BANKURA UNIVERSITY

(West Bengal Act XIX of 2013- Bankura University Act, 2013)

Main Campus, Bankura Block-II, P.O.: Purandarpur, Dist.: Bankura, Pin- 722155, West Bengal

Office of the Secretary

Faculty Council for Undergraduate Studies

Ref: BKU/FCUG/166/2024 Date: 28/06/2024

NOTIFICATION

As directed, the undersigned is pleased to inform all concerned that Bankura University has initiated the process to implement New Curriculum and Credit Framework for Undergraduate Programme, UGC 2022 (as per NEP 2020) for 4-years Undergraduate programme with Computer Science as Major, Minor etc. from the academic session 2023-2024. The Syllabus for the purpose will be framed and finalized as per the guidelines of appropriate authority. As an important corollary to the process, the workshop will be organized on the date mentioned herewith to get the feedback from the stakeholders. Present Students, Alumni, Guardians, Academicians and other stakeholders related to the specific programme/course are requested for their kind participation in the workshop and to present their views/ observations etc. The stakeholders may go through the draft syllabus attached herewith and convey their observations to the office of the undersigned Venue: Room No. 301, Academic Building, Bankura University.on ugsecretaryoffice@bankurauniv.ac.in within seven days from the date of publication of notice.

T.A. will not be provided for the purpose.

Date: 3rd July, 2024.

Time: 12 PM onwards

Google Meet joining info

Video call link: meet.google.com/ire-iqrj-pkb

Sd/-
Dr. Arindam Chakraborty
Secretary
Faculty Council for Undergraduate Studies

BANKURAUNIVERSITY

Curriculum and Credit Framework for

Computer Science

(Basic, Honours and Honours with Research)

With effect from the Academic Year 2023-2024

SEMESTER–III

Sl. No.	Course Code	Course Title	Credit	Marks			No. of Hours		
				IA	ESE	Total	L	T	P
1	CSC/301/MJC-3	Computer Organization and Architecture	4	10	40 T:25 L:15	50	3	0	2
2	CSC/302/MJC-4	Object Oriented Programming using Java	4	10	40 T:25 L:15	50	3	0	2
2	CSC/303/MN-03	Computer Organization and Architecture	4	10	40 T:25 L:15	50	3	0	2
3	CSC/304/MD-03	Understanding ICT Tools	3	10	40 T:40 L:00	50	3	0	0
4	CSC/305/SEC-3	Web Design using HTML	3	10	40 T:00 L:40	50	3	0	2
5	ACS/306/AEC-03		2						
Total in Semester-III			**20**						

SEMESTER–IV

Sl. No.	Course Code	Course Title	Credit	Marks			No. of Hours		
				IA	ESE	Total	L	T	P
1	CSC/401/MJC-05	Numerical Methods	4	10	40 T:25 L:15	50	3	0	2
2	CSC/402/MJC-06	Database Management Systems	4	10	40 T:25 L:15	50	3	0	2
3	CSC/403/MJC-07	Computer Networks	4	10	40 T:25 L:15	50	3	0	2
4	CSC/404/MJC-08	Operating System Concepts	4	10	40 T:25 L:15	50	3	0	2
5	CSC/405/MN-04	Database Management Systems	4	10	40 T:25 L:15	50	3	0	2
6	ACS/406/AEC-04		2						
Total in Semester-IV			**22**						

SEMESTER–III

COMPUTER SCIENCE (MJC-03/MN-03): **Computer Organization and Architecture**
Credit: 04 (03 Theory + 01 Practical) **L/T/P: 3/0/2**

Course Learning Outcomes: After successful completion of the Course a student will be able to:

- Learn about function and design of various components of a computer.
- Become skilled at developing different types of combinational and sequential circuits.
- Learn about the working principle of interfaces between software and hardware.
- Learn about the working principle of central processing unit of a Computer.
- Learn about the internal structure of different types of memory used in a computer.
- To make students aware of the different ways of communicating with I/O devices and standard I/O interfaces.

Theory

Unit I: Introduction

Logic gates, Boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory units.

Unit II: Data Representation and Basic Computer Arithmetic

Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, and multiplication and division algorithms for integers

Unit III: Basic Computer Organization and Design

Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference ,input -output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer

Unit IV: Central Processing Unit

Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language,input output programming, RISC, CISC architectures, pipelining and parallel architecture.

Unit V: Memory Organization

Cache memory , Associative memory, mapping.

Unit VI: Input-Output Organization

Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Practical

COMPUTER SCIENCE LAB (MJC-03/MN-03):
(Besides the traditional Hardware Platform use of open source Simulators are also encouraged)
Computer System Organization and Architecture Lab Practical

1. Implement X-OR Gate using NAND Gates.
2. Implement X-OR Gate using NOR Gates.
3. Implement Half-Adder using Basic Gates.
4. Implement Half-Adder using NAND Gates.
5. Implement Full-Adder using NAND Gates.
6. Implement Full-Subtractor using NAND Gates.
7. Implement the Function: : F = ABC + DEF using Basic Gates.

8. Implement the Function: : F = ABC + DEF using Basic Gates.
9. Implement the Function: F = ABC + DEF .
10. Implement 2 × 1 Multiplexer using Basic Gates.
11. Implement 4 × 1 Multiplexer using NAND Gates.
12. Implement 8 × 1 MUX .
13. Implement a 2-bit Comparator using Basic Gates.
14. Implement S-R Flip-Flop using NAND Gates.
15. Implement J-K Flip-Flop using NAND Gates.

Recommended Books:

1. M. Mano, Computer System Architecture, Pearson Education 1992
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India, 2009
4. M.M. Mano, Digital Design, Pearson Education Asia, 2013
5. Carl Hamacher, Computer Organization, Fifth edition, McGrawHill, 2012.

COMPUTER SCIENCE (MJC-04): **Object Oriented Programming using Java**
Credit: 04 (03 Theory + 01 Practical) **L/T/P: 3/0/2**

Course Learning Outcomes: After successful completion of the Course a student will be able to:
• Learn about Object Oriented Programming.
• Use, write, compile, debug and learn in Java Programming.
• The practical part of this course will enable the students to develop apps based on Java.
• Develop Web Site and Web Applications.

Theory

Unit I: Object-Oriented Programming Overview

Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

Unit II: Introduction to Java

Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, 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).

Unit III: Arrays, Strings and I/O

Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

Unit IV: Inheritance, Interfaces, Packages

Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes.

Unit V: Exception Handling, Threading
Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multithreading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads.

Unit VI: Applets and Event Handling
Java Applets: Introduction to Applets, Writing Java Applets, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes.

Practical

COMPUTER SCIENCE LAB (MJC-04):

1. Create Matrix class using templates. Write a menu-driven program to perform following Matrix operations (2-D array implementation):

a) Sum b) Difference c) Product d) Transpose

2. 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).

3. Create a class Triangle. Include overloaded methods for calculating area.

4. Create a class Box containing length, breath and height. Include following methods in it:

a) Calculate surface Area

b) Calculate Volume

c) Check if it is a Cube or cuboid

Write a program which takes input from the user for length, breath and height to test the above class.

5. 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.

6. 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)

7. 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.

8. Write a program to show the use of static functions and to pass variable length arguments in a function.

9. 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.

10. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series,

11. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages

12. 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.

16. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.

17. 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).

18. Write a program to demonstrate priorities among multiple threads.

19. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).

20. Write a program to create URL object, create a URL Connection using the openConnection ()

method and then use it examine the different components of the URL and content.
21. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet‘s window.
22. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
23. Write a program to demonstrate different keyboard handling events.
24. Write a program to generate a window without an applet window using main() function.
25. Write a program to demonstrate the use of push buttons.

Recommended Books:

1. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
2. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley"The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
3. Joshua Bloch, "Effective Java" 2nd Edition,Publisher: Addison-Wesley, 2008.
4. Cay S. Horstmann, GaryCornell, "Core Java 2 Volume 1 ,9th Edition,Printice Hall.2012
5. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 2 - Advanced Features)", 9th Edition, Printice Hall.2013
6. Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.
7. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.
8. Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
9. "Head First Java", Orielly Media Inc. 2nd Edition, 2005.
10. David J. Eck, "Introduction to Programming Using Java", Published by CreateSpace Independent Publishing Platform, 2009.
11. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

COMPUTER SCIENCE (SEC-03): **Web Design using HTML**
Credit: 03 **L/T/P: 0/0/6**

Course Learning Outcomes: After successful completion of the Course a student will be able to:
• Use the HTML programming language.
• Resolves written HTML codes.
• Runs the page he/she has designed using HTML codes.
• Design simple web site and pages through HTML programming.

Theory

UNIT I: **Introduction**
UNIT II: **Basics**
Head, Body, Colors, Attributes Lists, Ordered, Unordered
UNIT III: **Links**
Introduction to Relative and Absolute Links Link Attributes Using the ID Attribute to Link within a Document.
UNIT IV: **Images**
Putting an Image on a Page Using Images as Links Putting an Image in the Background.
UNIT V: **Tables**
Creating a Table, Table Headers, Captions, Spanning Multiple Columns Styling Table.
UNIT VI: **Forms**
Basic Input and Attributes Other Kind of Inputs Styling Forms with CSS Where to Go from Here.

Practical

COMPUTER SCIENCE LAB (SEC-03):

A. Create an HTML document with the following formatting options:
I. Bold
II. Italics
III. Underline
IV. Headings (Using H1 to H6 heading styles)
V. Font (Type, Size and Color)
VI. Paragraph
VII. Line Break
VIII. Horizontal Rule
IX. Pre tag
B. Create an HTML document which consists of:
I. Ordered List
II. Unordered List
III. Nested List of Images
C. Create a table having students' Roll, Name and Grade
D. Create a Table with an inserted image
E. Create a form using HTML which has the following types of controls:
• Text Box
• Option/radio buttons
• Check boxes
• Reset and Submit buttons

COMPUTER SCIENCE (MD-03): **Understanding ICT Tools**
Credit: 03 **L/T/P: 3/0/0**

Course Learning Outcomes: After successful completion of the Course a student will be able to:

- To effectively use ICT tools, software applications and digital resources.
- Use different types of Web browsers.
- To acquire, organize and create his/her own digital resources.
- Interpret data and represent it graphically using spreadsheet.
- Prepare professional presentation.
- To handle ICT related software and Hardware.

Theory

UNIT-1: Overview of Computer Network, Types of Computer Network- LAN, MAN and WAN. Overview of Internet, benefits and drawbacks of Internet.

UNIT-2: Introduction to browser and browsing: accessing relevant information from the Web using URL, accessing textual information using search engines, communicating through E-Mail using the web in a safe manner.

UNIT-3: word processing- Create edit and save document, apply formatting features, insert and edit images, tables and shapes, apply page layout features.

UNIT-4: Working with data- Exploring spreadsheet: Create, open and edit spreadsheet. Insert formulas; apply data sort, filter and data validation features. Working with spreadsheet to extend and represent data using graphs.

UNIT-5: ICT tools for presentation- Create slide presentation, apply animation effects to the text and slides and add audio and video files in the given presentation.
UNIT-6: ICT tools for organizing Quizzes and test- Google Forms.
UNIT-7: ICT interaction tools- Google Drive, Drop Box, WebEx, Zoom, Google Meet and Skype.

Recommended Books:

1. Sushila Madan , Introduction to Essential tools,JBA,2009.
2. Anita Goel, Computer Fundamentals, Pearson, 2012
3. Das, S.K. (2005). A Text book of Information Technology. Dominant Publishers and Distributors.

SEMESTER–IV

COMPUTER SCIENCE (MJC-05): **Numerical Methods**
Credit: 04 (03 Theory + 01 Practical) **L/T/P: 3/0/2**

Course Learning Outcomes: After successful completion of the Course a student will be able to:

- Solve various types of Numerical or Mathematical problems.
- Implement various numerical methods with high accuracy through programming languages.
- Represent statistical data through graphs.

Theory

UNIT I: Floating point representation and computer arithmetic, Significant digits, Errors: Round-off error, Local truncation error, Global truncation error, Order of a method, Convergence and Terminal conditions, efficient computations.

UNIT II: Bisection method, Secant method, Regula−Falsi method Newton−Raphson method, Newton‘smethod for solving nonlinear systems Gauss elimination method (with row pivoting) andGauss−Jordan method, Gauss Thomas method for tridiagonal systems. **Iterative methods**: Jacobi and Gauss-Seidel iterative methods Interpolation: Lagrange‘s form and Newton‘s form

UNIT III: Finite difference operators, Gregory Newton forward and backward differences InterpolationPiecewise polynomial interpolation: Linear interpolation, Cubic spline interpolation (onlymethod), Numerical differentiation: First derivatives and second order derivatives, Richardson Extrapolation.

UNIT IV: Numerical integration: Trapezoid rule, Simpson‘s rule (only method), Newton−Cotes openformulas .

UNIT V: Extrapolation methods: Romberg integration, Gaussian quadrature, Ordinary differential equation: Euler‘s method, Modified Euler‘s methods: Heun method and Mid- point method, Runge-Kutta second methods: Heun method without iteration, Mid-point method and Ralston‘s Method

UNIT VI: Classical 4th order Runge-Kutta method, Finite difference method for linear ODE.

Practical

COMPUTER SCIENCE LAB (MJC-05):

1. Find the roots of the equation by bisection method.
2. Find the roots of the equation by secant/Regula–Falsi method.
3. Find the roots of the equation by Newton's method.
4. Find the solution of a system of nonlinear equation using Newton's method.
5. Find the solution of tridiagonal system using Gauss Thomas method.
6. Find the solution of system of equations using Jacobi/Gauss-Seidel method.
7. Find the cubic spline interpolating function.
8. Evaluate the approximate value of finite integrals using Gaussian/Romberg integration.
9. Solve the boundary value problem using finite difference method.

Recommended Books:

[1] Laurence V. Fausett, Applied Numerical Analysis, Using MATLAB, Pearson, 2/e (2012)
[2] M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publisher, 6/e (2012)
[3] Steven C Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, Tata McGraw Hill, 2/e (2010).

COMPUTER SCIENCE (MJC-06/MN-04): **Database Management Systems**
Credit: 04 (03 Theory + 01 Practical) **L/T/P: 3/0/2**

Course Learning Outcomes: After successful completion of the Course a student will be able to:
• Gain knowledge of database systems and database management systems software
• Work with a huge database. Through database management system they can work with any real life database.
• Work in different databases using PL-SQL. They can create, delete, and update the database in this class.
• Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

Theory

UNIT I: **Introduction:**
Characteristics of Database Approach, Data Models, Database System Architecture and Data Independence.
UNIT II:**Entity Relationship (ER) Modeling**
Entity Types, Relations, Constraints
UNIT III: **Relational Data Model**
Relational Model Concepts, Relational Constraints, Relational Algebra, SQL Queries

UNIT IV: **Database Design**
Mapping ER model to relational database, functional dependencies, Lossless decomposition, and Normal forms (up to BCNF).
UNIT V: **Transaction Processing**
ACID properties, concurrency control
UNIT VI: **File Structure and Indexing**
Operations on File, Unordered and Ordered Records, Overview of File Organizations, IndexingStructures for Files, B and B_+ Trees.

Practical

COMPUTER SCIENCE LAB (MJC-06/MN-04):

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	No	PRI	NULL
Dname	Varchar (50)	Yes		NULL
Location	Varchar(50)	Yes		New Delhi

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than $2850.
6. Query to display Employee Name and Department Number for the Employee No= 7900.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Query to display Name and Hire Date of every Employee who was hired in 1981.
10. Query to display Name and Job of all employees who don‘t have a current Manager.
11. Query to 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. Query to display Name of all the employees where the third letter of their name is ‗A‘.
14. Query to 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 Manger‘s Employee No = 7788.
15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Query to display the Current Date.
17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.

18. Query to display Name and calculate the number of months between today and the date each employee was hired.
19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
20. Query to 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. Query to display Name, Hire Date and Day of the week on which the employee started.
22. Query to display Name, Department Name and Department No for all the employees.
23. Query to display Unique Listing of all Jobs that are in Department # 30.
24. Query to display Name, Dept Name of all employees who have an ‗A‘ in their name.
25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.
26. Query to display Name and Employee no. Along with their Manger‘s Name and the Manager‘s employee no; along with the Employees‘ Name who do not have a Manager.
27. Query to display Name, Dept 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. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees.
30. Query to display the number of employees performing the same Job type functions.
31. Query to display the no. of managers without listing their names.
32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33. Query to display Name and Hire Date for all employees in the same dept. as Blake.
34. Query to display the Employee No. And Name for all employees who earn more than the average salary.
35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a ‗T‘.
36. Query to display the names and salaries of all employees who report to King.
37. Query to display the department no, name and job for all employees in the Sales department.

Recommended Books:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6thE, PE, 2010

2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rdE, MGH, 2002

3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6thE, PE.

COMPUTER SCIENCE (MJC-07): Computer Networks

Credit: 04 (03 Theory + 01 Practical) L/T/P: 3/0/2

Course Learning Outcomes: After successful completion of the Course a student will be able to:

- Acquire the computer networking knowledge as well as the existing connectivity technologies.
- Establish a solid knowledge of the layered approach.
- Acquire the knowledge of the basic protocols involved in wired/wireless communication process.
- Get practical approaches to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work?

Theory

UNIT I: **Introduction to Computer Networks**
Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

UNIT II: **Data Communication Fundamentals and Techniques**
Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

UNIT III: **Networks Switching Techniques and Access mechanisms**
Circuit switching; packet switching- connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

UNIT IV: **Data Link Layer Functions and Protocol**
Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

UNIT V: **Multiple Access Protocol and Networks**
CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways;

UNIT VI: **Networks Layer Functions and Protocols**
Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

UNIT VII: **Transport Layer Functions and Protocols**
Transport services- error and flow control, Connection establishment and release- three way handshake;

UNITVIII: **Overview of Application layer protocol**
Overview of DNS protocol; overview of WWW &HTTP protocol.

Practical

COMPUTER SCIENCE LAB (MJC-07):

1. Simulate and implement Hamming code method of error correction
2. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
3. Simulate and implement stop and wait protocol for noisy channel.
4. Simulate and implement go back n sliding window protocol.
5. Simulate and implement selective repeat sliding window protocol.
6. Simulate and implement distance vector routing algorithm
7. Simulate and implement Dijkstra algorithm for shortest path routing.

Recommended Books:

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM ,2007.
2. William Stallings:Data and Computer Communications, Eight Edition, Pearson.
3. A. S. Tanenbaum: Computer Networks**,** Fourth edition**,** PHI , 2002

COMPUTER SCIENCE (MJC-08): Operating System Concepts
Credit: 04 (03 Theory + 01 Practical) L/T/P: 3/0/2

Course Learning Outcomes: After successful completion of the Course a student will be able to:
- Acquire knowledge in the objectives of operating systems.
- Know how operating systems are related to computer hardware, what functionalities are provided to users, and what the major components in operating systems are.
- Get familiarization with LINUX system calls for process management and inter-process communication.
- Perform experiments on process scheduling and other operating system tasks through simulation.
- Have a basic knowledge about multithreading.
- Understand concepts of memory management including virtual memory.
- Understand issues related to file system interface and implementation, disk management.

Theory

1. Introduction
Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems, time sharing systems; operating systems for personal computers & workstations, process control & real time systems.

2. Operating System Organization
Processor and user modes, kernels, system calls and system-programs.

3. Process Management
System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter- process communication; deadlocks.

4. Memory Management
Physical and virtual address space; memory allocation strategies –fixed and variable partitions, paging, segmentation, virtual memory

5. File and I/O Management
Directory structure, file operations, file allocation methods, device management.

6. Protection and Security
Policy mechanism, Authentication, Internal access Authorization.

Practical

COMPUTER SCIENCE LAB (MJC-08):

1. 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.

2. WRITE A PROGRAM to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)

3. WRITE A PROGRAM to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)

4. WRITE A PROGRAM to print file details including owner access permissions, file access time, where file name is given as argument.

5. WRITE A PROGRAM to copy files using system calls.

6. Write program to implement FCFS scheduling algorithm.

7. Write program to implement Round Robin scheduling algorithm.

8. Write program to implement SJF scheduling algorithm.

9. Write program to implement non-preemptive priority based scheduling algorithm.
10. Write program to implement preemptive priority based scheduling algorithm.
11. Write program to implement SRJF scheduling algorithm.
12. Write program to calculate sum of n numbers using *thread* library.
13. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

Recommended Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.