंदी के प्रमुख इंटरनेट पोर्टल।

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पाठ्य पुस्तक:

1. प्रयोजनमूलक हिंदी-   प्रो. राधाकांत मिश्र,

डॉ. अमूल्य रत्न महांती,

प्लैनेट वी, हिंदी बुक सेंटर, बादामबाड़ी, कटक

VAC
Environmental Studies
&
Disaster Management

SEMESTER-I
For Under Graduate Compulsory Courses for Arts, Science and Commerce

FULL MARK-100 (Credit-3)

Unit 1: Multidisciplinary nature of environmental studies   (8Period)
Definition, scope and importance
Need for public awareness
Environmental Pollution
Definition
• Cause, effects and control measures of:-
a.   Air pollution
b.   Water pollution
c.   Soil pollution
d.   Marine pollution
e.   Noise pollution
f.   Radiation pollution

Unit 2: Natural
Resources: (8Period)

Renewable and non-renewable resources:
Natural resources and associated problems.
a.   Forest resources: Use and over-exploitation, deforestation, case studies.
         Timber extraction, mining, dams and their effects on forest and tribal people.
    b.   Water resources : Use and over-utilization of surface and ground water,
         floods, drought, conflicts over water, dams-benefits and problems.
    c.   Mineral resources : Use and exploitation, environmental effects of extracting
         and using mineral resources, case studies.
    d.   Food resources : World food problems, changes caused by agriculture and
         Overgrazing, effects of modern agriculture, fertilizer-pesticide problems,
         waterlogging, salinity, case studies.
    e.   Energy resources : Growing energy needs, renewable and non-renewable
         energy sources, use of alternate energy sources. Case studies.
Biodiversity:-
Introduction-Definition; Biogeographically classification of India
India as a mega diversity nation. Hot sports of biodiversity, Threats to biodiversity.
Endangered and endemic species of India. Conservation of biodiversity. In Situ and Ex-so
conservation of biodiversity

Unit-3: Disaster Management   (8 Period)

1. **Disaster Management:** Types of disasters (natural and Man-made) and their causes and effect)
2. **Vulnerability Assessment and Risk analysis:** Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves, Desertification and Lighting)
3. **Institutional Framework:** Institutional arrangements for disaster management (National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), Disaster Management Act, 2005, District Disaster Management Authority (DDMA), National Disaster Response Force(NDRF) and Odisha Disaster Rapid Action Force(ODRAF)
4. **Preparedness measures:** Disaster Management cycle, Early Warning System, Pre-Disaster and Post-Disaster Preparedness, strengthening of SDMA and DDMA, Community Preparedness for flood cyclone, heat waves, fire safety, lightening and snake biting. Stakeholders participation, Corporate Social Responsibility (CSR)
5. **Survival Skills:** Survival skills adopted during and after disaster (Flood, Fire, Earthquake, Cyclone and Lightening), Disaster Management Act-2005, Compensation and Insurance

Unit 4: Social Issues and the Environment   (6 Period)

A.

a.   Environmental Ethics: Issues and possible solutions.
b.   Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies
   c.   Environment Protection Act
d.   Air(Preservation Control of Pollution) Act
e.   Water(Preservation Control of Pollution) Act
f.   Wildlife Protection Act
g.   Forest Conservation Act
h.   Solid waste management Cause, effect and Control Measure of Urban and Industrial waste
        (Role of each individual in conservation of Natural resources and prevention of pollution)
   B. Human Population and the Environment
        Population Ecology: Individuals, species, population, community
        Human population growth, population control method
        Urbanisation and its effect on society

Unit 5: Field work   (15 Periods of 30 hrs)
   • Visit to an area to document environmental assets: river/forest/flora/fauna, etc.
   • Visit to a local polluted site- Urban/Rural/Industrial/Agricultural
   • Study of common plants, insects, birds and basic principles of identification.
   • Study of simple ecosystems-pond, river, Delhi Ridge ,etc.

BSc. ITM 2ND SEMESTER (NEP 2020)

SUBJECT CODE	SUBJECT NAME
MAJOR-P-3	Principle of Management
MAJOR-P-4	JAVA Programming
MINOR-2-P-1	Mathematical Physics-I
MDC-2	Computer Fundamental
AEC-2	English
SEC-1	Analytical Thinking & Logical Reasoning

Semester-II

Core III   **Principle of Management**

Course Objectives:

The objective of this course is to help the students to get aware towards varied management principles and practices. This course covers the explanations about the fundamentals of management disciplines in organizational context. It details the different functions of management such as planning, organizing, staffing, directing and controlling.

Course Outcome: On completion of this course, students will be able to

- UnderstandtheconceptsrelatedtoBusiness.
- Demonstratetheroles,skillsandfunctionsofmanagement.
- Focusonthetheoriesofmanagement.
- Demonstrateaclearunderstandingoftheconcepts,tools&techniquesuse dbyexecutives in developing and executing strategies and will appreciate its integrative andinterdisciplinarynature.

Unit-I:
- **Nature of Management:** Meaning, Definition, importance & Functions, Nature ofManagementasArt,Science&Profession,levelsofmanagement, managerialtasksandskills.
- **DifferentSchoolsofThoughts:**ClassicalSchool-contributionsofTaylorandHenriFayolNeo-classical School-Human Relations approach and Behavioural Science Approach;ModernSchool;SystemapproachandContingencyapproach.
- **Outcome:** The students will be able to understand the basic concepts, principles, approaches and practices of management. It inculcates the ability to apply multifunctional approach to organizational objective.

Unit-II:

- **Planning-**Meaning-Need&Importance,types, –advantages&limitations,**Forecasting**-Need & Techniques, **Decision making** - Types - Process of rational decision making &techniquesofdecision making,

- **Organizing-** Concept, importance, principles, different organization models-line and staff;Functional;Departmentation-need,basis,principles,**DelegationofAuthority**-Elements,stepsbarriers; Centralization and Decentralization of Authority; Span of Management; conceptanddeterminingfactors.

- **Outcome:** The students will be able to have a conceptual knowledge about the planning and decision making and also able to apply the concept of organizing for the effective functioning of management.

Unit-III:

- **Staffing -** Meaning & Importance. **Directing**: concepts, importance of directing, Leadership:Concept,importance,types,leadershiptraits,Tannenbaum&Schmidt'sModelandBlake&Mouton'sModel.

- **Outcome:** The students will be able to evaluate leadership style to anticipate the consequences of each leadership style, diagnose qualities of efficient leadership, and able to demonstrate elements of directing and its applications.

Unit-IV:

- **Motivation:** Concept, importance, importance of need theory, and contributions ofMcGregor, Maslow, Herzberg. Coordination: concepts, importance, principles andimplementationtechniques.Control:concepts,importance, processandtoolsofcontrol.

- **Outcome:** The students will be able to demonstrate clear understanding of the concepts, tools and models of Motivation, coordination and controlling.

Text Books:

- ✓ *HaroldKoontzandIteinzWeibrich,EssentialofManagement,McGrawHills International.*
- ✓ *K.Aswathapa,EssentialofBusinessAdministration,HimalayaPublishingHouse.*

Reference Books:

- ✓ *L.M.PrasadPrinciples&practiceofmanagement-SultanChand&Sons–NewDelhi.*
- ✓ *Tripathi,Reddy,PrinciplesofManagement,TataMcGrawHill.*

Core III- **Project Work**

Guidelines for the Project:

Project is an assignment tostrengthen the understanding of fundamentals through effectiveapplication of theoretical concept. The objective of the project course is to help the student developability to apply multidisciplinary concepts, tools and techniques to solve organizational problems.Theproject maybefromanyoneofyourareasrelatedtotheconcernedsubject.

Projectreport: TheProjectReportmusthavethefollowing.

- CoverPage–musthavethenameandrollno.ofthestudentandthename& designationoftheguidealongwiththetitleoftheProject.
- Acknowledgement,declaration,Certificateoforiginalitysignedbytheguidewithdate
- Detailedtables&figuresofcontentswithpagenos.
- AllpagesoftheProjectReportmustbenumberedasreflectedinIndexofChapters.

Index of Chapters:

- Chapter-I:Introduction&Reviewofliteratures
- Chapter-II: ResearchMethodology
- Chapter-III:Conceptual& TheoreticalDescriptions
- Chapter-IV:DataAnalysis&Interpretations
- Chapter-V:Conclusion,Findings,suggestions&Scopeforfurtherresearch.
- References,Annexure,etc.

Core IV   **Java Programming**

Course Objectives:
- Tounderstandthebasicconceptsandfundamentalsofplatformindependentobject-orientedlanguage.
- Todemonstrateskillsinwritingprogramsusingexceptionhandlingtechniquesandmulti threading.
- Tounderstandstreamsandefficientuserinterfacedesigntechniques.
- UsethesyntaxandsemanticsofjavaprogramminglanguageandbasicconceptsofOOP.

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

- Developreusableprograms usingtheconcepts of inheritance,polymorphism, interfacesandpackages.
- ApplytheconceptsofMultithreadingandExceptionhandlingtodevelopefficient anderrorfreecodes.
- DesigneventdrivenGUIandwebrelatedapplicationswhichmimictherealwordscenarios

Unit-I:

Introduction to Java: Java History, Architecture and Features, Understanding the semantic andsyntax differences between C++ and Java, Compiling and Executing a Java Program, Variables,Constants, Keywords (super, this, final, abstract, static, extends, implements, interface) , DataTypes,Wrapper class,Operators(Arithmetic,LogicalandBitwise)andExpressions,Comments,Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) andNesting,JavaMethods(Defining,Scope,PassingandReturningArguments,TypeConversion and Type and Checking, Built-in Java Class Methods). Input through keyboard using CommandlineArgument,theScannerclass,BufferedReaderclass.
Outcome: Students will be able to identify java language components and how they work together in applications.

Unit-II:

Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining& Using Classes, Class Variables & Methods, Objects, Object reference, Objects as parameters,in all classes, Garbage Collection. Constructor-types of constructor, this keyword, super keyword.MethodoverloadingandConstructoroverloading.Aggregationvs Inheritance,Inheritance:extends vs implements, types of Inheritance, Interface, Up-Casting, Down-Casting, Auto-Boxing,Enumerations,Polymorphism,MethodOverridingandrestrictions.Package:Pre-definedpackagesandCustompackages.
Outcome: Students will be able to solve real world problem using OOP techniques.

Unit-III:

Arrays: Creating & Using Arrays (1D, 2D, 3D and Jagged Array), Array of Object, ReferencingArrays Dynamically. Strings and I/O: Java Strings: The Java String class, Creating & Using StringObjects, Manipulating Strings, String Immutability & Equality, and Passing Strings to & fromMethods, String Buffer Classes and String Builder Classes. IO package: Understanding StreamsFileclassand itsmethods,Creating,Reading,Writingusing

Classes: Byte and Character streams, File Output Stream, File Input Stream, File Writer, FileReader,InputStreamReader,PrintStream,PrintWriter.CompressingandUncompressing File.

Outcome: Students will be able to solve the various problems in array and string, working with file.

Unit-IV:

ExceptionHandling,Threading,NetworkingandDatabaseConnectivity:Exceptiontypes,uncaught exceptions, throw, built-in exceptions, creating your own exceptions; Multi-threading:TheThreadclassandRunableinterface,creatingsingleandmultiplethreads,Threadprioritization, synchronizationandcommunication, suspending/resumingthreads.Usingjava.netpackage,OverviewofTCP/IPandDatagramprogramming.Accessingandmanipulatingdatabasesusing JDBC.

Outcome: Students will be able to develop multithreaded applications with synchronization, working with how to handle exception.

Text Books:

✓ *E.Balagurusamy,"ProgrammingwithJava",TMH,4/Ed.*

Reference Books:

✓ *HerbertSchildt,"TheCompleteReferencetoJava",TMH,10/Ed.*

Core IV- Java Programming Lab

Write the following programs using Java

- Tofindthesumofanynumberofintegersenteredascommandlinearguments.
- Tofindthefactorialofa givennumber.
- Toconvertadecimaltobinarynumber.
- Tocheckifanumberisprimeornot,bytakingthenumber asinputfromthekeyboard.
- To find the sum of any number of integers interactively, i.e., entering every number fromthekeyboard,whereasthetotalnumberofintegersisgivenasacommandlineargument.
- Write a program that show working of different functions of String and String BufferclasseslikesetCharAt(),setLength(),append(),insert(),concat()andequals().
- Writea programto createa–"distance"classwith methodswheredistanceiscomputedin terms of feet and inches, how to create objects of a class and to see the use of thispointer.
- Modify the– "distance" class by creating constructor for assigning values (feet andinches) to the distance object. Create another object and assign second object as referencevariable to anotherobject reference variable. Further create a third object which is a cloneofthefirstobject.
- Write a program to show that during function overloading, if no matching argument isfound,thenJavawillapplyautomatictypeconversions (fromlowertohigher datatype).
- Write a program to show the difference between public and private access specifiers.The program should also show that primitive data types are passed by value and objectsarepassedbyreferenceandtolearn useoffinalkeyword.
- Write a program to show the use of static functions and to pass variable length argumentsinafunction.
- Write a program to create a multilevel package and also creates a reusable class togenerate Fibonacci series, where the function to generate Fibonacci series is given in adifferentfilebelongingto thesamepackage.
- Write a program – "Divide by Zero" that takes two numbers aand b as input,computes a/b,andinvokesArithmeticExceptiontogenerate amessagewhen thedenominatoriszero.
- Writeaprogramto showtheuseofnestedtrystatementsthatemphasizesthe sequenceofcheckingforcatchhandlerstatements.
- Writea programtocreateyourownexceptiontypestohandlesituation specifictoyourapplication (Hint: Define a sub class of Exception which itself is a sub class of Throwable).
- Writeaprogramtodemonstrateprioritiesamongmultiplethreads.
- Write a program to demonstrate different mouse handling event like mouseClicked (),mouseEntered (),mouseExited (),mousePressed (),mouseReleased ()& mouseDragged ().
- Writeaprogramtodemonstratedifferentkeyboardhandlingevents.
- Writeaprogramtodemonstratetheconceptofboxingandunboxing.

- Create a multi-file program where in one file a string message is taken as in put from theuserandthe functiontodisplaythemessageonthe screenisgiveninanotherfile(makeuseofScannerpackagein thisprogram).
- Write a program that creates illustrates different levels of protection in classes/sub classesbelongingtosamepackageordifferentpackages

Mathematical Physics-I

Course Outcomes
- Basic understanding of Differential equations and their solutions, conceptual understanding of calculus.
- Basic understanding of vector calculus and its differentiation.
- Use of vector calculus to understand vector integration. Dirac delta function and its properties.
- Understanding of orthogonal curvilinear coordinates and its application in vector differentiation.
- To understand the basic algorithm in application to functional algebra and error analysis.

Unit I
- **Calculus -I:** Plotting of functions, Intuitive ideas of continuous, differentiable functions and plotting of curves, Approximation: Taylor and binomial series (statements only), First Order Differential Equations and Integrating Factor, Second Order Differential equations: Homogeneous Equations with constant coefficients, Wronskian and general solution, Statement of existence and Uniqueness Theorem for Initial Value Problems, Particular Integral.

- **Calculus-II:** Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor with simple illustration, Constrained Maximization using Lagrange Multipliers,

Unit II
- **Vector algebra:** Recapitulation of vectors: Properties of vectors under rotations. Scalar product and its invariance under rotations, Vector product, Scalar triple product and their interpretation in terms of area and volume respectively, Scalar and Vector fields.

- **Vector Differentiation:** Directional derivatives and normal derivative, Gradient of a scalar field and its geometrical interpretation, Divergence and curl of a vector field, Del and Laplacian operators, Vector identities.

Unit III

- **Vector Integration:** Ordinary Integrals of Vectors, Multiple integrals, Jacobian, Notion of infitesimal line, surface and volume elements, Line, surface and volume integrals of Vector fields, Flux of a vector field, Gauss' divergence theorem, Green's and Stokes Theorems and their applications (no rigorous proofs)
- **Dirac Delta function and its properties:** Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function, Properties of Dirac delta function

Unit IV

Orthogonal Curvilinear Coordinates: Orthogonal Curvilinear Coordinates, Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems, Comparison of velocity and acceleration in cylindrical and spherical coordinate system.

Text Books:

- ✓ *Mathematical Methods for Physicists, G.B.Arfken, H.J.Weber, F.E.Harris (2013,7th Edn.,Elsevier)*
- ✓ *Advanced Engineering Mathematics, Erwin Kreyszig (Wiley India)*

Reference books:

- ✓ *Mathematical Physics C. Harper (Prentice Hall India)*
- ✓ *Complex Variable: Schaum's Outlines Series M. Spiegel (2nd Edition, Mc- Graw Hill Education)*
- ✓ *Complex variables and applications, J. W. Brown and R.V. Churchill*
- ✓ *Mathematical Physics, Satya Prakash (SultanChand)*
- ✓ *Mathematical Physics, B. D. Gupta (4th edition, Vikas Publication)*
- ✓ *Mathematical Physics and Special Relativity, M. Das, P.K. Jena and B.K.Dash (Srikrishna Prakashan)*
- ✓ *Mathematical Physics –H.K.Das, Dr. Rama Verma (S. ChandPublishing)*
- ✓ *Mathematical Physics, B.S. Rajput,(Pragati Prakashana*

Computer Fundamentals

Course Objectives:

• Introduce number systems and data representation

• Understand functional units and components of computer

• Introduce the emerging technologies

Learning Outcomes:

Upon completion of this course, students will be able to:

• Understand the basic organization of a computer and the number system

• Learn about the working of commonly used input-output and memory devices

• Understand the role of Operating system and Computer Networks

• Know about some of the emerging computing technologies and web services

UNIT-1:

Computer Basics: Simple Model of a Computer, Characteristics of Computers, Hardware and Software, working of a Computer, Stored Program Concept, Problem Solving with computer: Flowchart, Algorithms, Programming.

Computer Software: Introduction to computer software, classification of computer software, system software, application software, firmware, middleware

UNIT-2:

Input/output Units: Input devices, Output devices, Computer Memory: Introduction, Read Only Memory, Serial Access Memory, Cache memory, primary memory, secondary storage devices, magnetic tapes, hard disks, SSD, optical drives, USB flash drivers, Memory cards, Mass storage devices, Memory Hierarchy.

UNIT-3:

Operating Systems: Definition, Batch Operating System, Multiprogramming Operating System, Time Sharing Operating System, Multiprocessing Operating System. Services of OS.

Computer Networks: Concepts of Networking-LAN, WAN, MAN, Network topologies.

Internet and the World Wide Web.

UNIT-4:

Emerging Computing Environments: Peer to Peer Computing, Grid computing, distributed computing, Cloud Computing: Introduction, cloud services, cloud deployment models.

Email, video conferencing, e-Learning, e-Banking, UPI, e-commerce, e-Governance, social networking, emerging computer applications.

Text Book:

✓ *Fundamentals of Computers by V Rajaraman 6th edition PHI Learning Private Limited*

Reference Books:

✓ *A First Course in Computers by Sanjay Saxena, Vikas Publishing House.*

✓ *Computer Fundamentals by Anita Goel, Pearson publication*

English

Introduction

This Course aims at providing students familiarity with all components of language learning; listening, speaking, reading, writing, grammar and vocabulary which will eventually help in development of communication skills. This is an activity-based, goal-oriented, functional course, which aims to make the students able and efficient communicators by helping them to be self-reflexive about English. This course has a predefined context of being supportive and complementary to the core courses in various disciplines. Therefore, unlike most other courses in English Communication on offer, it does not seek to build facile fluency that passes off as communicative competence. Rather, it intends to equip the students with the relevant skills of presentation and expression needed in the academic as well as in the professional domains. While reading skills exercises are meant to promote the acquisition of analytical and comprehension skills, writing skills exercises are centred on sentence construction, paragraph development and précis writing. In this course there is ample scope to build the speaking and listening skills of students with an emphasis on interactive learning and articulation.

Course Objectives

- Develop in students the required knowledge, skills, and judgement around human communication that facilitate their ability to work collaboratively with others.
- Enable the students to understand and practise different techniques of communication. Through this course, they will familiarise themselves with different types of communication. Enhance the employability of students by developing in them the required skills of communication in English, so as to enable them to: 2 i. Speak correctly, intelligibly and fluently as well as to listen and comprehend accurately when spoken to, so as to be able to communicate effectively and with confidence in a variety of social, academic and work-related situations; ii. Read and comprehend accurately the various kinds of written texts which they may be expected to deal with;

iii. Write effectively in a number of different genres (forms) of writing, relevant to social, academic and work-related needs;

- Develop interpersonal skills and the attitudes required for effective functioning in different social and work-related situations.
- Provide cognitive and cultural enrichment through exposure to a variety of humanistic learning experiences. General Pedagogical Principles 1. Instruction will essentially be activity-based. Each session will provide a variety and range of activities, pitched at different levels of linguistic competence. Group activities will be encouraged. The links between theory and practice will constantly be exemplified and highlighted. Theoretical inputs will be provided, as far as possible, in a non-technical manner. 2. Periodical tests may be conducted to assess skills and application of theoretical principles and not recalling information from memory. The skills of Listening and

Speaking may be tested through oral examinations in the classes, depending on time and scope. 3. An inventory of available software, including audio/ audio-visual materials should be made, and the use of such materials be standardised across all colleges. If necessary, software tailored to the requirements of the program should be produced in collaboration with appropriate agencies. 4. Although portions of selected texts will be used to develop the skills, a teacher is free to use material recommended by the experts. 5. The course cannot be effectively implemented unless all instructors are properly oriented. It should be ensured that orientation programs are organised before the curriculum is implemented. Handbooks must be produced and made available to all instructors. 3 6. Workshops for the development of instructional materials by members of college faculties should be organised periodically, as a part of on-going orientation.

Attention

The course drives away the myth that communicative competence in a language is honed, built and effectively practiced by learning and mastering the grammar, phonetics of a language or appropriating the accent and structures of the native tongue. Rather it is an adaptation with equal blend of the first language and the context in collaboration with the foreign tongue achieved by suitable use of texts from literature. So the teachers as well as students are advised to use as much literary texts as possible from the texts prescribed and other sources for providing an exposure to the students to be aware of the truth that literature enables skilful communication. The examination questions will be set according to the texts and topics prescribed.

Unit-I

English Language and Communication: Introduction (9 hours)

I. Communication, its importance and factors that determine communication (sender, receiver, channel, code, topic, message, context, feedback, barriers) models of communication, the information gap principle: given and new information; information overload, redundancy and cliches, the importance of audience and purpose ii. Types of communication: horizontal, vertical, interpersonal, lateral and grapevine iii. Verbal and nonverbal communication, body language and its manifestations in different cultures, written and oral communication, bias-free communication, political correctness. iv. Styles of Communication: formal, informal and semi formal Note: The topics listed above should be introduced briefly in the theory classes. The reflections of the students' understanding may be assessed by the facilitator through exercises. The teacher/facilitator can refer to the books recommended under 'prescribed readings' for teaching and exercise purposes. He/she can refer to valid and recognised web-resources and additional titles from renowned publishing houses for the same purpose.

Texts

- ✓ Communicative English OSHEC Publication. Chapters: Unit-I
- ✓ Literature and Art of Communication by Asima Ranjan Parhi, Madhusmita Pati, Subhra Prakash Das and Shakina Mohol, Cambridge University Press, 2019.
- ✓ The International Encyclopedia of Communication. Malden, MA: Blackwell Publishing. (ebook) 4

Suggested Readings

- ✓ A Cognitive Approach to Language Learning. Oxford University Press Donsbach, Wolfgang. (2008).
- ✓ 'Prospect of Electronic Media as Curriculum in Non-Native Contexts', by Parhi and Dutta in I-Manager's Journal on English Language Teaching, 4(2)2014. https://files.eric.ed.gov. pdf
- ✓ 21st CenturyCommunication: A Reference Handbook. Thousand Oaks, Calif: SAGE Reference. (e-book)
- ✓ Written and Spoken Communication in English published by Orient Blackswan
- ✓ Indian English through Newspapers, A R Parhi, Concept, New Delhi, 2008.
- ✓ An Introduction to Professional English and Soft Skills by Das et al
- ✓ *Communicative Competence.* T T Panigrahi, Notion Press, India, Singapore and Malaysia
- ✓ Soft Skills for Your Career, by Kalyani Samantaray. OUP
- ✓ An Anthology of English Prose 1400–1900 Cambridge University Press 2015.

Unit-II

English Language and Communication: Listening and Speaking (9 hours)

I. Types of listening (active and passive), listening to respond (how, when and why), empathic listening and interactive listening ii. Speaking to communicate effectively: fluency, accuracy. intelligibility and clarity iii. Style of speaking in various situations:formal, informal and semi-formal, tentative and cautionary, simple and plain English iv. English pronunciation: vowel and consonant sounds, diphthong, IPA, syllable division and primary stress in words, stress shift, sentence rhythm and weak forms, contrastive stress in sentences, intonation: falling and rising tones, varieties of spoken Englishes: Standard Indian, American and British (R.P.); 'Neutral English' , newspapers, ad captions and their contribution to the shaping of Indian English as a standard language

Note: This unit does not go deep into phonetics. The objective is to train students to refer to a Learners' Dictionary to find out the correct pronunciation of words. Students will be introduced to phonemic transcription using IPA symbols in theory classes and further practice will be provided during exercises/practices.

The teacher/facilitator will include simple questions on phonemic transcription and the marking of stress in words and sentences. The teacher/facilitator can refer to the books recommended under both 'Texts' and 'Suggested Readings' for teaching and exercise purposes. He/she can refer to valid and recognised webresources and additional titles from renowned publishing houses for the same purpose.

Texts
- ✓ Communicative English OSHEC publication. Chapter-Unit I
- ✓ The Sound of English by www.pronunciationstudio.com
- ✓ 'Towards the Anti-Canon: A Brief Focus on Newspaper English in India', SHSS (Studies in Humanities and Social Sciences, UGC Care), Ed. T.R. Sharma, IIAS (Indian Institute of Advanced Study), Shimla, Vol. XIII, No.1, Summer 2006, pp.143-155. http://14.139.58.200, iias.ac.in.journals Asima Ranjan Parhi.

Suggested Readings
- ✓ The Sounds of English Around the World: An Introduction to Phonetics and Phonology Cambridge University Press
- ✓ "Listening in the Language Classroom", pp. 58 - 76 DOI: https://doi.org/10.1017/CBO9780511575945.006, Cambridge University Press, Print publication year: 2009
- ✓ An Introduction to Professional English and Soft Skills by Das et al.
- ✓ Teaching the Spoken Language. Cambridge University Press Speaking. Oxford University Press
- ✓ *Communicative Competence.*Notion Press, India, Singapore and Malaysia
- ✓ Exploring Spoken English. Cambridge University Press English Conversation. Oxford University Press
- ✓ **The English Language in India: From Racial-Colonial to Democratic",** *EJBS (The European Journal of Behavioural Sciences)* **3 (1): page:8-16, Dec. 2020. DOI-10.33422/ejbs.v3i1.302**

Unit-III

English Language and Communication: Reading and Writing (9 hours)

I. Reading methods and techniques: fluency, accessing meaning, levels of competence, skimming and scanning, global and local reading, silent reading and reading aloud ii. Reading texts to understand literal, metaphorical and suggested meanings (essays, poems and stories), identifying the tone (admiring, accusatory, ironical, sympathetic, ambiguous and neutral etc.) of the writer iii. Writing process: brainstorming, pre-writing, writing and post writing, coherence, cohesion, style, iv. Writing short texts: paragraph writing; writing longer texts: literary writing, academic writing and media writing

Note: This unit will focus on the basic principles of reading and writing as forms of communication. The teacher/facilitator may use reading material from literary texts, media writings, non-fiction prose and other written discourses. He/she needs to adopt caution in selecting the reading materials. Reading and writing are related activities. The insights gained through training in reading can be utilised for effective writing. The teacher/facilitator must refer to the chapters and topics from the books recommended under 'Prescribed Texts' for teaching and exercise purposes. From which questions will be set for the examination. He/she can refer to valid and recognised web-resources and additional titles from renowned publishing houses for the same purpose.

Prescribed Pieces/Texts
- ✓ *Communicative English* OSHEC Publication. Chapters:Unit-III
- ✓ From *The Winged Word,* David Greene, Macmillan.1974 and *Melodious Songs and Memorable Tales,* 2015:
- ✓ 'Daffodils' by William Wordsworth, 'When we two Parted' by Lord Byron, 'The Last Ride Together' by Robert Browning, "Self Portrait" by A K Ramanujan.
- ✓ From *The Widening Arc*. Kitab Bhavan, 2016, A R Parhi, S Deepika, P Jani :
- ✓ 'No Learning without Feeling' by Claire Needell Hollander and 'The Empty Page' by Steven Harvey, 'George V High School' by Dinanath Pathy

Suggested Readings
- ✓ The Oxford Essential Guide to Writing Oxford University Press 2000.
- ✓ An Introduction to Professional English and Soft Skills Das et al
- ✓ The Classic Guide to Better Writing: Step-by-Step Techniques and Exercises to Write Simply, Clearly and Correctly Oxford University Press, 1996
- ✓ Ways of Reading: Advanced Reading Skills for Students of Literature Routledge. 2007.
- ✓ 'Semantic Excess or New Canons? Exploring the Print Media', Journal of Media and Communication, 2010. Research Gate https://www.researchgate.net.237. A R Parhi
- ✓ An Anthology of English Prose 1400–1900Cambridge University Press 2015

Unit-IV

I. English Language and Communication: Grammar and Vocabulary (9hours) i. Grammar for meaning, multiplicity of meaning, grammar in communication ii. Stative and dynamic verbs, modals and auxiliaries, tense and time reference, aspect,voice, modality, negation, interrogation; reported questions and tag questions, complex noun phrases, concord phrasal verbs. iii. Sentence structure: simple, compound and complex, clauses, types of sentences:statement, questions, exclamations,commands iv. Functions of language,usage-oriented vocabulary, neutral vocabulary Note: The teaching of grammar and vocabulary in this unit need to be connected to communication teaching. Teachers/Instructors may select other areas of grammar for review depending on the needs. They will identify the grammatical errors commonly made by their students in speech as well as writing.

The remediation of these errors may require some explanations of grammar. Instructors should use many grammar and vocabulary related exercises and through them will provide all the grammatical information needed to explain the errors that are identified. The teacher/facilitator can refer to the books recommended under 'suggested readings' for teaching and exercise purposes. He/she can refer to valid and recognised web-resources and additional titles from renowned publishing houses for the same purpose.

Texts
- ✓ Communicative English OSHEC publication. Chapters: Unit-III Communicative Grammar of English by Geoffrey Leech. Routledge publications, 2002
- ✓ Oxford Practical English Usage (International Edition 2016) by Michael Swan
  Suggested Readings
- ✓ The Widening Arc, Kitab Bhavan, Asima R Parhi, S Deepika, P Jani, 2016.
- ✓ Writing Skills Remapping: An Anthology for Degree Classes Orient Blackswan
- ✓ An Anthology of English Prose 1400–1900 Cambridge University Press 2015
  Scheme of Evaluation
- ✓ Midterm test: 20 marks

5x1=5 (short answer, short notes, comprehension questions)
5x1=5 (Analytical, perspective-based and critical-analysis questions)
5x2=10 (activity/practice/reports/case studies/response papers/assignments etc.)

The teacher will have the flexibility of conducting internal examinations or assess the students' learning outcomes through activities, short projects, case studies etc. from all 20 marks/ in parts

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Final Examination: 80 marks

Unit1: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Unit 2: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Unit 3: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Unit 4: 1 long answer question+ 1 short note/analysis (15+05) =20 marks

Analytical Thinking and Logical Reasoning

Course Objectives

- To cover various forms of reasoning including deductive, inductive, and abductive, and integrate these with critical thinking skills.

- To explore logical sequences, coding-decoding, and arrangements as key elements of logical reasoning.

- To delve into complex logical reasoning constructs such as alphanumeric series, reasoning analogies, and calendars.

- To engage with arguments involving two or more premises and utilize connectives effectively.

Learning Outcomes

- To be acquainted with using facts, evidence, rules, and principles to draw valid conclusions and make sound judgments
- Able to practice pattern recognition, spatial reasoning, and decision-making as fundamental components of analytical reasoning

- Able to apply logical reasoning to practical scenarios involving cause and effect, dices, directions, and visual reasoning

- Able to master logical constructs such as statements and assumptions, conclusions, and syllogisms

Unit-I: Analytical Reasoning
Deductive Reasoning, Inductive Reasoning, Abductive Reasoning, Critical Thinking, Pattern Recognition- Data, Sequences, Structures, Logical Reasoning, Spatial Reasoning, Causal Reasoning, Decision Making.

Unit-II: Basic Logical Reasoning Concepts
Logical Sequence Series- patterns and sequences in reasoning. Coding- Coding decoding. Arrangements-Seating arrangements and data arrangement. Blood Relations-problems related to blood relations. Input and Output Patterns. Binary Logic Problems

Unit-III: Logical Reasoning
Alphanumeric series, Reasoning Analogies, Calendars, Cause and Effect, Clocks, Cubes and cuboids, Data Sufficiency, Decision Making, Deductive Reasoning/Statement Analysis, Dices, Directions, Mirror and Water Images,

Unit-IV: Logical Statements
Two premise argument. More than two premise argument using connectives. Statement and Assumptions. Statement and Conclusions. Syllogism.

BSc. ITM 3RD SEMESTER (NEP 2020)

SUBJECT CODE	SUBJECT NAME
MAJOR-P-5	Digital Logic
MAJOR-P-6	Computer Networks
MAJOR-P-7	Business Accounting
MINOR-2-P-2	Introduction to Algebra & Number Theory
MDC-3	Professional Writing
VAC-2	Ethics & Values

Semester-III
Core V   **Digital Logic**

Course Objectives:

Introduce the concept of digital and binary systems. Be able to design and analyze combinational logic circuits. Be able to design and analyze sequential logic circuits. Understand the basic software tools for the design and implementation of digital circuits and systems.

Course Outcomes: **On completion of this course, students will be able to**

- Convert different type of codes and number systems which are used in digital communication and computer systems.
- Compare different types of logic families which are the basic unit of different types of logic gates in the domain of economy, performance and efficiency.
- Analyze different types of digital electronic circuit using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods.
- Design different types of digital electronic circuits for particular operation.

Unit-I:

Character Codes, Decimal System, Binary System, Decimal to Binary Conversion, HexadecimalNotation, Boolean Algebra, Basic Logic Functions: Electronic Logic Gates, Synthesis of Logic Functions, Minimization of Logic Expressions, Minimization using Karnaugh Maps, Synthesis with NAND and NOR Gates, Tri-State Buffers.
Outcome: Students will be able to understand the various types of number systems and their conversions and simplify Boolean expression and apply the Boolean theorems through logical gates.

Unit-II:

Arithmetic: Addition and Subtraction of Signed Numbers, Addition/ Subtraction Logic Unit, Design of Fast Adders: Carry-Look ahead Addition, Multiplication of Positive Numbers, Signed- Operand Multiplication: Booth Algorithm, Fast Multiplication: Bit-Pair Recoding Multipliers, Carry-Save Addition of Summands, Integer Division, Floating-Point Numbers and Operations: IEEE Standard for Floating-point Numbers, Arithmetic Operations on Floating-Point Numbers, Guard Bits and Truncation, Implementing Floating-Point Operations.
Outcome: Students will be able to design and implement variety of logical devices using combinational circuits concept.

Unit-III:

Flip-Flops, Gated Latches, Master-Slave Flip-Flops, Edge-Triggering, T Flip-Flops, JK Flip Flops. Registers and Shift Registers, Counters, Decoders, Multiplexers, Programmable Logic Devices (PLDs), Programmable Array Logic (PAL), Complex Programmable Logic Devices (CPLDs), Field-Programmable Gate Array (FPGA), Sequential Circuits, UP/DOWN Counters.
Outcome: Students will be able to analyze sequential circuits like registers and counters using flip-flops.

Unit-IV:

Memory System: Semiconductor RAM Memories, Internal Organization of Memory Chips, Static Memories, Asynchronous DRAMS, Synchronous DRAMS, Structure of Large Memories, Memory System Considerations, RAMBUS Memory. Read-Only Memories: ROM, PROM, EPROM, EEPROM, Flash Memory, Speed, Size, and Cost of Memory. Secondary Storage: Magnetic Hard Disks, Optical Disks, Magnetic Tape Systems.
Outcome: Students will be able to demonstrate and compare the construction of programmable logic devices and different types of ROM and RAM.
Text Books:
   ✓ *Carl Hamacher, Z. Vranesic, S. Zaky: Computer Organization, 5/e (TMH).*
Refence Books:
   ✓ *M. Morris Mano: Digital Logic and Computer Design, Pearson.*

Core V- Practical/Tutorial: Digital Logic Lab

Introduction to Xilinx S/W (VHDL). Write the codes for the following using VHDL.

- Realizing all logic gates.
- Combination Circuit.
- ADDER.
- SUBTRACTOR.
- MUX.
- DE-MUX.
- Encoder.

- Decoder.
- PAL.
- PLA.

Also write the codes using VHDL for the following Sequential Logic Circuits:

- Flip Flops.
- Shift Registers.
- Counters.
- Memory Elements.

Core VI   **Computer Networks**

Course Objectives:

This course is intended to provide an overview of the concepts and fundamentals of data communication and computer networks. It will help the students in understanding of various types of computer networks, different components of computer networks, various protocols, e-mail andcommunication protocols, network naming and addressing, modern technologies used in networking and their applications.

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

- Understand network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model.
- Understand various types of transmission media, network devices.
- Understand the concept of flow control, error control and LAN protocols.
- Explain the design of and algorithms used in the physical, data link layers.
- Understand the working principles of LAN and the concepts behind physical and logical addressing, subnetting and super netting.
- Analyze the contents in a given Data Link layer packet, based on the layer concept.
- Determine the various modulation and error detection and correction techniques andtheir application in communication systems.

Unit-I:
Introduction to Data Communications and Network Models: Protocols and Standards, Layers in OSI Models, Analog and Digital Signals, Transmission Modes, Transmission Impairment, Data Rate Limits, Performance, Digital Transmission, Network Devices & Drivers: Router, Modem, Repeater, Hub, Switch, Bridge (fundamental concepts only).
Outcome: Students will have the basic knowledge about computer network, causes of network errors, layers in networking and network devices & drivers.

Unit-II:

Signal Conversion: Digital-to-Digital Conversion, Analog-to-Digital Conversion, Digital-to- analog Conversion, Analog-to-analog Conversion. Transmission Media: Guided Media, Unguided Media, Switching Techniques: Packet Switching, Circuit Switching, Datagram Networks, Virtual- Circuit Networks, and Structure of a Switch.
Outcome: Students will have the knowledge about how data transmission takes place through signals and use of switching techniques.

Unit-III:
Error Detection and Correction: Checksum, CRC, Data Link Control: Framing, Flow and Error Control, Noiseless Channels, Noisy channels, (Stop and Wait ARQ, Sliding Window Protocol, Go Back N, Selective Repeat) HDLC, Point-to-Point Protocol. Access Control: TDM, CSMA/CD, and Channelization (FDMA, TDMA, and CDMA).
Outcome: Students will come to know about identifying and correcting errors occurred during data transmission.

Unit-IV:

Network Layer: Logical Addressing, IPv4 Addresses, IPv6 Addresses, Virtual-Circuit Networks: Frame Relay and ATM, Transport Layer: Process-Process Delivery: UDP, TCP. Application layers: DNS, SMTP, POP, FTP, HTTP, Basics of WiFi (Fundamental concepts only), Network Security: Authentication, Basics of Public Key and Private Key, Digital Signatures and Certificates (Fundamental concepts only).

Outcome: Students will able to understand various protocols used in network to transmit different types of data.

Text Books:
- ✓ *Data Communications and Networking, Fourth Edition by Behrouza A. Forouzan,T*

Reference Books:
- ✓ *Computer Networks, A.S. Tanenbaum, 4th edition, Pearson Education.*

Core VI- Computer Network Lab using C/C++/any Simulator

- Simulate Even Parity generator and checker.
- Simulate two-dimensional Parity generator and checker.
- Simulate check sum generator and checker.
- Simulate Hamming code method.
- Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
- Simulate and implement stop and wait protocol for noisy channel.
- Simulate and implement go backsliding window protocol.
- Simulate and implement selective repeat sliding window protocol.
- Simulate and implement distance vector routing algorithm.

Core VII   # Business Accounting

Course Objectives:

The objective of this course is to introduce problems of financial accounting such as measuring and reporting issues related to assets and liabilities and preparing the financial statements. Students are expected to gain the ability of using accounting information as a tool inapplying solutions for managerial problems, evaluating the financial performance, and interpreting the financial structure.

Course Outcomes: On completion of this course, students will be able to

- Enable the students learn basic accounting principles, concepts, principles and conventions.
- Practice Financial and Management accounting applications.
- Construct the financial statements of company.
- Able to understand the provisions of Companies Act, 1956.
- Exposure on the different accounting software packages.

Unit-I:

Introduction: Financial Accounting-definition and Scope, objectives of Financial Accounting, Accounting v/s Book Keeping terms used in accounting, users of accounting information and limitations of Financial Accounting. Conceptual Framework: Accounting Concepts, Principles and Conventions, Accounting Standards concept, objectives, benefits, briefer view of Accounting Standards in India, Accounting Policies, Accounting as a measurement discipline, valuation Principles, accounting estimates.
Outcome: The students will be able to learn basic accounting principles, concepts, principles and conventions which used in business transactions and its applications.

Unit-II:

Recording of transactions: Voucher system; Accounting Process, Journals, Subsidiary Books, Ledger, Cash Book, Bank Reconciliation Statement, Trial Balance. Depreciation: Meaning, need & importance of depreciation, methods of charging depreciation.
Outcome: The students will be able to prepare trial balance, bank reconciliation statement, identify and rectify the errors in bank reconciliation statement and also understand methods of charging Depreciation.

Unit-III:

Preparation of final accounts: Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary business.
Outcome: The students will be able to prepare financial statements in accordance with generally accepted accounting principles, employ critical thinking skills to analyze financial data as well as the effects of differing financial accounting methods on the financial statements.

Unit-IV:

Introduction to Company Final Accounts: Important provisions of Companies Act, 1956 inrespect of preparation of final accounts, Understanding of final accounts of a company. an overview of computerized accounting system –Salient features and significance
Outcome: The students will be able to understand the provisions of companies act 1956, significance and application of computerized accounting system.

Text Books:
- ✓ *Anil Chowdhry, "Fundamentals of Accounting & Financial Analysis", Pearson Education.*
- ✓ *Agarwal, R.Srinivasan, "Accounting Made Easy", TMH*

Reference Books:

- ✓ *Amrish Gupta, "Financial Accounting for Management", Pearson Education*
- ✓ *S.N.Maheshwari, "Financial Accounting for Management: Vikas Publishing House*

Core VII- Business Accounting

- Introduction to Tally, Features and Versions of Tally.
- Components of Tally Screen, Creation, Alteration & Deletion of Company.
- Primary Group & Subgroup, Creation.
- Alteration & Display of Ledger Accounting.
- Recording of Transactions through vouchers.
- DisplayofFinancialreportsF11andF12configuration.
- Introduction to Inventory system: Advantages of maintaining inventory system in Tally stock group Stock category, stock item units of measure, creation of inventory system.

Introduction to Algebra & Number Theory

Course Objectives:

To present a systematic introduction to number theory and a basic course on algebra.

Learning Outcomes:

After completing the course the student will be able to

- Understand the equivalence relations and concept of group with different examples.
- Understand the properties of cyclic groups, rings, and integral domain.
- Know divisibility and division algorithm and find *gcd* using Euclidean Algorithm.
- Solve linear Diophantine equations, find least common multiples,solve linear congruence applying the Chinese   remainder theorem.

Unit I

Integers and equivalence relations**,** properties of integers, modular arithmetic, mathematical inductions, equivalence relations, Introduction to groups**,** symmetries of a square, the dihedral groups, definitions and examples of groups, elementary properties of groups, subgroups, examples of subgroups.

Unit II

Cyclic groups, properties of cyclic groups, classification of subgroups of cyclic groups, definitions and examples of normal subgroups, Introduction to rings, definition and examples of rings, properties of rings, subrings, definition and examples of integral domain and fields.

Unit III

Divisibility**,** division algorithms, prime and composite numbers, Fibonacci and Lucas numbers, Fermat numbers, greatest common divisor, Euclidean algorithm.

Unit IV

Fundamental theorem of arithmetic, least common multiple, linear Diophantine equations, congruence, linear congruence, Chinese remainder theorem, Wilson's theorem, Fermat little theorem, Euler's theorem.

Books Recommended:

- ✓ *Joseph A. Gallian, Contemporary Abstract Algebra (4th Edition), Narosa Publishing House, New Delhi, 1999.(IX Edition 2010).*
- ✓ *Thomas Koshy, Elementary Number Theory with Applications (2nd Edition), Academic Press, 2007.*

Professional Writing

Course Objectives

- The course aims at teaching students to write grammatically correct, clear, effective prose and applies it to writing for the workplace.
- Its objective is to help students develop writing skills and acquire the knowledge to apply these skills in standard workplace document formats.
- It includes a study of writing in a variety of professional contexts with an emphasis on assessing rhetorical situations and crafting messages to inform and persuade diverse audiences in a variety of forms and formats.

Unit-1

Writing: Definition and Requirement

Writing Process: Prewriting, Writing and Post writing

Basic Writing Skills

Plain English

Unit-2

Genres of Writing: Persuasive, Expository, Narrative, Descriptive and Argumentative

Unit-3

Basic forms: Letters, Application, Memo, Notices and Minutes

Raising the Bar: Presentations, Proposal, and Report

Unit-4

The Elements of Style: Grammar, Usage, and Mechanics

Prescribed Texts

- ✓ *The Craft of Professional Writing*, Second Edition by Michael S. Malone
- ✓ *Literature and Art of Communication*. Parhi, Pati, Mohol et al. Cambridge University Press, 2019.
- ✓ *Professional Writing Skills: A Write It Well Guide* by Natasha Terk

Suggested Readings

- ✓ *Huddleston R., and Geoffrey K. Pulia, eds. A Student's Introduction to English Grammar. CUP.2005*
- ✓ *MLA Handbook for Writers of Research Papers. Eighth edition. Modern Language Association of America. 2021*
- ✓ Excellence In Business Communication by John V. Thill and Courtland L. BoveeOn Writing Well by William Zinsser

  https://communicationprogram.wharton.upenn.edu/library/

  https://www.osou.ac.in/eresources.php

ETHICS & VALUES

Credit point: 3   **Full mark -100**   **Total Hours: 45**

COURSE OUTCOME

- Development of a good human being and a responsible citizen
- Developing a sense of right and wrong leading to ethically correct behavior
- Inculcating a positive attitude and healthy work culture
- To equip the students to prepare themselves national and state level civil service and other competitive examination.

COURSE CONTENTS

UNIT-I- ETHICS AND HUMAN INTERFACE   [5 Hours]

Learning Outcome-

✓ *Understand the basic concept of ethics and its relevance in life*

- Ethics and Human Interface: Essence, Determinants and consequence of ethics and human action.
- Dimensions of Ethics in private and public relationship
- Human Values: Tolerance, Compassion, Rationality, Objectivity, Scientific Attitude Integrity, Respecting conscience and Empathy etc.
- Mahatma Gandhi and Ethical Practices: Non-Violence, Truth, Non-hatred and love for all, concern for the poorest, objective Nationalism and Education for man making. Relation between Ends and Means.

Subject Teacher: Philosophy/Political Science or Any other Teacher.

UNIT-II- ETHICS AND MAJOR RELIGIONS AND CIVILIZATIONS   [7 hours]

Learning Outcome-

✓ *Be familiar with ethical principles and values promoted by major   religious traditions and civilization*

- Hinduism- Dharma and Mokhya (out of 4 goals of life Dharma, Artha, Kama and Mokhya), Concept of Purusartha, Nisakama Karma(work without attachment to results), Concept of Basudev Kutumba and Peace (Whole world including all animals, plants, inanimate beings and human form one world)
- Ten Commandments: (Christianity and Judaism Tradition)
- Islamic Ethics: Justice, Goodness, Kindness, Forgiveness, Honesty, Purity and Piety
- Egyptian- Justice, Honesty, Fairness, Mercy, Kindness and Generosity
- Mesopotian-Non-indulgence in lying, stealing, defrauding, maliciousness, adultery, coveting possession of others, unworthy ambition, misdemeanors and injurious teaching.
- Buddhism-Arya Astangika Marg: Right View, Thought, Speed, Action, Livelihood, Efforts, Attention and Concentration.
- Jainism-Right faith, knowledge and conduct(Triralna)

- Chinese-Confucianism- Respect for Autonomy, Beneficence, non-maleficence and justice. Taoism: No killing, No stealing, No sexual misconduct, No false Speech and No taking of intoxicants.

Subject Teacher: History/Philosophy/Political Science or Any other Teacher.

UNIT-III- CONSTITUTIONAL VALUES, GOOD CITIZENSHIP, PATRIOTISM AND VOLUNTEERISM [10 Hours]

Learning Outcome-
✓ *Students Learns about constitutional values of India, Civic Sense and good Citizenship (both National and International) Patriotism and need for Volunteerism*
- Salient Values of Indian Constitution: Sovereign, Socialist, Secular, Democratic, Republic, Justice, Liberty, Equality and Fraternity
- Patriotic values and ingredients of National Building, Examples of great Patriots, Rani Laxmi Bai, Bhagat Singh, Mangal Pandey, Birsa Munda, Laxman Naik, Subhas Chandra Bose and Khudiram Bose.
- Law abiding citizenship
- Concept of Global citizenship in contemporary world
- Volunteerism- concept and facts of Volunteerism, building a better society through Volunteerism, Blood Donation, Social work, Helping the Aged, Promotion of Green Practices and Environment protection.

Subject Teacher: Philosophy/Political Science /History/ or Any other Teacher.

UNIT-IV- WORK ETHICS [6 hours]

Learning Outcome-
✓ *Understand the concept of work ethics, ethics in work place and ethical practices to be adopted by various professionals*
- The concept of professionalism.
- Professional ethics at work place
- Core values needed for all professionals. Reliability, Dedication, Discipline, Productivity, Co-operation , Integrity, Responsibility, Efficiency, Professionalism, Honesty, Purity and Time Management, Accountability, Respect Diversity, Gender Sensitivity, Respect for others, Cleanliness, Rational Thinking, Scientific Attitude, Clarity in Thinking . Diligence, cleanliness and Environment Consciousness.
- Codes of conduct for Students(both in College and Hostels),Teachers, Business professional, Doctors, Lawyers, Scientist, Accountants, IT professionals and Journalist.
- Practical ethics in day to day life.

Subject Teacher: Commerce/Philosophy/Education/History/ or Any other Teacher.

UNIT-V-ETHICS AND SCIENCE AND TECHNOLOGY [7 Hours]

Learning Outcome-

✓ *Understand how Science is related to ethics and values has ethical implications.*

- Ethics of Science and Technology. Are science and Technology ethically neutral? Are Science and Technology Value Free?
- Ethics of scientific Research ,Innovation and Technology
- Ethics of Social Media, Modern Gadgets
- AI and Ethics

Subject Teacher: Philosophy or Any Science Teacher

UNIT-VI- ETHICS AND VULNERABLE SECTIONS OF SOCIETY [10 hours]
Learning Outcome-
  - ✓ *Understand how various vulnerable sections of our society are treated unequally and what needs to be done to address their inequality*
  - ✓ *Understand dimensions of substance abuse*

1. **Women and family-**Gendered practices in the family, marriages (dowry, child marriage, women's consent).

   Women and work- women's work at home and at work place, pay gap, gendered roles, harassment at work place and working women and role conflict.

   Women and Society- Gender sensitive language, property right, marriage-divorce/Separation and women's right; violence against women

2. **Issues Relating to Children:** Nutrition and health , Child Exploitation: Child labour ,trafficking, sexual exploitation
3. **Issues Relating to Elderly Persons :** Abuse of Elders, Financial insecurity, Loneliness and Social insecurity, Health Care Issues, Needs for a happy and Dignified Ageing
4. **Issues Relating to persons with disability:** Rights of PWD, affirmative action, prevention of discrimination, providing equal opportunity, various scheme for empowering PWD and social justice for PWD.
5. **Issues Relating to Third Gender:** Understanding LGBTQ, Social justice for them, Removal of discrimination, Affirmative action and Acceptance of diversity of gender.

Subject Teacher: Sociology/political Science /Anthropology or Any Science Teacher

Sample Questions-

1. Birsa Munda belongs to which state of India?[1 mark]
2. Recall at least 4 constitutional values from the preamble to India constitution.[2 marks]
3. Explain utility of being Punctual.[5 marks]
4. Explain the ethical principles a scientist should follow.[8 marks]

Course material: To be developed by OSHEC and DDCE, Utkal University. Video Lectures will be also prepared by OSHEC and VTP, Utkal University. There shall be no internal examination for this course. The Term End Examination shall be conducted by the respective Universities. Student would engage in self-study and colleges shall conduct at least 4 doubt clearing session for each unit by engaging subject teachers as indicated above. The Principal may assign responsibility to any teacher.

4TH SEMESTER BSc. ITM(H)			
	SUB CODE		**SUB NAME**
MAJOR	CORE-I	PAPER-8	Database Systems
	CORE-I	PAPER-9	Organizational Behaviour
	CORE-I	PAPER-10	Foundation of Data Science & Data Analytics
MINOR	CORE-III	PAPER-2	Mechanics
	INTERNSHIP		

Semester-IV

Core VIII   **Database Systems**

Course Objectives:

To explain basic database concepts, applications, data models, schemas and instances. To demonstrate the use of constraints and relational algebra operations. Describe the basics of SQLand construct queries using SQL. To emphasize the importance of normalization in databases. To facilitate students in Database design. To familiarize issues of concurrency control and transaction management.

Course Outcomes: **On completion of this course, students will be able to**

- Apply the basic concepts of Database Systems and Applications.
- Use the basics of SQL and construct queries using SQL in database creation and interaction.
- Design a commercial relational database system (Oracle, MySQL) by writing SQL usingthe system.
- Analyze and Select storage and recovery techniques of database system

Unit-I:

Introduction to Database and Database Users, Database System Concepts and Architecture: dataModels, schema, and instances, Conceptual Modeling and Database Design: Entity Relationship(ER) Model: Entity Types, Entity Sets, Attributes, Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, ER Naming Conventions. Enhanced Entity- Relationship (EER) Model.
Outcome: Students will understand the database, its types, uses and applications. They will able to understand various data models.

Unit-II:
Database Design Theory and Normalization: Functional Dependencies, Join Dependencies, Normal Forms based on Primary Keys, Second and third Normal Forms,

Boyce-Codd Normal Form, Multi valued Dependency and Fourth Normal Form.
Outcome: Students will understand details of database design and will be able to design the real time data using various normal forms.

Unit-III:

Relational data Model and SQL: Relational Model Concepts, Basic SQLs, SQL Data Definition and Data types, Constraints in SQL, Retrieval Queries in SQL, INSERT, DELETE, UPDATE Statements in SQL, Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Binary Relation: JOIN and DIVISION.
Outcome: Students will able to access and manipulate the data using SQL.

Unit-IV:

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing, Properties of Transactions, Recoverability, Serializability, Concurrency Control: locking techniques and Time-Stamp Ordering.
Outcome: Students will learn about transaction processing in real world, how to handle data when more than one user accessing the same database using various methods.

Text Books:

✓ *Fundamentals of Database Systems, 6th edition, Ramez Elmasri, Shamkant B. Navathe,Pearson Education.*

Reference Books:

✓ An Introduction to Database System, Date C.J.- Pearson Education, New Delhi-2005.

Database Systems
Create and use the following database schemas to answer the given queries.

EMPLOYEE Schema			
Field	**Type**	**NULLKEY**	**DEFAULT**
Eno	Char (3)	NO	PRI
Ename	Varchar (50)	NO	
Job_type	Varchar (50)	NO	

Manager	Char (3)	Yes	FK
Hire_date	Date	NO	
Dno	Integer	YES	FK
Commission	Decimal (10,2)	YES	
Salary	Decimal (7,2)	NO	
DEPARTMENT Schema			
Field	**Type**	**NULLKEY**	
Dno	Integer	No	PRI
Dname	Varchar (50)	Yes	
Location	Varchar (50)	Yes	

Query List:

- Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
- Query to display unique Jobs from the Employee Table.
- Query to display the Employee Name concatenated by a Job separated by a comma.
- Query to display all the data from the Employee Table. Separate each Column by acomma and name the said column as THE_OUTPUT.
- Query to display the Employee Name and Salary of all the employees earning more than
- $2850.
- Query to display Employee Name and Department Number for the Employee No=7900.
- Query to display Employee Name and Salary for all employees whose salary is not in therange of $1500 and $2850.
- Query to display Employee Name and Department No. of all the employees in Dept10 and Dept 30 in the alphabetical order by name.
- Query to display Name and Hire Date of every Employee who was hired in 1981.
- Query to display Name and Job of all employees who don't have a current Manager.
- Query to display the Name, Salary and Commission for all the employees who earncommission.
- Sort the data in descending order of Salary and Commission.
- Query to display Name of all the employees where the third letter of their name is 'A'.

- Query to display Name of all employees either have two 'R's or have two 'A's in theirname and are either in Dept No=30 or their Mangers Employee No= 7788.
- Query to display Name, Salary and Commission for all employees whose CommissionAmount is 14 greater than their Salary increased by 5%.
- Query to display the Current Date.
- Query to display Name, Hire Date and Salary Review Date which is the 1st Monday aftersix months of employment.
- Query to display Name and calculate the number of months between today and the dateeach employee was hired.
- Query to display the following for each employee <E-Name> earns <Salary> monthlybut wants <3* Current Salary>. Label the Column as Dream Salary.
- Query to display Name with the 1st letter capitalized and all other letter lower case andlength of their name of all the employees whose name starts with 'J', 'A' and 'M'.
- Query to display Name, Hire Date and Day of the week on which the employee started.
- Query to display Name, Department Name and Department No for all the employees.
- Query to display Unique Listing of all Jobs that are in Department #30.
- Query to display Name, Department Name of all employees who have an 'A' in theirname.
- Query to display Name, Job, Department No. and Department Name for all the employees working at the Dallas location.
- Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees Name who do not have a Manager.
- Query to display Name, Department No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
- Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
- Query to display the Highest, Lowest, Sum and Average Salaries of all the employees.
- Query to display the number of employees performing the same Job type functions.
- Query to display the no. of managers without listing their names.
- Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
- Query to display Name and Hire Date for all employees in the same dept. as Blake.
- Query to display the Employee No. And Name for all employees who earn more than the average salary.
- Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a 'T'.
- Query to display the names and salaries of all employees who report to King.
- Query to display the department no, name and job for all employees in the Salesdepartment.

Core IX   **Organizational Behaviour**

Course Objectives:

The objective of this course is to learn the modern trends, theories and changes in organizational behaviour. This course covers the explanations about the human behavior in the organizational context. It details the impact of individual, group and organizational factors on human behavior. The course also focuses on understanding the behavior of the employees working in the organization. It highlights the significance of Challenges and Opportunities of OB, perception, attribution, learning, organizational change, organizational culture, motivation, leadership and conflict management.

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

- Understand the behaviour of people in the organization.
- Analyze the complexities associated with management of individual behaviour in theorganization.
- Understand the motivation (why) behind behaviour of people in the organization.
- Cover the explanations about human behavior in the organizational context.
- Impact of individual, group and organizational factors on human behavior.
- Understand the concept of personality, learning and attitude.

Unit-I:

Organizational Behaviour- Meaning, Definition and importance, Foundations of OB, OB Models, and Challenges to OB.
Outcome: The students will be able to understand the conceptual framework of the discipline of OB, OB Models and its practical applications in the organizational set up.

Unit-II:

Individual Behaviour: Perception: Definition &Concept; Personality: Concept, Determinants and Personality Types (Type A and Type B, Big Five Model, MBTI Model); Learning: Concept and Theories (Classical and Operant Conditioning); Attitude: Components& Formation.
Outcome: The students will be able to interpret key concepts and theories of perception, learning with regard to individual differences and apply these appropriately to specific situations.

Unit-III:

Group Behaviour: Group Dynamics: Meaning, Formation and Types of Groups (Formal & Informal Groups), Stagesof Group Development, Individual vs. Group decision making.

Group vs Team. Types of Team. **Group Communication:** Communication Types, Communication Process, Barriers to communication; Effective Communication Methods.
Outcome: The students will be able to interpret the key concepts and theories with regard to group behaviour and apply these appropriately to specific situations.

Unit-IV:

Motivation-Meaning, Nature &Importance. Motivational Theories (Maslow's Need Hierarchy Theory, Herzberg's two factor Theory, McClelland's Need Theory, Vroom's Expectancy Theory, Equity Theory); Motivational Challenges. **Leadership -** Leadership: Nature and Importance; Leadership Styles; Leadership Theories (Trait Theory, Behaviour Theory, Contingency Theory).
Outcome: The students will be able to understand how the organizational behavior can integrate in understanding the motivation behind behavior of people in the organization. Students also able to identify and develop effective motivational and leadership skills.

Text Books:

✓ *Organizational Behaviour: L.M. Prasad*
✓ *Organizational Behaviour: Rao &Narayana*
✓ *Organizational Behaviour: Gupta and Joshi (KP)*

Reference Books:

✓ *Organizational Behaviour: K Aswathappa(HPH)*
✓ *Organizational Behaviour: Stephen Robbins(PHI)*

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Core IX- Project Work
Organizational Behavior

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Guidelines for Project

Project is an assignment to strengthen the understanding of fundamentals through effective application of theoretical concept. The objective of the project course is to help the student develop ability to apply multidisciplinary concepts, tools and techniques to solve organisational problems. The project may be from any one of your areas related to the concerned subject.

Project report: The Project Report must have the following:

- Cover Page – must have the name and roll no. of the student and the name & designation of theguide along with the title of the Project.
- Acknowledgement, declaration, Certificate of originality signed by the guide with date
- Detailed tables & figures of contents with
  page nos.

- All pages of the Project Report must be numbered as reflected in Index of Chapters

Index of Chapters:

- Chapter-I: Introduction & Review of literatures
- Chapter-II: Research Methodology
- Chapter-III: Conceptual & Theoretical Descriptions
- Chapter-IV: Data Analysis & Interpretations
- Chapter-V: Conclusion, Findings, suggestions & Scope for further research.
- Chapter-VI: References, Annexures etc.

Core X **Foundation of Data Science and Data Analytics**

Course Objectives:

This course is intended to understand data management like data collection, processing, analysis, interpretation and visualization by applying quantitative modelling and data analysis techniques for real world business problems. The course also provides the knowledge of statistical data analysis techniques utilized in business decision making.

Course Outcome: On completion of this course the students will be able to

- Explain various software tools for data storage, analysis and
- Visualize the data.
- Choose EDA, inference and regression techniques.
- Apply R programming for analyzing statistical data for business decision making.
- Analyze different clustering methods for big data sets.

Unit-I:
Definition of Big Data, Big data characteristics & considerations, Data Repositories – analyst perspective, Business drivers for analytics, Typical analytical architecture, Business Intelligence Vs Data Science, Drivers of Big Data analytics, Role of data scientist in Big data ecosystem, Application of Big data analytics.
Outcome: The students will have to get Fundamentals of Big Data, Use software tools for data storage, analysis and visualization in big-data analytics.

Unit-II:
Need of Data analytic lifecycle, Key roles for successful analytic project, various phases of Data analytic lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicating Results, Operationalization.
Outcome: The students can utilize EDA, inference and regression techniques.

Unit-III:
Introduction to R: GUI of R, Getting data into & out of R, Data types in R, Basic operations, Descriptive Statistics.
Outcome: The students can apply R programming for analyzing statistical data for business decision making.

Unit-IV:
Overview of Clustering, K- means, Association Rules, Apriori Algorithm, Linear Regression, Logistic Regression.
Outcome: The students can understand different clustering methods for big data sets.

Text Book:

- ✓ *David Dietrich, Barry Hiller, "Data Science & Big Data Analytics", EMC education services, Wiley publications,2012*

Reference Book:

- ✓ *Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.*

5TH SEMESTER BSc. ITM(H)			
	SUB CODE		SUB NAME
MAJOR	CORE-I	PAPER-11	Web Technology
	CORE-I	PAPER-12	Software Engineering
	CORE-I	PAPER-13	Digital Marketing
MINOR	CORE-II	PAPER-3	Real Analysis-I
SEC	PAPER-2		
VAC	PAPER-3		

Semester-V

Core XI   **Web Technology**

Course objectives:

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using web technologies. Students will gain the skills and project-based experience needed for entry into web application and development careers. Students are able to develop a dynamic webpage by the use of java script.

Course Outcome: On completion of this course, students will be able to

- Analyze a web page and identify its elements and attributes.
- Create web pages using HTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client - s i d e programming).
- Work with PHP application (Server-side Programming) for any database operation.

Unit-I:

Web Essentials: Clients, Servers and Communication: The Internet –Basic Internet protocols– The WWW, HTTP request message –response message, web client's webservers –case study. Introduction to HTML: HTML, HTML domains, basic structure of an HTML document–creating an HTML document, mark up tags, heading, paragraphs, line breaks, HTML tags. Elements of HTML, working with text, lists, tables and frames, working with hyperlink, images and multimedia, forms and controls.
Outcome: Students will be able to explain client and server-side communication and able to design web applications

Unit-II:

Introduction to cascading style sheets: Concepts of CSS, creating style sheet, CSS properties, CSS styling (background, text format, controlling fonts), working with the block elements and objects. Working who lists and tables, CSS ID and class. Box model (introduction,

border properties, padding properties, margin properties), CSS colour, groping, Dimensions, display, positioning, floating, align, pseudo class, Navigation bar, image sprites

Outcome: Students will be able to design web pages using CSS and BOX model

Unit-III:

Java scripts: Client-side scripting, what is java script, simple java script, variables, functions, conditions, loops and repetitions. Java scripts and objects, java script own objects, the DOM andweb browser environment, forms and validations. DHTML: Combining HTML, CSS, java scripts, events and buttons, controlling your browser.

Outcome: Students will be able to integrate java script in a web page and check for validation (Client-side programming)

Unit-IV:

PHP: Starting to script on server side, PHP basics, variables, data types, operators, expressions, constants, decisions and loop making decisions. Strings – creating, accessing strings, searching, replacing and formatting strings. Arrays: Creation, accessing array, multidimensional arrays, PHP with Database.

Outcome: Students will be able to explain server-side scripting and their applicability

Text Book:

- ✓ *Web Technologies–Black Book–Dream Tech Press*
- ✓ *Matt Doyle, BeginningPHP5.3(wrox -Willey publishing)*
- ✓ *John Duckett, Beginning HTML, XHTML, CSS and Javascript.*

Reference Book:

- ✓ *HTML, XHTML and CSS Bible,5ed, Willey India-Steven M. Schafer.*

Core XI- Project Work

Web Technology Lab

- Acquaintance with elements, tags and basic structure of HTML files.
- Practicing basic and advanced text for formatting.
- Practice use of image, video and sound in HTML documents.
- Designing of webpages- Document layout, list, tables.
- Practicing Hyperlink of webpages, working with frames.
- Working with forms and controls.
- Acquaintance with creating style sheet, CSS properties and styling.
- Working with background, text, font, list properties.

- Working with HTML elements box properties in CSS.
- Develop simple calculator for addition, subtraction, multiplication and division operation using java script.
- Create HTML page with java script which takes integer number as a input and tells whether the number is odd or even.
- Create HTML page that contains form with fields name, Email, mobile number, gender, favorite colour and button; now write a java script code to validate each entry. Also write a code to combine and display the information in text box when button is clicked.
- Write a PHP program to check if number is prime or not.
- Write a PHP program to print first ten Fibonacci numbers.
- Create a MySQL database and connect with PHP.
- Write PHP script for storing and retrieving user information from MySQL table.
- Write a HTML page which takes Name, Address, Email and Mobile number from user(register PHP).
- Store this data in MySQL database.
- Next page displays all user in HTML table using PHP (display .PHP).
- Using HTML, CSS, Java script, PHP, MySQL, design an authentication module of a webpage.

Core XII   **Software Engineering**

Course Objectives:

Basic knowledge and understanding of the analysis and design of complex systems. To apply software engineering principles and techniques. Ability to develop, maintain and evaluate large-scale software systems. To provide the idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases. To provide an idea of using various process models in the software industry according to given circumstances. To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project. To perform independent research and analysis. Ability to work as an effective member or leader of software engineering teams.

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

- Understand of software process models such as waterfall and evolutionary model is required.
- Understand the problem statement and able to describe the Requirement analysis, creating a data model, use cases, computing function point, effort, architectural design and path testing of a software project.
- Learn about Software requirements and SRS documents.
- Understand project management's responsibilities, which includes planning, scheduling, risk management, and so on.
- Explain the differences between data models, object models, context models, and behavioral models.
- Familiar with implementation difficulties like modularity and coding standards.
- Gain knowledge of verification and validation methods, such as static analysis and reviews.
- Know about different software testing methodologies such as unit and integrated testing etc.
- Describe how to measure software and how to avoid software risks.

Unit-I:

Introduction: Evolution of Software to an Engineering Discipline, software development projects, Software Lifecycle Models: Waterfall Model and its Extensions, Rapid Application Development (RAD), Agile Development Models, Spiral Model.
Outcome: Students will be able to understand fundamental principles of Software engineering discipline & get an idea of various life cycle models used in software development.

Unit-II:
Software Project Management: Software Project Management Complexities, Responsibilities of a Software Project Manager, Project Planning, Metrics for Project Size Estimation,

Project Estimation Techniques, Empirical Estimation Techniques, COCOMO, Halstead's Software Science, Staffing Level Estimation, Scheduling, Organization and Team Structures, Staffing, Risk Management, Software Configuration Management.

Outcome: Students will get a brief idea of various project management activities & will understand various cost estimation techniques, organization team structure and management of staff & risk handling.

Unit-III:

Requirement Analysis and Specification: Requirements Gathering and Analysis, Software Requirement Specifications, Formal System Specification Axiomatic Specification, Algebraic Specification, Executable Specification and 4GL.Software Design: Design Process, Characterize a Good Software Design, Cohesion and Coupling, Layered Arrangements of Modules, Approaches to Software Design (Function Oriented & Object-Oriented).

Outcome: Students will get knowledge of various requirement analysis techniques and design process during software development work.

Unit-IV:

Coding and Testing: Coding: Code Review, Software Documentation, Testing, Unit Testing, Black Box and White Box Testing, Debugging, Program Analysis Tools, Integration Testing, System Testing, Software Maintenance.

Outcome: The students will understand of coding and testing process & will able to learn maintenance in software development projects.

Text Book:

- ✓ *Fundamental of Software Engineering, Rajib Mall, Fifth Edition, PHI Publication, India.*

Reference Books:

- ✓ *Software Engineering– IanSommerville,10/Ed, Pearson.*
- ✓ *Software Engineering Concepts and Practice – Ugrasen Suman, Cengage Learning IndiaPvt, Ltd.*

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Core XII- Project Work

Software Engineering

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Guidelines for Project

Project is an assignment to strengthen the understanding of fundamentals through effective application of theoretical concept. The objective of the project course is to help the student

develop ability to apply multidisciplinary concepts, tools and techniques to implement software engineering. The project may be from any one of your areas related to the concerned subject.

Project report: The Project Report must have the following:

- Cover Page – must have the name and roll no. of the student and the name & designation of theguide along with the title of the Project.
- Acknowledgement, declaration, Certificate of originality signed by the guide with date
- Detailed tables & figures of contents with page nos.
- All pages of the Project Report must be numbered as reflected in Index of Chapters

Sample Projects:

- *Criminal Record Management: Implement a criminal record management system for jailers, police officer sand CBI officers.*
- *Route Information: Online information about the bus routes and their frequency and fares*
- *Car Pooling: To maintain a web-based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.*
- *Patient Appointment and Prescription Management System*
- *Organized Retail Shopping Management Software*
- *Online Hotel Reservation Service System*
- *Examination and Result computation system*
- *Automatic Internal Assessment System*
- *Parking Allocation System*
- *Wholesale Management System*

Core XIII   **Digital Marketing**

Course Objective:

The key aim of this course is to understand the concepts of marketing management, to learn about the marketing process for different types of products and services, to understand the tools used by marketing managers in decision situations and to understand the marketing environment.

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

- Demonstrate strong conceptual knowledge in the functional area of marketing management.
- Demonstrate effective understanding of relevant functional areas of marketing management and its application.
- Demonstrate analytical skills in identification and resolution of problems pertaining to marketing management.
- Understand the 'Marketing mix' elements and the strategies and principles underlying the modern marketing practices.
- Explore for themselves the role of a marketing manager and the boundaries of marketing

Unit-I:

Marketing: Objectives of Marketing, Marketing vs Selling, Marketing Environment, Consumer Behaviour, Consumer Buying Process, Factors influencing consumer decision making, **Product:** Product concept, Product classification, New Product Development, Product lifecycle, Product mix.
Outcome: The students will be able to identify core concepts of marketing and the role of marketing in business and society. able to analyse the impact of different environmental factors, factors affecting consumer buying behavior, and different strategies related to product and its application.

Unit-II:

Price: Objective of pricing, Factors Influencing Product Pricing, Pricing policies. Distribution: Channel of Distribution- Meaning and Importance, Types of Distribution Channel. **Promotion:** Meaning, Importance of Promotion, Types of Promotion, Factors affecting promotion mix decisions.
Outcome: The students will be able to develop marketing strategies based on price, place and promotion objectives. Develop analytical skills in identification and resolution of problems pertaining to price, place and promotion mix.

Unit-III:

Fundamentals of Digital marketing & Its Significance, Traditional marketing Vs Digital Marketing, Evolution of Digital Marketing, Digital Marketing Landscape. Fundamentals of Social Media Marketing & its significance, Facebook Marketing-Different types of Ad formats, LinkedIn Marketing- LinkedIn Strategy, Twitter Marketing- Twitter usage, Twitter Ads, Twitter ad campaigns.

Outcome: The students will be able to use the digital platform in the optimal way to formulate possible solutions to marketing problems faced by several firms and also able to Identify and utilize various tools through social media.

Unit-IV:

Digital Advertising, Different Digital Advertisement, Performance of Digital Advertising: -Process & players, Display Advertising Media, Digital metrics. **YouTube Advertising:** - YouTube Channels, YouTube Ads, Type of Videos, Buying Models, Targeting & optimization, Designing & monitoring Video Campaigns, Display campaigns

Outcome: The students will be able to explain the key digital marketing activities needed for competitive success and also Leverage digital strategies to gain competitive advantage for business and career. Able to initiate marketing strategies through the use of Social Media Platform like Face book, Twitter, YouTube & LinkedIn etc.

Text Books:
- ✓ *Marketing Management in Indian Context, Sontakki, KP*
- ✓ *Marketing Management, Karunakaran,*
- ✓ *Digital Marketing –Kamat and Kamat-Himalaya*
- ✓ *Digital Marketing, S.Gupta, McGraw-Hill*

Reference Books:
- ✓ *Marketing Management, Kotler, Keler, Koshi, Jha, Pearson*

Core XIII- Project Work

Digital Management

Guidelines for the Project:

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Project report: The Project Report must have the following.

- Cover Page – must have the name and roll no. of the student and the name &

designation of theguide along with the title of the Project.

- Acknowledgement, declaration, Certificate of originality signed by the guide with date
- Detailed tables & figures of contents with page nos.
- All pages of the Project Report must be numbered as reflected in Index of Chapters

Index of Chapters:

- Chapter-I: Introduction & Review of literatures
- Chapter-II: Research Methodology
- Chapter-III: Conceptual & Theoretical Descriptions
- Chapter-IV: Data Analysis & Interpretations
- Chapter-V: Conclusion, Findings, suggestions & Scope for further research.
- Chapter-VI: References, Annexures, etc.

	SUB CODE		SUB NAME
MAJOR	CORE-I	PAPER-14	Theory of Computation
	CORE-I	PAPER-15	Python Programming
MINOR	CORE-III	PAPER-3	Electricity & Magnetism
SEC	PAPER-3		
VAC	PAPER-4		

Core XIV   **Theory of Computation**

Course Objectives:

This course focuses on the basic theory of Computer Science and formal methods of computationlike automata theory, various machines, grammars and Turing Machines. To explore the theoretical foundations of computer science from the perspective of formal languages and classify machines by their power to recognize languages.

Course Outcomes: On completion of this course, the students will be able to
- Understand the basic properties of formal languages and grammars.
- Differentiate among regular, context-free and recursively enumerable languages.
- Make grammars to produce strings from a specific language.
- Minimize the finite automata.
- Acquire concepts relating to the theory of computation and computational models including decidability and intractability.
- Design and deal with Turing machines.
- Get the basic foundation of compiler design.

Unit-I:

Alphabet, Languages, Grammars, Finite Automata (DFA, NFA), Regular operations, Regular Languages/Grammars, Regular Expressions, Finite Automaton With $\acute{\epsilon}$ -Moves, Equivalence of NFA and DFA.
Outcome: The students will be able to understand the basic properties of formal languages and grammars, DFA & NFA.

Unit-II:
Minimization of Finite Automata, Closure Properties of Regular operations, Pumping Lemma of Regular Languages, Context Free Grammars, Context Free Languages, Derivation Tress, Ambiguity, Properties of Context Free Languages, Left and Right Linear Grammars.
Outcome: The students can minimize the finite automata, understand Pumping lemma and

Right linear and Left Linear grammar.

Unit-III:
Chomsky Normal Form (Elimination of Useless Symbols, Unit Productions, Null Productions), Pushdown Automata, Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Languages.
Outcome: The students can be able to Design Push down automata, convert a grammar to CNF'

Unit-IV:
Turing Machines, Turing Computability, Type 0 Languages, Techniques for Turing Machine Construction, Multihead And Multitape Turing Machines, Church Turing thesis, Recursive and Recursively Enumerable Set, Chomsky Hierarchy of Languages.
Outcome: The students will be able to Design and deal with Turing machines. Get the basic foundation of compiler design, Differentiate regular, context-free and recursively enumerable languages.

Text Books:
- ✓ *Introduction to the theory of Computation, Michael Sipser, Cengage Learning.*
- ✓ *Introduction to Automata Theory, Languages and Computation, J. E. Hopcrpft and J.D. Ullman, Pearson Education, 3rdEdition.*

Reference Books:
- ✓ *JFLAP - An Interactive Formal Languages and Automata Package Rodger, Finley,ISBN:0763738344*
- ✓ *JFLAP User Manual and Exercises, Tobias Fransson. Available in the Web.*

Core XIV- Practical/Tutorial: Theory of Computation Lab
Use Java Formal Language and Automata Language (FLAP) software Package (can be downloaded from www.jflap.org) to carry out the following experiments:

- Regular Language-Create: DFA, NFA, Regular Grammar, and Regular Expression.
- Regular Language – conversions: NFA to DFA to Minimal DFA,
  NFA to regular expression& vice versa.
- NFA to regular grammar & vice-versa.
- Context-free language–create: push-down automaton, context-free grammar.
- Context-free language – transform: PDA to CFG, CFG to PDA (LL parser), CFG to PDA (SLR Parser), CFG to CNF, CFG to LL parse table and parser, CFG to SLR parse table and parser.
- Recursively Enumerable language: Turing machine (1 tape), Turing machine (multi tape), Turing machine (building blocks), unrestricted grammar.

Core XV   **Python Programming**

Course Objectives:
To acquire programming skills in core Python. To acquire Object Oriented Skills in Python. Todevelop the ability to write database applications in Python.

Course Outcome:
On completion of this course, the students will be able to
- Explain basic principles of Python programming language.
- Implement object-oriented concepts.
- Implement database and GUI applications

Unit-I:

Python: Features of Python , Installing Python for windows and setting up paths, writing and Executing of a python programs, Python Virtual machine, Frozen binaries, Comparison betweenC, Java and python , Comments , Doc strings ,How python sees variables,   Data typesinPython,builtintypes,sequencesinpython,sets,literalsinPython,userdefineddatatypes, identifiers & reserved words, Naming convention in python.
Outcome: Students will be able to understand the syntax and basic concepts of python programming language.

Unit-II:

Various Operators in Python, Input & Output, Control statements, if statements, while loop, for loop, infinite loop, nested loop, else suit, break, continue, pass, assert, return statements, command line arguments.
Arrays in python, advantages using arrays, creating arrays, importing the array module, indexingand slicing on arrays, Processing the arrays, Comparing arrays.
Strings in Python, creating strings, Length of a string, indexing in strings, slicing strings, Concatenation and Comparing strings, Finding Sub Strings, Replacing a String.
Outcome: Students will be able to build basic programs using fundamental programming constructs

Unit-III:

Functions in Python, define a function, calling a function, return from function, pass by object Reference, Positional arguments, Default arguments, Recursive functions. Introduction to OOP, features of OOP, creating classes, the self-variable, constructor, types ofvariables, namespaces, types of methods.
Outcome: Students will be able to articulate the OOPs concepts as well as use of functions.

Unit-IV:

Inheritance: Define inheritance, types of inheritance, and constructors in inheritance, overridingsuperclass constructors& methods, the super () method, MRO Polymorphism: Duck typing philosophy of Python, operator overloading, method over riding,interfaces in python.

Exceptions: Errors in a python program, Exceptions, Exception handling, Types of Exceptions, the Exception block, the assert statement, user defined exceptions.

Python Database Connectivity: DBMS, types of databases used with Python, installation of MySQL database, setting path, verifying MySQL, installing MySQL connector, working with MySQL database, Using MySQL from python, retrieving rows, deleting rows, updating rows in a table.

Outcome: Students will be able to articulate the OOPs concepts such as inheritance and able to know how to handle exception and python database connectivity.

Text Books:

- ✓ *T.Budd, Exploring Python, TMH, 1stEd, 2011.*
- ✓ *Core Python Programming, Dr.R. Nageswar Rao, Dreamtech Press.*
- ✓ *Python Programming for Absolute Beginners, Michael Dawson, CENGAGE Learning.*

Reference Books:

- ✓ *Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist: Learning with Python, Freely available online.2012.*

Online References:

- ✓ *Python Tutorial/Documentation www.python.or 2015*
- ✓ *http://docs.python.org/3/tutorial/index.html*
- ✓ *http://interactivepython.org/courselib/static/pythonds*
- ✓ *http://www.ibiblio.org/g2swap/byteofpython/read/*

Core XV- Software Lab based on Python Programming

- Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.

- Write a Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria: Grade A: Percentage>=80, Grade B:

Percentage>=70 and <80Grade C: Percentage>=60 and <70Grade D: Percentage>=40and <60GradeE: Percentage<40.

- Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.

- Write a Program to display the first n terms of Fibonacci series.

- Write a Program to find factorial of the given number.

- Write a Program to find sum of the following series for n terms: 1 –2/2! +3/3! -----

- Write a Program to calculate the sum and product of two compatible matrices.

- Install MySQL and connector and write Python programs to retrieve, inserting, delete,update rows in a table.