BCA 3RD SEMESTER (NEP 2020)

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

SEMESTER-III

Core-V   **Data Base Management System**

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

Learning Outcomes:

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

Unit I:

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

Unit II:

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

Unit III:

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

Unit IV:

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

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

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

BCA 3.3 Lab: Data Base Management System

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

EMPLOYEE Schema

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

DEPARTMENT Schema

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

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

9. Display Name and Hire Date of every Employee who was hired in 1981.
10. Display Name and Job of all employees who don't have a current Manager.
11. Display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Display Name of all the employees where the third letter of their name is 'A'.
14. Display Name of all employees either have two 'R's or have two 'A's in their name and are either in Dept No = 30 or their Mangers Employee No = 7788.
15. Display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Display the Current Date.
17. Display Name, Hire Date and Salary Review Date which is the 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, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India*

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

Core VII

Operating Systems

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

Learning Outcomes:

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

Unit I:

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

Unit II:

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

Unit III:

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

Unit IV:

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

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

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

BCA 4.2 Lab: Operating Systems

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

DISCRETE MATHEMATICS

Course Objectives:

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

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

• Learn core ideas in logic and relations.

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

• Learn lattices and Boolean algebra.

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

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

Books Recommended:

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

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

Books for Reference:

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

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

Professional Writing

Course Objectives

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

Unit-1

Writing: Definition and Requirement

Writing Process: Prewriting, Writing and Post writing

Basic Writing Skills

Plain English

Unit-2

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

Unit-3

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

Raising the Bar: Presentations, Proposal, and Report

Unit-4

The Elements of Style: Grammar, Usage, and Mechanics

Prescribed Texts

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

Suggested Readings

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

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

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

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

COURSE OUTCOME

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

COURSE CONTENTS

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

Learning Outcome-

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Learning Outcome-

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

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

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

Subject Teacher: Philosophy or Any Science Teacher

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

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

1. **Women and family-**Gendered practices in the family, marriages (dowry, child marriage, women's consent).
   Women and work- women's work at home and at work place, pay gap, gendered roles, harassment at work place and working women and role conflict.
   Women and Society- Gender sensitive language, property right, marriage-divorce/Separation and women's right; violence against women

2. **Issues Relating to Children:** Nutrition and health , Child Exploitation: Child labour ,trafficking, sexual exploitation

3. **Issues Relating to Elderly Persons :** Abuse of Elders, Financial insecurity, Loneliness and Social insecurity, Health Care Issues, Needs for a happy and Dignified Ageing

4. **Issues Relating to persons with disability:** Rights of PWD, affirmative action, prevention of discrimination, providing equal opportunity, various scheme for empowering PWD and social justice for PWD.

5. **Issues Relating to Third Gender:** Understanding LGBTQ, Social justice for them, Removal of discrimination, Affirmative action and Acceptance of diversity of gender.

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

Sample Questions-

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

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