

Model Curriculum for Three/Four Year Degree Course

(With Multiple Entry/Exit Option)

Based on NEP-2020

Bachelor of Computer Application (BCA)



Odisha State Higher Education Council, Bhubaneswar

Government of Odisha

Semester	Subjects
I	Core I - Problem Solving using C Programming
	Core II- Introduction to Python Programming
II	Core III- Data Structures
	Core IV – Object Oriented Programming using C++
III	Core V- Data Base Management System
	Core VI- Computer Organization & Architecture
	Core VII- Operating Systems
IV	Core VIII- Computer Graphics
	Core IX- Web Development with PHP
	Core X- Computer Network
V	Core XI- Software Engineering
	Core XII- (A) Introduction to Artificial Intelligence or (B) Introduction to Data Science
	Core XIII- Programming in Java
VI	Core XIV- Algorithm Design Techniques
	Core XV- Project Work-I
VII	Core XVI- Applied Artificial Intelligence
	Core XVII- Data Analytics with Python
	Core XVIII- Cyber Security
	Core XIX- (A)Internet of Things or (B) Theory of Computation or (C)Android Programming
VIII	Core XX- Cloud Computing
	Core XXI- Machine Learning
	Core XXII- (A) Foundations of Block chain Technology or (B)Compiler Design or (C)Information Science
	Core XXIII- Project Work-II

Program Outcomes

PO1: To understand the function of various hardware, software, and network components.

PO2: To develop the ability to analyze, design, and develop computer-based solutions for different application domains.

PO3: To be professionally competent in order to adapt to the fast-changing IT industry.

PO4: To be able to use Internet effectively and develop web-based and mobile applications for wider access.

PO5: To develop entrepreneurship skills and venture into start-ups for providing end-to-end solutions.

NB:

Students have to do the laboratory assignments mentioned under different subjects/papers. In order to make the subject more interesting and sync with the current trends in the subject, the course instructor will give additional assignments relevant to the subject, and students are also encouraged to do some experiments on their own.

Core I

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
$$S = 1 + 1/2 + 1/3 + 1/4 + \dots$$
6. Write a Program to compute the sum of the first n terms of the following series
$$S = 1 - 2 + 3 - 4 + 5 - \dots$$
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.

Core II

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 & indentation, 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.

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 pub*

ପ୍ରଥମ ପର୍ଯ୍ୟାୟ (SEMESTER-I)

ସାମର୍ଥ୍ୟବର୍ଦ୍ଧକ ପାଠ୍ୟକ୍ରମ

Ability Enhancement Course (AEC)

ପରିଶୁଦ୍ଧ ଭାଷା ଓ ଲିଖନ ଧାରା

Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳଶ୍ରୁତି):

ସାହିତ୍ୟର ଲିଖନ ଓ ଅଧ୍ୟୟନ କ୍ଷେତ୍ରରେ ଭାଷାର ପରିଶୁଦ୍ଧତା ନିତ୍ୟ ଆବଶ୍ୟକ । ସାହିତ୍ୟକର୍ମ ଦ୍ୱାରା ବିଭିନ୍ନ କ୍ଷେତ୍ରରେ ନିର୍ଭୁଲ ଭାଷା ବ୍ୟବହାର ହେବା ବାଞ୍ଛନୀୟ । ଭାରତର ସମ୍ବିଧାନସ୍ୱୀକୃତ ଭାଷାମାନଙ୍କ ମଧ୍ୟରେ ଓଡ଼ିଆଭାଷାର ସ୍ଥାନ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ । ଶିକ୍ଷାଧୀନମାନେ ନିର୍ଭୁଲ ଭାଷା ପ୍ରୟୋଗକ୍ଷେତ୍ରରେ ବିପତ୍ତି ସମର୍ଥ ହେବେ, ଯେଥିନିମିତ୍ତ ଏହି ପାଠ୍ୟପତ୍ରଟି ପରିଚାଳିତ । ବିଭିନ୍ନ ପ୍ରତିଯୋଗିତାମୂଳକ ତଥା ପ୍ରାକ୍ତନ ବ୍ୟବହାର ନିମ୍ନ ଲେଖାପାଇଁ ସମ୍ବୃଦ୍ଧ ହେଉଥିବା ପରୀକ୍ଷାନିମିତ୍ତ ମଧ୍ୟ ଏହା ଶିକ୍ଷାଧୀନଙ୍କୁ ସାହାଯ୍ୟ କରିବ ।

Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି):

- ୧ମ ଏକକ: କ) ଶବ୍ଦ ଗଠନରେ ଶୁଦ୍ଧତା
ଖ) ରୁଚିର ଅର୍ଥ ଅବଗତ
ଗ) ରୁଚିର ପ୍ରୟୋଗ ବିଧି ଶିକ୍ଷା
- ୨ୟ ଏକକ: କ) ବାକ୍ୟର ଗଠନରୀତି ଶିକ୍ଷା
ଖ) ବିବିଧ ପ୍ରକାର ବାକ୍ୟ ସମ୍ପର୍କରେ ଧାରଣା
ଗ) ନିର୍ଭୁଲ ବାକ୍ୟଲିଖନ ବିଦ୍ୟା
- ୩ୟ ଏକକ: କ) ଦୁହେଁ ଅନୁଲେପକୁ ସଂକ୍ଷିପ୍ତ କରିବାର କୌଶଳ
ଖ) ବିଷୟଗତ ଶୀର୍ଷକ ନିର୍ଦ୍ଧାରଣ କରା
ଗ) ଅନୁଲେପରୁ ବିଭିନ୍ନ ପ୍ରଶ୍ନର ଉତ୍ତର ପ୍ରଦାନ
- ୪ର୍ଥ ଏକକ: କ) ସମଲିଖନ ଜ୍ଞାନ
ଖ) ଫିଟର ପ୍ରସ୍ତୁତି
ଗ) ନିର୍ଭୁଲ ପତ୍ରଲିଖନ ଓ ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି କରା

ପାଠ୍ୟ ବିଷୟ

- ପ୍ରଥମ ଏକକ: (କ) ଶବ୍ଦର ସଂଜ୍ଞା, ଶୁଦ୍ଧ ଶବ୍ଦ ଓ ବର୍ଣ୍ଣାଣୁବି
(ଖ) ରୁଚିର ଅର୍ଥ ଓ ପ୍ରୟୋଗ ବିଧି
- ଦ୍ୱିତୀୟ ଏକକ: ବାକ୍ୟ ଗଠନରୀତି ଓ ପ୍ରକାର ଭେଦ
- ତୃତୀୟ ଏକକ: ଅନୁଲେପ ସଂକ୍ଷେପଣ, ଶୀର୍ଷକ ନିର୍ଦ୍ଧାରଣ ଓ ପ୍ରସ୍ତୋତର
- ଚତୁର୍ଥ ଏକକ: ନିର୍ଭୁଲ ଲିଖନ ପଦ୍ଧତି, ସମ ଲିଖନ, ଫିଟର, ପତ୍ର ଲିଖନ, ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି

ସହାୟକ ଗ୍ରନ୍ଥସୂଚୀ (Book of reference) :

୧. ସର୍ବସାର ବ୍ୟାକରଣ - ଶ୍ରୀଧର ଦାସ, ଗ୍ରନ୍ଥ ମନ୍ଦିର, କଟକ ।
୨. ସାରସ୍ୱତ ବ୍ୟାକରଣ ବ୍ୟାକରଣ - କୃଷ୍ଣଚନ୍ଦ୍ର ପ୍ରଧାନ, ସତ୍ୟ ନାରାୟଣ ବୁକ୍ ହୋର ।
୩. ବୃହତ୍ ଓଡ଼ିଆ ବ୍ୟାକରଣ- ତ୍ରିଲୋଚନ ଦେହେରା, ଗୋବିନ୍ଦ ଚନ୍ଦ୍ର ଲେଙ୍କା, ଫ୍ରେଣ୍ଡସ୍ ପବ୍ଲିଶର୍ସ, କଟକ ।
୪. ଆଧୁନିକ ଓଡ଼ିଆ ବ୍ୟାକରଣ- ଧନେଶ୍ୱର ମହାପାତ୍ର, କିରାଟ୍ ମହଲ, କଟକ ।
୫. ସାଧାରଣ ଓଡ଼ିଆ ବନାନ ଶୁଦ୍ଧି- ଓଡ଼ିଆ ଭାଷା ପ୍ରତିଷ୍ଠାନ, ଭୁବନେଶ୍ୱର ।
୬. ଗଣମାଧ୍ୟମ ଓ ଗଣଯୋଗାଯୋଗ - ଶିଶିର ଦେହେରା, ଫ୍ରେଣ୍ଡସ୍ ପବ୍ଲିଶର୍ସ, କଟକ ।
୭. ଯୋଗାଯୋଗ ମୂଳକ ମାତୃଭାଷା - ବିରଞ୍ଚି ନାରାୟଣ ସାମଲ, ସତ୍ୟନାରାୟଣ ବୁକ୍ ହୋର, କଟକ ।
୮. ଯୋଗାଯୋଗର ଭାଷା - ସୁଧାଚର ଚନ୍ଦ୍ର ମହାନ୍ତି, ପ୍ରାଚୀ ପ୍ରକାଶନ, କଟକ ।

୯. ନିର୍ଭୁଲ ଲେଖାର ମୂଳସୂତ୍ର, ନୀଳାଦ୍ରି ଭୂଷଣ ହରିଚନ୍ଦନ, କିତାବ ମହଲ, କଟକ ।
୧୦. ଓଡ଼ିଆ ଭାଷା ବ୍ୟାକରଣ ସୌଭଜ, ଚନ୍ଦ୍ରଶେଖର ପତି, ଓଡ଼ିଶା ବୁକ୍ ଏମ୍ପୋରିୟମ୍, କଟକ ।

ନମୁନା ପ୍ରଶ୍ନ (Sample Questions) :

୧. ଶବ୍ଦ କାହାକୁ କୁହାଯାଏ ? (୧ ମାର୍କ)
୨. ପର୍ବତର ଦୁଇଟି ପ୍ରତିଶବ୍ଦ ଲେଖ । (୨ ମାର୍କ)
୩. ବ୍ୟାକର 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

कार्यालयी 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 शब्दावली

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 एक्सप्लोरर, इंटरनेट की अनुप्रयुक्तता।

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

पाठ्य पुस्तक:

1. प्रयोजनमूलक हिंदी- प्रो. राधाकांत मिश्र,
डॉ. अमूल्य रत्न महांती,
प्लैनेट वी, हिंदी बुक सेंटर, बादामबाड़ी, कटक

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 (8 Period)

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: (8 Period)

Renewable and non-renewable resources:

Natural resources and associated problems.

- a) Forest resources: Use and over-exploitation, deforestation, case studies.
- b) Timber extraction, mining, dams and their effects on forest and tribal people.
- c) Water resources : Use and over-utilization of surface and ground water,
- d) floods, drought, conflicts over water, dams-benefits and problems.
- e) Mineral resources : Use and exploitation, environmental effects of extracting
- f) and using mineral resources, case studies.
- g) d) Food resources : World food problems, changes caused by agriculture and
- h) Overgrazing, effects of modern agriculture, fertilizer-pesticide problems,
- i) waterlogging, salinity, case studies.
- j) e) Energy resources : Growing energy needs, renewable and non-renewable
- k) energy sources, use of alternate energy sources. Case studies.

Biodiversity:-

Introduction-Definition; Biogeographically classification of India

India as a mega diversity nation. Hot spots 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, PreDisaster 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.

Core III

Semester II Data Structures

Course Outcomes:

- 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:

- Learn about data structures and the use of array
- Create linked lists and perform insertion/deletion operations on them
- Represent Stack and Queue in the memory and learn their applications
- 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 Books:

- ✓ *Classic Data Structure, D. Samanta, PHI, 2/ed.*
- ✓ *Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Pubs.*

Reference Book:

- ✓ *Sastry C.V., Nayak R, Ch. Rajaramesh, Data Structure & Algorithms, I. K. International ,Publishing House Pvt. Ltd, New Delhi.*

BCA 3.1 Lab: Data Structures

Write C Programs 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
- 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, 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, 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 Output Operations, Updating a File: Random Access, Error Handling during File Operations, Command-line Arguments.

TextBooks:

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

ReferenceBooks:

- ✓ *Paul Deitel, Harvey Deitel, "C++: How to Program", 9/e. Prentice Hall.*
- ✓ *Herb Schildt, C++: The Complete Reference, McGraw Hill.*

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 in member function.
7. Write a Program to find area of circle, triangle and rectangle using function overloading.
8. Write a program to distinguish the properties of static and non-static class 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 and average 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.

Introduction to Web Technologies

Course Objectives:

- To learn the fundamentals of web designing.
- To design and develop standard and interactive web pages.

Learning Outcomes:

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

- Understand Internet, Internet Protocols, and World Wide Web
- Understand HTML and its tags
- Learn the design and development of web pages
- Learn the styles/layouts of web pages using CSS & client-side scripting using JavaScript

UNIT-1:

- Introduction to Internet, Internet Protocols, World Wide Web (WWW): Introduction, History, HTTP, Web Browser, Web Server with example, Web page, working principles of WWW. Web Development: Introduction, Front-end and Backend Development Technologies. Concepts of Client-Server communication.
- Introduction to HTML: Introduction, Characteristics, Advantages and Disadvantages of HTML, HTML Editors, Understanding elements in HTML, Container and empty elements, Basic Tags and Attributes: `<!DOCTYPE>`, `<HTML>`, `<HEAD>`, `<TITLE>`, `<BODY>`, `<P>`, Attributes of the basic tags. Creating a Simple HTML Web Page, running a web page in the browser.

UNIT-2:

- Working with HTML Tags: Headings, Break, Horizontal Line. Formatting Text with HTML Elements: Italic, Bold, Small, Subscript, Superscript and changing background color. Adding Comments in HTML. Working with Hyperlink, List, Table, Image, Video, and Frames in HTML.
- Creating Forms in HTML: Form Tag and its attributes. Creating Text box, Password box, Text area, Drop-down list, Checkbox, Radio button, Email, Color picker, Date-Time picker, Submit and Reset buttons.

UNIT-3:

- 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, Display. CSS Box Model: Introduction, working with Margin, Border, and Padding. Working with CSS Navigation Bar and Drop-Downs.

UNIT-4:

- JavaScript: Introduction, Features, Benefits, Creating Simple JavaScript. Using JavaScript in HTML: Use in the Head, Body and as external script file. Exploring Popup Boxes: alert, confirm, prompt box. Display Possibilities: innerHTML, document.write(), window.alert(), console.log().

- Programming using JavaScript: Introduction to Data types, Variables, Operators, Expressions (Arithmetic, String, Logical), Comments. Control Statements: Selection Statements: if, if...else, nested if...else, else...if ladder, switch. Loops: while, do...while, for. Jump Statements: break, continue. Functions in JavaScript: built-in and user defined, Invoking a function, scope of a function, global vs local variables.

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-Sтивен M. Schafer.*

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:
 - 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 Century Communication: 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, IAS (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

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

SEC

Core V

Semester III 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:

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 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'.
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, Saeed Zaky (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.*
- ✓ *Computer Architecture & Organization, Rajiv Chopra, S. Chand Pubs.*

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 GregGagne, 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.

Internet and Ethical Practices

Core VIII

Semester IV 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, Subnetmasking, 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 PublicKeyandPrivateKeyCryptography, 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.

Community Engagement & Services/ Field work /Internship

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 of 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 ToolBox: 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 Know About 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 StreamFile 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 StringBuffer class 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 (feet and inches) 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.

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 Learn 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.

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

SEC

Contemporary Cross-Cutting Issues

Credit point: 3

Full marks -100

Total Hours: 45

COURSE OUTCOMES

- UGC and NAAC emphasize the coverage of contemporary cross cutting issues in the curriculum of Graduate Studies.
- NAAC has identified following issues: Gender, Human Rights, Sustainable Development, Climate Change and Environmental Protection Etc. In addition to above presently A.I is fast emerging as a cross cutting issue. The proposed course under Value Added Category proposes to address the above issues.
- The students will be cognizant of contemporary cross cutting issues at the national and global level. Develop an understanding of all the issues identified such as: Gender, Human Rights, Sustainable Development, Climate Change, Environment Protection and AI etc.

Students will contribute and act actively to meet the challenges of cross cutting issues.

COURSE CONTENTS

UNIT- I GENDER

[8 hours]

Learning Outcome: To understand the concept of gender and sensitize students about gender related issues.

- Meaning of Gender and Gender related Concepts: Meaning and definition of gender, difference between sex and gender, socialization and gender stereotypes, care work and differential pay
- Demographic aspects of Gender: Sex selections, overall sex ratio and social consequences
- Knowledge and Gender: Historical perspective on gender in academics, contribution of women writers, gender in language and literature
- Issues and Response: Transgender and social exclusion, sexual harassment and policies, development index-gender gap

(Subject Teacher- Sociology/Political Science/Anthropology or Any other)

UNIT- II HUMAN RIGHTS

[9 Hours]

Learning Outcome: To Understand evolution of Human Rights from the earliest times and learn basics of Human Rights at National and Global Level

- Understanding Human Rights: Meaning and Definition of Human Rights; differences between right and human rights, Human Rights Law and Humanitarian Law
- Evolution of Human Rights : Developments prior to French Revolution, The French Declaration of Rights of Man and of the Citizen (1789), The US Bills of Rights (1791), Universal Declaration of Human Rights (1948)
- Three Generation of Rights : First Generation Rights- Civil and Political Rights, Second Generation Rights-Social, Economic and Cultural Rights, Third Generation Rights- Solidarity /Group /Collective Rights, The Advance of Science and Human Rights
- Human Rights in India: Protection of Human Right Act, 1993 and 2006, National Human Right Commission (NHRC), Protection of Human Right Amendment Act, 2019
- The Human Rights Issues in the World: Arbitrary deprivation of life; War crimes; Issues of Surveillance, Censorship, Refugees and religious minorities; Terrorism and Genocide; Cybercrime

- Human Rights Issues in India: Domestic violence, Ethnic/Caste violence, Violation of the Rights of aboriginals/ indigenous people, human trafficking, Issues of Displacement, Protective Laws of the Government.

(Subject Teacher- Political Science/History/Law or Any other)

UNIT- III SUSTAINABLE DEVELOPMENT

[7 hours]

Learning Outcome:

To understand the meaning and evolutionary growth of sustainable development goals (SDGs)

To acknowledge challenges and responses of Sustainable Development

Meaning and Evolution of SDGs: Meaning, definition and principles of sustainable development, evolutionary growth of the concept of Sustainable Development Goals (SDGs), Green growth

Challenges to Sustainable development: Agriculture, population & food security; public health and nutrition; education; natural resources, climate change; unemployment and poverty

Responses to the challenges of sustainable development: Public policy (community participation and participatory learning), technology and engineering, and the inter-linkage between sustainable development and governance

(Subject Teacher- Economics/Geography/Political Science/History or Any other)

UNIT- IV CLIMATE CHANGE ESSENTIALS

[7 hours]

Learning Outcome:

To understand meaning and factors of Climate Change.

To understand the global impact of climate change and the response towards it.

Understanding Climate Change: Meaning and definition of climate change, Drivers of climate change: natural and anthropogenic

Impacts of Climate Change: Climate change as threat to human wellbeing and the planet, evidence of rapid and intensifying changes across the world

Global response to Climate Change: Historical mooring of the global response towards climate change; Role of major international bodies and steps taken to address the issues of climate change

(Subject Teacher- Geography or Any Science Teacher)

UNIT- V ENVIRONMENT PROTECTION

[7 hours]

Learning Outcome:

To understand the need for environmental protection, basic concepts and the efforts taken at national and global levels.

- Understanding Environment and Environmental Protection: Components of environment, Ecological Footprint, Living planet index and bio-prospecting, Need of protection of the Natural Capital (Natural resources and ecosystem services)
- Challenges and Response towards Environmental Protection: Extinction of species, Types of Biodiversity conservation (In-situ and Ex-situ), National and International efforts towards Conservation, Environmental ethics and Economics

(Subject Teacher- Any Science Teacher)

UNIT- VI Artificial Intelligence

[7 hours]

Learning Outcome:

To understand what is AI and how its, effect on humanity

To comprehend the interdisciplinary nature of AI and its impacts on various domains.

To discuss strategies for addressing challenges and maximizing benefits of AI in society.

- Introduction to Artificial Intelligence: Definition and scope of AI, Historical background and evolution, AI applications across different sectors.
- Ethical Considerations: Ethical dilemmas in AI development and deployment, case studies highlighting ethical challenges (e.g., bias, privacy concerns), Strategies for promoting ethical AI practices
- Socio-Economic Implications: Explorations of societal impacts of AI on employment, education, healthcare, etc., examination of AI's role in exacerbating or mitigating social inequalities, analysis of AI's influence on economic growth, productivity and job market, fostering inclusively and accessibility in AI technologies.
- Legal and Regulatory Frameworks (30 Minutes): Overview of existing legal frameworks for AI, Challenges in regulating AI technologies, International perspective on AI Governance
- Environmental Sustainability: AI's contributions to Environmental Sustainability and Challenges, exploration of Energy Consumption, E-waste, and Carbon Footprints of AI technologies, solutions for minimizing AI's Environmental Impact
- Integrating AI into Human Rights: Examination of AI's implications for Human Rights including Privacy, Freedom of Expression, and Access to Information, Strategies for safeguarding Human Rights in AI Development and Deployment
- Future Trends and Reflection: Overview of Emerging Trends and Future Directions in AI, Ideas for promoting responsible AI Innovation and addressing Cross-Cutting Issues

(Subject Teacher- Computer Science/Mathematics/Any Science Teacher)

Sample Questions

Define Human Rights in one Sentence. [1 mark]

List two positive impacts at AI. [2 marks]

Write a paragraph on sustainable development Goals. [5 marks]

Critically examine India's efforts to preserve Bio-diversity. [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.