VIDYASAGAR UNIVERSITY

Midnapore, West Bengal

PROPOSED CURRICULUM & SYLLABUS (DRAFT) OF

BACHELOR OF SCIENCE WITH COMPUTER SC.

(MULTIDISCIPLINARY STUDIES)

3-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2023-2024)

Based on

Curriculum & Credit Framework for Undergraduate Programmes

(CCFUP), 2023 & NEP, 2020

VIDYASAGAR UNIVERSITY

BACHELOR OF SCIENCE IN MULTIDISCIPLINARY STUDIES with COMPUTER SCIENCE

(*Under CCFUP, 2023*)

Level	YR.	SEM	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
								CA	ESE	TOTAL
B.Sc. in Physical Sc./ Math. & Comp. Sc. with Computer Science	3rd	V	**SEMESTER-V**							
			Major-A4	COSPMJ04	T: Networking; P: Practical *(To be studied by students taken* Computer Sc. *as Discipline- A)*	4	3-0-1	15	60	75
			Major-A5	COSPMJ05	T: Database Management Systems; P: Practical *(To be studied by students taken* Computer Sc. *as Discipline- A)*	4	3-0-1	15	60	75
			Major-A6	COSPMJ06	T: Web Technology; P: Practical *(To be studied by students taken* Computer Sc. *as Discipline- A)*	4	3-0-1	15	60	75
			Major (Elective) -1	COSMJE02	T: MATLAB Programming; P: *(To be studied by students taken* Computer Sc. *as Discipline- A)*	4	3-0-1	15	60	75
			Minor-5 (Disc.-C5)	COSMIN05	T: Operating System*; P:* Practical *(To be studied by students taken* Computer Sc. *as Discipline- C)*	4	3-0-1	15	60	75
					Semester-V Total	20				375
		VI	**SEMESTER-VI**							
			Major-B4		*To be decided (Same as MajorA4 for* Computer Sc. *taken as Discipline-B)*	4	3-0-1	15	60	75
			Major-B4		*To be decided (Same as Major–A5 for* Computer Sc. *taken as Discipline-B)*	4	3-0-1	15	60	75
			Major-B4		*To be decided (Same as Major–A6 for* Computer Sc. *taken as Discipline-B)*	4	3-0-1	15	60	75
			Major (Elective) -2	COSMJE02	T: Internet of thing (IoT); *P:* Practical *(To be studied by students taken* Computer Sc. *as Discipline- A)*	4	3-0-1	15	60	75
			Minor -6 (Disc.-C6)	COSMIN06	T: Database Management Systems*; P:* Practical *(To be studied by students taken* Computer Sc. *as Discipline- C)*	4	3-0-1	15	60	75
					Semester-VI Total	20				375
					TOTAL of YEAR-3	40	-	-	-	700
			Eligible to be awarded Bachelor of Science in Multidisciplinary Studies With Computer Science *on Exit*			126	**Marks (Year: I+II+III)**			2325

MJP = Major Programme (Multidisciplinary), MI = Minor, A/B = Choice of Major Discipline; C= Choice of Minor Discipline; CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical

MAJOR (MJ)

MJ A4/B4: Networking **Credits 04 (FM: 75)**

OBJECTIVE OF THE COURSE **(Theory: 45 Lectures)**

- Provide a foundational understanding of network architectures, protocols, and technologies.
- Cover essential concepts such as the OSI and TCP/IP models, and data transmission across networks.
- Teach about network devices, including routers, switches, and hubs, and their roles in communication.
- Delve into protocols like HTTP, FTP, TCP, and UDP, illustrating their functions in data exchange.
- Emphasize network design, addressing, and subnetting for configuring and managing networks.
- Offer hands-on experience with network configuration and troubleshooting through practical labs and projects.
- Explore wireless networks, security practices, and emerging technologies like cloud computing and the Internet of Things (IoT).
- Prepare students to analyze, design, and implement network solutions, laying the groundwork for careers in network administration, cybersecurity, and IT infrastructure.

MJ A4/B4T: Data Structure & Algorithm **Credits 03 (45 Lectures)**

Course contents:

Module I: Introduction to Computer Networks **8 Hrs.**
Network definition; network topologies; network classifications; network protocol; layerednetwork architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

Module II: Data Communication Fundamentals and Techniques **10 Hrs.**
Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulsecode modulation; parallel and serial transmission; digital to analog modulation-; multiplexingtechniques- FDM, TDM; transmission media.

Module III: Networks Switching Techniques and Access mechanisms **10 Hrs.**
Circuit switching; packets witching- connectionless datagram switching, connection-orientedvirtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

Module IV: Data Link Layer Functions and Protocol **10 Hrs.**
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.

Module V: Multiple Access Protocol and Networks **5 Hrs.**
CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways;

Module VI: Networks Layer Functions and Protocols **6 Hrs.**
Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols.

Module VII: Transport Layer Functions and Protocols **6 Hrs.**
Transport services- error and flow control, Connection establishment and release – three-way handshake;

Module VIII: Overview of Application layer protocol **5 Hrs.**
Overview of DNS protocol; overview of WWW &HTTP protocol.

Suggested Readings:

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM, 2007.
2. A. S. Tanenbaum: Computer Networks**,** Fourth edition**,** PHI, 2002.

MJ A4/B4 P: Data Structure & Algorithm (Practical) **Credits 01**

Use C++/ Python/ Java:

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.
7. Experiments for capturing and analyzing data packets using Wire Shark.
    a. Experiments on filtering packets
    b. Experiments on inspecting packets

8. Write a program for a HLDC frame to perform the following. i. Bit stuffing , ii. Character stuffing.
9. Write a program for distance vector algorithm to find suitable path for transmission.
10. Implement Dijkstra 's algorithm to compute the shortest routing path.
11. For the given data, use CRC-CCITT polynomial to obtain CRC code. Verify the program for the cases
    a Without error
    b. With error
12. Implementation of Stop and Wait Protocol and Sliding Window Protocol
13. Write a program for congestion control using leaky bucket algorithm.

Use NS2/NS3.

1. Write TCL Script for connecting two nodes and sending packets in wired network.
2. Write TCL Script for given STAR topology using SFQ on queue at intermediate node & use different colors for packet originated from different nodes.
3. Write TCL Script for given RING topology in wired network using For loop & making topology dynamic.
4. Write TCL Script in wired network for the given topology using TCP connection and sending data through the node.
5. Write TCL Script in wired network for the given topology using UDP connection and sending data through node.
6. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.
7. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
8. Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination
9. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.
10. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
11. Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
12. Implement simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.
13. Implement and study the performance of GSM on NS2/NS3 (Using MAC layer) or equivalent environment.
14. Implement and study the performance of CDMA on NS2/NS3 (Using stack called Call net) or equivalent environment

MJ A5/B5: Database Management Systems **Credits 04 (FM: 75)**

OBJECTIVE OF THE COURSE

- Provide a comprehensive understanding of database design, implementation, and management.
- Cover fundamental concepts of database architecture, data models, and relational database management systems (RDBMS).
- Teach students to design and normalize databases to ensure data integrity and eliminate redundancy.
- Emphasize the use of SQL for querying and manipulating databases, including creating, updating, and deleting records.
- Explore advanced topics such as transactions, concurrency control, and database security for reliable data handling.
- Offer hands-on experience through projects involving the design and implementation of database systems.
- Equip students with skills to design, manage, and optimize databases.
- Prepare students for careers in database administration, data analysis, and software development.

MJ A5/B5T: Database Management Systems **Credits 04**

Course contents:

Module-I: Introduction **6 Hrs.**
Characteristics of database approach, data models, database system architecture and data independence

Module-II: Entity Relationship(ER) Modeling **6 Hrs.**
Entity types, relationships, constraints.

Module-III: Relation data model **10 Hrs.**
Relational model concepts, relational constraints normalization, relational algebra, SQL queries

Module-IV: Database design **20 Hrs.**
Mapping ER/EER model to relational database, functional dependencies, Lossless decomposition, Normal forms (up to BCNF).

Module-V: Transaction Processing **10 Hrs.**
ACID properties, concurrency control

Module-VI: File Structure and Indexing **8 Hrs.**
Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files (Primary index, secondary index, clustering index), Multilevel indexing using B and B^+ trees.

Suggested Readings:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, DatabaseSystem Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education, 2013.

MJ A5/B5 P: Database Management Systems- Lab (Practical) **Credits 01**

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

EMPLOYEE Schema

Field	Type	NULL KEY	DEFAULT
Eno	Char(3)	PK	
Ename	Varchar(50)		
Job_type	Varchar(50)		Part
Manager	Char(3)		
Hire_date	Date		
Dno	Integer	FK	
Commission	Decimal(10,2)		
Salary	Decimal(10,2)		

DEPARTMENT Schema

Field	Type	NULL KEY	DEFAULT
Dno	Integer	PK	
Dname	Varchar(50)	NOT NULL	
Location	Varchar(50)		KOLKATA

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‘.

B. Create a database having two tables with the specified fields, to computerize a library system of a Delhi University College.

Library Books (Accession number, Title, Author, Department, PurchaseDate, Price) Issued Books (Accession number, Borrower)

a) Identify primary and foreign keys. Create the tables and insert at least 5 records ineach table.
b) Delete the record of book titled ―Database System Concepts‖.
c) Change the Department of the book titled ―Discrete Maths‖ to ―CS‖.
d) List all books that belong to ―CS‖ department.
e) List all books that belong to ―CS‖ department and are written by author ―Navathe‖.
f) List all computer (Department=‖CS‖) that have been issued.

List all books which have a price less than 500 or purchased between ―01/01/1999‖and ―01/01/2004‖

MJ A6/B6: Web Technology **Credits 04 (FM: 75)**

OBJECTIVE OF THE COURSE

Web application development course can vary depending on the specific objectives and level of the course. However, here is a general outline of topics that are commonly covered in a web application development.

MJ A6/B6 T: Web Technology (Theory) **Credits 03**

Course contents:

Unit-1: Introduction to Web Development:

1. Overview of web technologies
2. Client-server architecture
3. Introduction to HTML, CSS, and JavaScript

Unit-2: Front-End Development:

1. HTML fundamentals and document structure
2. CSS styling and layout techniques
3. JavaScript basics and DOM manipulation
4. Responsive web design and mobile optimization
5. Introduction to front-end frameworks (e.g., Bootstrap, Foundation)

MJ A6/B6 P: Web Technology (Practical) **Credits 01**

Basic operation on HTML all tag inkling Form and application of CSS

Suggested Readings:

1. Virginia DeBolt , Integrated HTML and CSS A Smarter, Faster Way to Learn Wiley / Sybex, 2006
2. Cassidy Williams, Camryn Williams Introduction to HTML and CSS, O'Reilly, 2015

Major Elective

(To be studied by students taken Computer Science as Discipline- A)

Major Elective -2: MATLAB Programming **Credits 04 (Full Marks: 75)**

MJE-2T: MATLAB Programming (Theory) **Credits 03**

Course contents:

Introduction to Programming: Components of a computer, working with numbers, Machine code, Software hierarchy. **8 Hrs.**

Programming Environment: MATLAB Windows, A First Program, Expressions, Constants, Variables and assignment statement, Arrays. **8 Hrs.**

Graph Plots: Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save. **8 Hrs.**

Procedures and Functions: Arguments and return values, M-files, Formatted console input-output, String handling. **10Hrs.**

Control Statements: Conditional statements: If, Else, Else-if, Repetition statements: While, for loop. **8 Hrs.**

Manipulating Text: Writing to a text file, Reading from a text file, Randomising and sorting a list, searching a list. **8 Hrs.**

GUI Interface: Attaching buttons to actions, Getting Input, Setting Output. **10Hrs.**

Recommended Books:

1. MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley, 2004,
2. C.B. Moler, Numerical Computing with MATLAB, SIAM, 2004.

MJE-2P: MATLAB Programming (Practical) **Credits 01**

1. Write a program to assign the following expressions to a variable A and then to print outthe value of A.
   a) (3+4)/(5+6)
   b) $2\pi^2$
   c) $\sqrt{2}$
   d) $(0.0000123 + 5.67 \times 10^{-3}) \times 0.4567 \times 10^{-4}$

2. Celsius temperatures can be converted to Fahrenheit by multiplying by 9, dividing by 5, and adding 32. Assign a variable called C the value 37, and implement this formula to assign a variable F the Fahrenheit equivalent of 37 Celsius.
3. Set up a vector called N with five elements having the values: 1, 2, 3, 4, 5. Using N, create assignment statements for a vector X which will result in X having these values:
   a. 2, 4, 6, 8, 10
   b. 1/2, 1, 3/2, 2, 5/2
   c. 1, 1/2, 1/3, 1/4, 1/5

d. 1, 1/4, 1/9, 1/16, 1/25

4. A supermarket conveyor belt holds an array of groceries. The price of each product (in pounds) is [0.6, 1.2 ,0.5, 1.3] ; while the numbers of each product are [3, 2 ,1 ,5]. Use MATLAB to calculate the total bill.
5. The sortrows(x) function will sort a vector or matrix X into increasing row order. Use this function to sort a list of names into alphabetical order.
6. The ―identity‖ matrix is a square matrix that has ones on the diagonal and zeros elsewhere. You can generate one with the eye() function in MATLAB. Use MATLAB to find a matrix B, such that when multiplied by matrix A=[1 2; -1 0] the identity matrix I=[1 0; 0 1] is generated. That is A*B=I.
7. Create an array of N numbers. Now find a single MATLAB statement that picks out from that array the 1,4,9,16,…,√Nth entries, i.e. those numbers which have indices that are square numbers.
8. Draw a graph that joins the points (0,1), (4,3), (2,0) and (5,-2).
9. Calculate 10 approximate points from the function y=2x by using the formulae:
   xn = n
   yn = 2n + rand - 0.5
10. Fit a line of best fit to these points using the function polyfit() with degree=1, and generate co-ordinates from the line of best fit using polyval(). Use the on-line help to find out how to use these functions. Plot the raw data and the line of best fit.
11. Calculate and replay 1 second of a sinewave at 500Hz with a sampling rate of 11025Hz. Save the sound to a file called "ex35.wav". Plot the first 100 samples.
12. Calculate and replay a 2 second chirp. That is, a sinusoid that steadily increases in frequency with time, from say 250Hz at the start to 1000Hz at the end.
13. Build a square wave by adding together 10 odd harmonics: 1f, 3f, 5f, etc. The amplitude of the nth harmonic should be 1/n. Display a graph of one cycle of the result superimposed on the individual harmonics.
14. Write a function called FtoC (ftoc.m) to convert Fahrenheit temperatures into Celsius. Make sure the program has a title comment and a help page.
15. Write a program to input 2 strings from the user and to print out (i) the concatenation of the two strings with a space between them, (ii) a line of asterisks the same length as the concatenated strings, and (iii) the reversed concatenation. For example:
    Enter string 1: Mark
    Enter string 2: Huckvale
    Mark Huckvale
    ****

Major Elective -3: Internet of thing (IoT) **Credits 04(Full Marks: 75)**

MJE-3T: Internet of thing (IoT) (Theory) **Credits 03**

Course contents:

UNIT-I

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

UNIT-II

Sensors Networks : Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

UNIT- III

Data Handling& Analytics: Introduction, Bigdata, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction to Hadoop. Introduction to data Analytics, Types of Data analytics, Local Analytics, Cloud analytics and applications

UNIT-IV

Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

Text Books:

1. Hakima Chaouchi, ― "The Internet of Things Connecting Objects to the Web" ISBN : 978-1- 84821-140-7, Wiley Publications
2. Olivier Hersent, David Boswarthick, and Omar Elloumi, ― "The Internet of Things: Key Applications and Protocols", WileyPublications
3. Vijay Madisetti and ArshdeepBahga, ― "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
4. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.
5. Keysight Technologies, "The Internet of Things: Enabling Technologies and Solutions for Design and Test", Application Note, 2016.

References

6. Daniel Minoli, ― "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
7. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
8. https://onlinecourses.nptel.ac.in/noc17_cs22/course

9. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

MJE-3P: Practical of IoT (Arduino Lab) **Credits 01**

1. Understanding Arduino UNO Board and Components
2. Installing and work with Arduino IDE
3. Blinking LED sketch with Arduino
4. Simulation of 4-Way Traffic Light with Arduino
5. Ultrasonic sensor handing with Arduino
6. Servo motor, stepper handing with Arduino
7. Different sensor handing related to smart home using Arduino.
8. Spinning a DC Motor and Motor Speed Control Sketch
9. Working with Shields
10. Interfacing Arduino with Cloud.

MINOR (MI)

MI-5/C5: Same as Minor-5 (COSMIN05) of Computer Science (Hons) programme **Credits 04**
Full Marks: 75

MI-6/C6: Same as Minor-6 (COSMIN06) of Computer Science (Hons) programme **Credits 04**
Full Marks: 75