

Deccan Education Society's

**Kirti M. Doongursee College of  
Arts, Science and Commerce  
(AUTONOMOUS)**



Affiliated to

**UNIVERSITY OF MUMBAI**

Syllabus for  
Program: Bachelor of Science  
Course: F.Y.BSc  
Subject: Computer Science

Choice Based Credit System (CBCS)  
with effect from  
Academic Year 2024-2025

## **PROGRAM OUTCOMES**

<b>PO</b>	<b>Description</b>
	A student completing Bachelor's Degree in <b>Science</b> Program will be able to
PO1	To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
PO2	To apply their knowledge and skills to be employed and excel in CS professional careers and/or to continue their education in CS and/or related postgraduate programmes.
PO3	To be capable of managing complex CS projects with consideration of the human, financial and environmental factors.
PO4	To work effectively as a part of a team to achieve a common stated goal in a professional manner.
PO5	To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
PO6	To communicate effectively with a range of audiences both technical and non-technical.
PO7	To develop an aptitude to engage in continuing professional development
PO8	To understand corporate approach towards the projects in a research oriented qualitative manner

**Deccan Education Society's  
Kirti M. Doongursee College  
(Autonomous) Proposed  
Curriculum as per NEP-2020**

**Year of implementation- 2024-2025**

**Name of the Department-Computer Science**

<b>Semester</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Vertical</b>	<b>Credit</b>
<b>I</b>	<b>24CSMJ111</b>	<b>Fundamentals of Computers</b>	<b>Major</b>	<b>2</b>
	<b>24CSMJ112</b>	<b>Introduction to OOPs using C++</b>	<b>Major</b>	<b>2</b>
	<b>24CSMJ11</b>	<b>CS practical 1 (Part A+B)</b>	<b>Major</b>	<b>2</b>
	<b>24CSOE131</b>	<b>Introduction to IT and Internet</b>	<b>OE</b>	<b>2</b>
	<b>24CSOE132</b>	<b>Cyber Law</b>	<b>OE</b>	<b>2</b>
	<b>24CSV141</b>	<b>Introduction to HTML</b>	<b>VSC</b>	<b>2</b>
	<b>24CSSC151</b>	<b>Python</b>	<b>SEC</b>	<b>2</b>
<b>II</b>	<b>24CSMJ211</b>	<b>Principles of Operating Systems</b>	<b>Major</b>	<b>2</b>
	<b>24CSMJ212</b>	<b>Database Systems</b>	<b>Major</b>	<b>2</b>
	<b>24CSMJ21</b>	<b>CS practical 2 (Part A+B)</b>	<b>Major</b>	<b>2</b>
	<b>24CSMR231</b>	<b>Discrete Mathematics</b>	<b>Minor</b>	<b>2</b>
	<b>24CSOE231</b>	<b>Decision Making using Information Technology</b>	<b>OE</b>	<b>2</b>
	<b>24CSOE232</b>	<b>E-Commerce</b>	<b>OE</b>	<b>2</b>
	<b>24CSV241</b>	<b>Introduction to JavaScript and PHP</b>	<b>VSC</b>	<b>2</b>
	<b>24CSSC251</b>	<b>Introduction to SQL</b>	<b>SEC</b>	<b>2</b>

# **SEMESTER-I**

<b>Course Code</b>	<b>MAJOR SEM – I</b>	<b>Credits</b>	<b>Lectures /Week</b>
<b>24CSMJ111</b>	<b>Paper I - Fundamentals of Computer</b>	<b>2</b>	<b>2</b>
<p><b>Course Outcomes:</b></p> <ul style="list-style-type: none"> <li>• After successful completion of this course, students would be able to</li> <li>• identify logic gates with symbols and truth tables. State Demorgan’s theorems</li> <li>• Understand the basics of digital electronics needed for computers.</li> <li>• Apply the various rules and laws of Boolean Algebra for designing digital circuits.</li> <li>• Analyze the digital circuits using K-map.</li> </ul>			
<b>Unit</b>	<b>Topics</b>	<b>No of Lectures</b>	
<b>I</b>	<p><b>Logic Gates:</b> Logic gates: definition, symbols, truth tables, Boolean expressions combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters, and memory units.</p> <p><b>Number System and Codes:</b> Decimal, binary, octal, hexadecimal number systems, Arithmetic operations on number systems, Number System Conversion, ASCII Code.</p>	<b>15</b>	
<b>II</b>	<p><b>Boolean Algebra</b> Rules and laws of Boolean algebra, logic expression, De Morgan’s theorems, their proof, Sum of products form (min. terms), Product of sum form (max. terms), Simplification of Boolean expressions using Boolean algebra and Karnaugh map up to 4 variables</p>	<b>15</b>	
<p><b>Textbooks:</b></p> <ul style="list-style-type: none"> <li>• Rajaraman, V., Adabala, Neeharika, Fundamentals of Computers, PHI Learning Pvt Ltd, 6<sup>th</sup> ed., 2015</li> </ul> <p><b>Additional References:</b></p>			

- M. Mano, Computer System Architecture 3rd edition, Pearson Education 2014
- R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd., 4th Edition, 2010
- Digital Principals, Schaum's outline series, Tata McGraw Hill, 2006

Course Code	MAJOR SEM - I	Credits	Lectures /Week
24CSMJ112	Paper II - Introduction to OOPs using C++	2	2
<b>Course Outcomes:</b>			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> <li>• Describe various data types and OOPs concepts.</li> <li>• Understand the importance of OOPs approach over procedural language.</li> <li>• Apply the concepts of OOPS like encapsulation, inheritance and polymorphism.</li> <li>• Illustrate basic file operations.</li> </ul>			
Unit	Topics	No of Lectures	
I	<p><b>Introduction to Programming Concepts:</b> Object oriented programming paradigm, basic concepts of object oriented programming, benefits of object oriented programming, object oriented languages, applications of object oriented programming.</p> <p>Tokens-keywords, identifiers, constants-integer, real, character and string constants, backslash constants, features of C++ and its basic structure, simple C++ program without class, compiling and running C++ program.</p> <p><b>Data Types, Data Input Output and Operators:</b> Basic data types, variables, rules for naming variables, programming constants, the type cast operator, implicit and explicit type casting, cout and cin statements, operators, precedence of operators.</p> <p><b>Decision Making, Loops, Arrays and Strings:</b> Conditional statements-if, if...else, switch loops- while, do...while, for, types of arrays and string and string manipulations</p> <p><b>Classes, Abstraction &amp; Encapsulation:</b> Classes and objects, Dot Operator, data members, member functions, passing data to functions, scope and visibility of variables in function.</p> <p><b>Constructors and Destructors:</b> Default constructor, parameterized constructor, copy constructor, private constructor, destructors.</p> <p><b>Working with objects:</b> Accessor - mutator methods, static data and static function, access specifiers, array of objects.</p>	15	
II	<p><b>Polymorphism</b> - Binding-static binding &amp; overloading, constructor overloading function overloading, operator overloading, overloading unary and binary operators.</p> <p><b>Modeling Relationships in Class Diagrams:</b> Association, Aggregation- Composition and examples covering these principles</p> <p><b>Inheritance:</b> Defining base class and its derived class, access specifiers, types of inheritance-single, multiple, hierarchical,</p>	15	

	<p>multilevel, hybrid inheritance, friend function and friend class, constructors in derived classes.</p> <p><b>Pointers:</b> Introduction to pointers, * and &amp; operators, assigning addresses to pointer variables, accessing values using pointers, pointers to objects &amp; this pointer, pointers to derived classes</p> <p><b>File Handling:</b> File Stream classes, opening and closing file-file opening modes, text file handling, binary file handling.</p>	
<p><b>Textbooks:</b></p> <ul style="list-style-type: none"> <li>● Object Oriented Programming with C++, Balagurusamy E., 8th Edition, McGraw Hill Education India.</li> <li>● UML &amp; C++: A Practical Guide to Object Oriented Development, Lee/Tepfenhart, Pearson Education, 2nd Edition 2015</li> </ul> <p><b>Additional References:</b></p> <ul style="list-style-type: none"> <li>● Mastering C++ by Venugopal, Publisher: McGraw-Hill Education, 2017</li> <li>● Let Us C++ by Kanetkar Yashwant, Publisher: BPB Publications, 2020</li> <li>● Object Oriented Analysis and Design by Timothy Budd TMH, 2001</li> </ul>		

Course Code	MAJOR SEM-I Practical	Credits	Lectures/Week
24CSMJ11	CS Practical(A+B)	2	4
<b>Part A : Fundamentals of Computer</b>			
<b>Course Outcomes:</b>			
<ul style="list-style-type: none"> <li>• After successful completion of this course, students would be able to</li> <li>• Describe the circuit diagrams using different symbols of electronic components.</li> <li>• Discuss working of circuits of individual experiment.</li> <li>• Apply DeMorgan's theorems, laws of Boolean algebra to construct different practical circuits.</li> <li>• Analyze observations of each experiment based on the aim and objectives of an experiment.</li> <li>• Evaluate observed outputs with expected theoretical outputs.</li> </ul>			
1	Study of discrete Logic gates: Study and verify the truth table of various logic gates (NOT, AND, OR, EX-OR, and EX-NOR).		
2	Study of NAND and NOR gate as universal gate.		
3	Simplify given Boolean expression		
4	Design and verify a half/full adder		
5	Design and verify half/full subtractor		
6	Design and verify the operation of flip-flops using logic gates.		
7	Verify the operation of a counter		
8	Verification of De Morgan's theorems		
9	Using SPIM, write and test an adding machine program that repeatedly reads in integers and adds them into a running sum. The program should stop when it gets an input that is 0, printing out the sum at that point.		
10	Using SPIM, write and test a program that reads in a positive integer using the SPIM system calls. If the integer is not positive, the program should terminate with the message "Invalid Entry;" otherwise, the program should print out the names of the digits of the integers, delimited by exactly one space. For example, if the user entered "528," the output would be "Five Two Eight."		

<b>PART B</b>	<b>Introduction to OOPs using C++ - Practical</b>
<b>Course Outcomes:</b>	
<ul style="list-style-type: none"> <li>• After successful completion of this course, students would be able to</li> <li>• List the errors and warnings for the given input.</li> <li>• Explain and demonstrate the execution process of the programs.</li> <li>• Solve the problems based on each OO concept.</li> <li>• Write modularized program code for implementing OO concepts.</li> </ul>	
1	Program to demonstrate use of data members & member functions.

<b>2</b>	Programs based on branching and looping statements using classes.
<b>3</b>	Program to demonstrate one and two dimensional arrays using classes.
<b>4</b>	Programs to demonstrate various types of constructors and destructors.
<b>5</b>	Programs to demonstrate use of public, protected & private scope specifiers.
<b>6</b>	Programs to demonstrate single and multilevel inheritance.
<b>7</b>	Programs to demonstrate friend function, inline function, this pointer
<b>8</b>	Programs to demonstrate function overloading and overriding.
<b>9</b>	Programs to demonstrate use of pointers.
<b>10</b>	Programs to demonstrate text and binary file handling.

Course Code	OPEN ELECTIVE SEM – I	Credits	Lectures /Week
24CSOE131	Paper I Introduction to IT and Internet	2	2
<b>Course Outcomes:</b>			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> <li>• Describe various components of a computer, network and e-security systems</li> <li>• Explain the characteristics and usage of various elements of a computer, a network and operating systems</li> <li>• Use various input, output, memory and local network devices</li> <li>• Explain basic terminology related to data and information</li> </ul>			
Unit	Topics	No of Lectures	
I	<p><b>Information technology concepts:</b> Concept of Data, Information and Knowledge Concept of Database Introduction to Information Systems and its major components. Types and Levels of Information systems. Main types of IT Support systems</p> <p>Computer based Information Systems (CBIS)</p> <ul style="list-style-type: none"> <li>• Types of CBIS - brief descriptions and their interrelationships/hierarchies</li> <li>• Office Automation System(OAS)</li> <li>• Transaction Processing System(TPS)</li> <li>• Management Information System(MIS)</li> <li>• Decision Support Systems (DSS)</li> <li>• Executive Information System(EIS)</li> <li>• Knowledge based system, Expert system</li> </ul> <p><b>Internet</b></p> <ul style="list-style-type: none"> <li>· Basic of Computer networks - LAN, WAN; Concept of Internet; Applications of Internet; Connecting to internet; Knowing the Internet; Basics of internet connectivity related troubleshooting.</li> <li>· World Wide Web - Web Browsing softwares, Search Engines; Understanding URL; Domain name; IP Address; Using E-governance website.</li> <li>· Switch, Router, and Gateways, Identification of Nodes in a Networked Communication, Internet, Web and the Internet of Things, Domain Name Systems.</li> </ul>	15	
II	IT Risk - Definition, Measuring IT Risk, Risk Mitigation and	15	

	<p>Management</p> <ul style="list-style-type: none"> <li>● E-Business Risk Management Issues: Firewall concept and component, Benefits of Firewall</li> <li>● Security on the Internet: Network and website security risks Website Hacking and Issues therein. Security and Email</li> <li>● Information Security Environment in India with respect to real Time Application in Business Types of Real Time Systems, Distinction between Real Time, On – line and Batch Processing System. Real Time Applications viz. Railway / Airway / Hotel Reservation System, ATMs, EDI Transactions - definition, advantages, examples; E - Cash, Security requirements for Safe E-Payments.</li> </ul> <p>Security Aspects Threats and Prevention, Malware - virus, Worms, Ransomware. Trojan, spyware, adware, key loggers, Modes of Malware distribution, Antivirus, HTTP vs HTTPS, Firewall, Cookies, Hackers and Crackers.</p>	
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Information Technology for Management, 6TH ED (With CD )</li> <li>2. By Efraim Turban, Dorothy Leidner, Ephraim Mclean, James Wetherbe</li> <li>3. Microsoft Office Professional 2013 Step by Step</li> <li>4. By Beth Melton, Mark Dodge, Echo Swinford, Andrew Couch, Tata McGraw Hill</li> </ol> <p>Joseph, P.T. : E-commerce An Indian Perspective</p>		

<b>Course Code</b>	<b>OPEN ELECTIVE SEM – I</b>	<b>Credits</b>	<b>Lectures /Week</b>
<b>24CSOE132</b>	<b>Paper II- Cyber Law</b>	<b>2</b>	<b>2</b>
<b>Course Outcomes:</b>			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> <li>• Make Learner Conversant With The Social And Intellectual Property Issues Emerging From ‘Cyberspace.</li> <li>• Explore The Legal And Policy Developments In Various Countries To Regulate Cyberspace;</li> <li>• Develop The Understanding Of Relationship Between Commerce And Cyberspace</li> <li>• Give Learners In Depth Knowledge Of Information Technology Act And Legal Framework Of Right To Privacy, Data Security And Data Protection.</li> </ul>			
<b>Unit</b>			
<b>Unit</b>	<b>Topics</b>	<b>No of Lectures</b>	
<b>I</b>	Introduction to Cyber World, Introduction to Indian Cyber Law , Distinction between Cyber Crime and Conventional Crime , Cyber Criminals and their Objectives , Kinds of Cyber Crime-cyber stalking; cyber pornography; forgery and fraud; crime related to IPRs; Cyber terrorism; computer vandalism etc.	<b>15</b>	
<b>II</b>	Overview of General Laws and Procedures in India, Penalties & Offences under the IT Act, 2000	<b>15</b>	
<b>Textbooks:</b>			
<ul style="list-style-type: none"> <li>• Cyber law –The Indian perspective by Pavan Duggal</li> </ul>			
<b>Additional References:</b>			
<ul style="list-style-type: none"> <li>• CYBER FRAUDS, CYBERCRIMES &amp; LAW IN INDIA by Pavan Duggal</li> </ul>			

Course Code	VOCATIONAL SKILL COURSE SEM – I	Credits	Lectures/ Week
24CSVC141	Paper I - Introduction to HTML (Practical Based)	2	2
<b>Course Outcomes:</b>			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> <li>Recall key concepts and terminology related to web programming and apply them in practical exercises.</li> <li>Recognize the fundamental web programming concepts and their application in real-world scenarios.</li> <li>Use web programming languages and tools to create dynamic, interactive, and responsive web applications.</li> <li>Evaluate the effectiveness of web programming solutions in terms of functionality, usability, and security.</li> </ul>			
<b>Unit</b>			
<b>Topics</b>		<b>No of Sessions</b>	
I	<p><b>Internet and the World Wide Web:</b> What is the Internet? Applications of Internet, E-mail, Telnet, FTP, Internet Service Providers, Domain Name Server, Internet Address, World Wide Web (WWW): World Wide Web and its Evolution, Uniform Resource Locator (URL), Browsers, Search Engine, Web Server, HTTP Protocol.</p> <p><b>HTML5:</b> Introduction, Formatting Text by using Tags, Using Lists, Creating Hyperlinks and Bookmarks, Defining Metadata about an HTML Document, Redirecting to another URL.</p> <p><b>CSS:</b> Implementing Styles using CSS – Stylesheets, Formatting Text, Paragraphs and Links using CSS, CSS Selectors</p> <p><b>HTML Media:</b> Embedding Images, Creating Client-side and Server-side Image Map, Embedding audio and video on web page</p>	15	
II	<p><b>Frames, Tables and Forms:</b> Creating web pages using frame tag ,Creating Simple Table, Table Dimension, Merging Table Cells.</p> <p><b>Formatting Tables:</b> Applying Borders, Background and Foreground fills, Changing Cell Padding, Spacing and Alignment, Collecting user input with HTML Forms</p>	15	
<b>Textbooks:</b>			

- The Complete Reference HTML & CSS, Thomas A. Powell, McGraw Hill, 5th edition
- Step by Step HTML5, Faithe Wempen, Microsoft Press, 2011

**Additional References:**

- Learning PHP, MySQL, JavaScript, CSS & HTML5, Robin Nixon, O'Reilly, 3rd edition, 2018

Course Code	SEM I –Computer Science (Practical)	Credits	Practical/Week
24CSVC141	Paper I - Introduction to HTML (Practical Based)	2	2

**Course Outcomes:**

After successful completion of this course, students would be able to

- (Remember) static web pages using Hyper Text Markup Language (HTML).
- (Understanding) Understand how to effectively implement HTML.
- (Apply). To construct basic websites using HTML and Cascading Style Sheets
- (Analyze) Deploy a local web server and run a simple web application.

1	Design a web page using different text formatting tags
2	Design a web page with links to different pages and allow navigation between web pages.
3	Design a web page that automatically redirects the user to another page.
4	Design a web page demonstrating different stylesheet types.
5	Design a web page demonstrating grouping selectors.
6	Design a web page demonstrating different semantics.
7	Design a web page embedding image, audio and video.
8	Design a web page with Imagemaps.
9	Design a web page with different tables.
10	Design a web page with a form that uses all types of controls.

Course Code	SKILL ENHANCEMENT COURSE SEM – I	Credits	Lectures/ Week
24CSSC151	Paper I - Python	2	2
<b>Course Outcomes:</b>			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> <li>• To learn basic syntax of Python programming language.</li> <li>• Describe To define the structure and components of a Python program.</li> <li>• Understand data storing and processing mechanism using Arrays, String, List, Tuple and Dictionary</li> <li>• Understand sequential control how to write loops and decision statements in Python</li> <li>• Demonstrate inbuilt input/output operations and compound data types in Python</li> <li>• Develop python simple standalone application</li> </ul>			
Unit	Topics	No of Lectures	
I	<p><b>Introduction to Python Language</b></p> <p>What is Python, Uses of Python Programming Language / Python Applications, Python for Software development, Python for Networking, Python for Automated Testing, Features of Python Programming Language, Implementations of Python, and Python career opportunities.</p> <p><b>Download &amp; Install Python</b></p> <p>Download your operating system compatible Python Interpreter, install Python, set environment variable, customize Python shell, write &amp; execute Python programs using Interactive mode and script mode. Python PyCharm or IDE, set Python for PyCharm IDE, configure PyCharm IDE, write &amp; execute Python programs.</p> <p><b>Python Language Syntax</b></p> <p>Modes of Programming in Python, Interactive mode programming, Script mode programming, Creating Python program file, Python Identifiers, Python keywords, Lines and Indentation, Writing code blocks, Comments in Python, and Quotation in Python.</p> <p><b>Python Keywords and Identifiers</b></p> <p>Python keywords or Reserved words, Python keywords define</p>	15	

	<p>the syntax and structure of the Python language, Python keywords are case sensitive, Python literals (True, False, Null), Python Identifiers, class names, variable names, function names, method names, and Identifier naming rules.</p> <p><b>Python Variables</b></p> <p>What is Variable?, Declaration of Variables, Assign Values to Variables, Initialization, Reading, Variable naming restrictions, and Types of Python Variables.</p> <p><b>Python Data Types</b></p> <p>What is Data Type?, Implicit Declaration of Data Types, Python Numbers (Integers, floating-point numbers, and complex numbers), Python Strings, Python boolean data type.</p> <p><b>Python Operators</b></p> <p>Arithmetic operators, Assignment operators, Unary minus operator, Relational operators, Logical operators, Bitwise operators, Membership operators, Identity operators, Precedence of Operators, Basic Input and Output Functions.</p> <p><b>Control Statements:</b> The if statement, The if ... else Statement, The 'if ... elif ... else' Statement, Loop Statement-while loop, for loop, Infinite loop, Nested loop, The else suite, break statement, continue statement, pass statement, return statement</p> <p><b>Python Control Flow – Decision Making</b></p> <p>Decision Making / Conditional Statements in Python, Simple If Structure, if-else structure, if elif structure, and nested If Structure.</p> <p><b>Python Control Flow – Looping</b></p> <p>Python Control Flow Statements, Python Loop Statements. Python while loop, Python for loop, Python range(), Python Nested Loop Structures, and Inserting conditions in Loops and vice versa.</p>	
<p style="text-align: center;"><b>II</b></p>	<p><b>Python Control Flow – Branching</b></p> <p>Python Flow Control – Branching Statements, break statement, continue statement, pass statement, return statement.</p> <p><b>Arrays:</b> Creating Arrays, Indexing and Slicing of Arrays, Basic Array Operations, Arrays Processing, Mathematical Operations on Array, Aliasing Arrays, Slicing and Indexing in Arrays.</p> <p><b>Strings:</b> Creating Strings, Functions of Strings, Working with Strings, Length of a String, Indexing and Slicing, Repeating and Concatenating Strings,</p>	<p style="text-align: center;"><b>15</b></p>

	<p><b>List and Tuples:</b> Lists, List Functions and Methods, List Operations, List Slices, Nested Lists, Tuples, Functions in Tuple</p> <p><b>Dictionaries:</b> Creating a Dictionary, Dictionary Methods, Using for Loop with Dictionaries, Operations on Dictionaries, Sorting the Elements of a Dictionary.</p> <p><b>Functions:</b> Function definition and call, Returning Results, Returning Multiple Values from a Function, Built-in Functions, User defined functions, call by reference, call by value, Parameters and Arguments, Formal and Actual Arguments.</p> <p><b>File Handling:</b> Python File Input-Output: Opening and closing files, various types of file modes, reading and writing to files, manipulating directories. Iterables, iterators and their problem-solving applications.</p> <p><b>Exception handling:</b> What is an exception, various keywords to handle exceptions such try, catch, except, else, finally, raise.</p>	
<p><b>Textbooks:</b></p> <ul style="list-style-type: none"> <li>● Yashwant Kanetkar, Aditya Kanetker, Let Us Python: A Programmer-Friendly Guide- 5th Edition</li> </ul> <p><b>Additional References:</b></p> <ul style="list-style-type: none"> <li>● Python: The Complete Reference, Martin C. Brown, McGraw Hill, 2018</li> <li>● Beginning Python: From Novice to Professional, Magnus Lie Hetland, Apress, 2017</li> <li>● Programming in Python 3, Mark Summerfield, Pearson Education, 2nd Ed, 2018</li> <li>● Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University Press, 2017</li> </ul>		

# **SEMESTER-II**

Course Code	MAJOR SEM – II	Credits	Lectures /Week
24CSMJ211	Paper I- Principles of Operating Systems	2	2
<p><b>Course Outcomes:</b></p> <p>After successful completion of this course, students would be able to</p> <ul style="list-style-type: none"> <li>• Describe different concepts of the operating system.</li> <li>• Discuss the concept of file systems and mass storage structure.</li> <li>• Apply process scheduling algorithms on a given scenario.</li> <li>• Apply deadlock handling techniques to determine the existence of deadlock and recover it.</li> <li>• Compare and analyze the performance of different algorithms.</li> </ul>			
Unit	Topics	No of Lectures	
I	<p><b>Structures:</b> Definition of Operating System, Functions of Operating System, Operating-System Services, System Calls, Types of System Calls, Operating-System Structure.</p> <p><b>Process Concept:</b> Process concept, Process State, PCB, Process scheduling, Operations on processes.</p> <p><b>Process Synchronization:</b> Inter-process Communication, Critical Section Problem, Semaphores: Usage, Implementation.</p> <p><b>Process Scheduling:</b> Basic Concept - CPU-I/O burst cycle, CPU scheduler, Preemptive, Scheduling, Dispatcher, Scheduling Criteria, Scheduling Algorithms- FCFS, SJF, Priority scheduling, Round-robin scheduling, Multiple queue scheduling, Multilevel feedback queue scheduling.</p> <p><b>Deadlocks:</b> System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock</p>	15	
II	<p><b>Main Memory:</b> Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.</p> <p><b>Virtual Memory:</b> Background, Demand Paging, Copy-on-Write, Page Replacement</p>	15	

	<p><b>Mass-Storage Structure:</b> Overview, Disk Structure, Disk Scheduling, Disk Management.</p> <p><b>File-System Interface:</b> File Concept, Access Methods, Directory and Disk Structure.</p> <p><b>File-System Implementation:</b> Allocation Methods, Free-Space Management.</p>	
<p><b>Textbooks:</b></p> <ul style="list-style-type: none"> <li>• Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts, Wiley, 2021</li> </ul> <p><b>Additional References:</b></p> <ul style="list-style-type: none"> <li>• Achyut S. Godbole, Atul Kahate, Operating Systems, Tata McGraw Hill, 2017</li> <li>• Naresh Chauhan, Principles of Operating Systems, Oxford Press, 2014</li> <li>• Andrew S Tanenbaum, Herbert Bos, Modern Operating Systems, 4e Fourth Edition, Pearson Education, 2016</li> </ul>		

Course Code	MAJOR SEM – II	Credits	Lectures /Week
24CSMJ212	Paper II - Database Systems	2	2
<b>Course Outcomes:</b>			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> <li>• Describe different concepts of Database Systems.</li> <li>• Discuss the concept Schema and Relational Algebra.</li> <li>• Apply ER Model and Relational Model concepts.</li> <li>• Compare and analyze the performance of File organizations.</li> </ul>			
Unit	Topics	No of Lectures	
I	<p><b>Introduction to DBMS</b> – Database, DBMS – Definition, Overview of DBMS, File Systems versus a DBMS, Advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture. Data models - Client/Server Architecture, Object Based Logical Model, Record Based. Logical Model (Relational, Hierarchical, Network)</p> <p><b>Introduction to Database System:</b> Database Design and ER Diagrams, Entities, Attributes, and Entity Sets , Relationships and Relationship Sets, Additional Features of the ER Model(Key Constraints , Participation Constraints , Weak Entities , Class Hierarchies , Aggregation)</p> <p><b>Conceptual Design With the ER Model</b> (Entity versus Attribute, Entity versus Relationship, Binary versus Ternary Relationships, Aggregation versus Ternary Relationships)</p> <p><b>Introduction to the Relational Model</b> (Creating and Modifying Relations Using SQL ), Integrity Constraints over Relations(Key Constraints, Foreign Key Constraints, General Constraints),Enforcing Integrity Constraints(Transactions and Constraints),Querying Relational Data,</p> <p><b>Logical Database Design:</b> ER to Relational (Entity Sets to Tables ,Relationship Sets (without Constraints) to Tables, Translating Relationship Sets with Key Constraints, Translating Relationship Sets with Participation Constraints ,Translating Weak Entity Sets ,translating Class Hierarchies, Translating ER Diagrams with Aggregation)</p>	15	

<b>II</b>	<p><b>Schema refinement and Normal forms:</b> Functional dependencies, first, second, third, and BCNF normal forms based on primary keys, lossless join decomposition.</p> <p><b>Relational Algebra</b> operations (selection, projection, set operations union, intersection, difference, cross product, Joins –conditional, equi-join and natural joins, division)</p> <p><b>Database Protection:</b> Security Issues, Threats to Databases, Security Mechanisms, Role of DBA, Discretionary Access Control</p> <p><b>Storage and Indexing:</b> Data on External Storage File Organizations and Indexing (Clustered Indexes, Primary and Secondary Indexes Index Data Structures, Hash-Based Indexing , Tree-Based Indexing)</p>	<b>15</b>
<p><b>Textbooks:</b></p> <ul style="list-style-type: none"> <li>• Ramez Elmasri &amp; Shamkant B.Navathe, Fundamentals of Database Systems, Pearson Education, Seventh,Edition, 2017</li> <li>• Ramakrishnam, Gehrke, Database Management Systems, McGraw-Hill, Third Edition, 2014</li> </ul> <p><b>Additional References:</b></p> <ul style="list-style-type: none"> <li>• Database System Concepts by Abraham Silberschatz, Henry F. Korth, et al., 7th Edition, 21 July 2021</li> </ul>		

Course Code	MAJOR SEM-II Practical	Credits	Lectures/Week
24CSMJ21	CS Practical (A+B)	2	4
<b>Part A - Principles of Operating Systems</b>			
<b>Course Outcomes:</b>			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> <li>• List the errors and warnings for the given input.</li> <li>• Explain and demonstrate the execution process of the programs.</li> <li>• Solve the problems based on each algorithm.</li> <li>• Write modularized program code for implementing various operating system algorithms and integrate them.</li> </ul>			
<b>1</b>	Process Communication:		
<b>2</b>	Write a program to give a solution to the Producer–Consumer problem using shared memory.		
<b>3</b>	Process Communication:		
<b>4</b>	Write a program to give a solution to the Producer–Consumer problem using message passing.		
<b>5</b>	Synchronization:		
<b>6</b>	Write a program to give a solution to the Bounded Buffer problem.		
<b>7</b>	Synchronization:		
<b>8</b>	Write a program to give a solution to the Readers–Writer’s problem.		
<b>9</b>	Write a program that implements FCFS scheduling algorithm.		
<b>10</b>	Write a program that implements (with no preemption) scheduling algorithm.		

<b>Part B : Database Systems – Practical</b>	
<b>Course Outcomes:</b>	
After successful completion of this course, students would be able to	
<ul style="list-style-type: none"> <li>• List the errors and warnings for the given input.</li> <li>• Explain and demonstrate the concept of Database systems.</li> <li>• Solve the problems based on each concept of Database System.</li> <li>• Analyze the output for the given input</li> </ul>	
<b>1</b>	Perform Following: <ul style="list-style-type: none"> <li>• Create ER model with               <ul style="list-style-type: none"> <li>- Key Constraints</li> <li>- Participation Constraints</li> <li>- Weak Entities</li> <li>- Class Hierarchies</li> <li>- Aggregation</li> </ul> </li> </ul>

<b>2</b>	Perform Following: <ul style="list-style-type: none"> <li>● Create Relational Model</li> <li>- Create and Modify Relations</li> <li>- Integrity Constraints over Relations(Key Constraints, Foreign Key Constraints, General Constraints)</li> </ul>
<b>3</b>	Perform Following: <ul style="list-style-type: none"> <li>● Create Relational Model</li> <li>● Enforcing Integrity Constraints(Transactions and Constraints)</li> <li>● Querying Relational Data</li> </ul>
<b>4</b>	Perform Following: <ul style="list-style-type: none"> <li>● Convert ER to Relational (Entity Sets to Tables ,Relationship Sets (without Constraints) to Tables</li> <li>● Translating Relationship Sets with Key Constraints</li> <li>● Translating Relationship Sets with Participation Constraints</li> </ul>
<b>5</b>	Perform Following: <ul style="list-style-type: none"> <li>● Convert ER to Relational (Entity Sets to Tables ,Relationship Sets (without Constraints) to Tables</li> <li>● Translating Weak Entity Sets</li> <li>● Translating Class Hierarchies</li> <li>● Translating ER Diagrams with Aggregation</li> </ul>
<b>6</b>	Perform Relational algebra operations on above ER Model.
<b>7</b>	Perform Normalization and schema refinement on above ER and Relational Model
<b>8</b>	Perform Following: Create Clustered index
<b>9</b>	Perform Following: File Tables: Create, Alter and drop. Load Files
<b>10</b>	Perform Following: Create database User, Grant and Deny

Course Code	MINOR SEM – II	Credits	Lectures /Week
24CSMR221	Paper I - Discrete Mathematics	2	2
<p><b>Course Outcomes:</b></p> <p>After successful completion of this course, students would be able to</p> <ul style="list-style-type: none"> <li>• Describe the basic concepts of sets, permutations, relations, graphs, trees</li> <li>• Understand sets and perform operations and algebra on set</li> <li>• Apply the concepts of graphs to solve various problems in day to day life.</li> <li>• Demonstrate an understanding of relations and functions and be able to determine their properties</li> <li>• Illustrate relationships using directed, undirected, weighted graphs and trees</li> </ul>			
Unit	Topics	No of Lectures	
I	<p><b>Set Theory Introduction:-</b> Sets and Elements, Subsets, Venn Diagrams, Set Operations, Algebra of Sets, Duality, Finite Sets, Counting Principle, Classes of Sets, Power Sets, Partitions, Mathematical Induction</p> <p><b>Relations:-</b> Introduction, Product Sets, Relations, Pictorial Representations of Relations, Composition of Relations, Types of Relations, Closure Properties, Equivalence Relations, Partial Ordering Relations.</p> <p><b>Functions and Algorithms:</b> Introduction, Functions, One-to-One, Onto, and Invertible Functions, Mathematical Functions, Exponential and Logarithmic Functions, Sequences, Indexed Classes of Sets, Recursively Defined Functions, Cardinality, Algorithms and Functions, Complexity of Algorithms</p>	15	
II	<p><b>Counting Principle Cardinality of sets, Basics of Counting:</b> Addition rule, Product rule, Inclusion and Exclusion Principle, Mathematical Induction: 1st and 2nd principle of induction</p> <p><b>Introduction to Graphs and Operations on Graphs:</b> Definition and examples of graph, Handshaking lemma and its corollaries. Types of graph, Complete graph, bipartite graph, Regular graph, Null graph. Isomorphism of graphs, Adjacency and Incidence Matrix of a Graph. Vertex induced subgraph, Edge induced subgraph, Vertex deleted subgraph, Edge deleted subgraph, Union of two graphs, Intersection of two graphs, Product of two graphs, Ring Sum of two graphs, Fusion of vertices, Complement of a graph.</p>	15	

<b>Textbooks:</b> <ul style="list-style-type: none"><li>• Kenneth H.Rosen. Discrete Mathematics and its applications. (7th edition) McGraw-Hill Higher Education, 2017.</li><li>• Bernard Kolman, Robert C.Busby , and Sharon Cutler Ross. Discrete Mathematical Structures (6th edition). Prentice-Hall, Inc. Upper Saddle River, NJ, USA, 2003.</li></ul> <b>Additional References:</b> <ul style="list-style-type: none"><li>• John Clark and Derek Holton, a first look at Graph Theory, 2013</li></ul>		

Course Code	OPEN ELECTIVE SEM – II	Credits	Lectures /Week
24CSOE231	Paper I- Decision Making using Information Technology	2	2
<p><b>Course Outcomes:</b></p> <p>After successful completion of this course, students would be able to</p> <ul style="list-style-type: none"> <li>• Understand various corporate decision-makings using IT systems</li> <li>• Infer how technology supports business decision making</li> <li>• Describe emerging technologies like ERP, CRM, SCM and trends in enterprise applications</li> <li>• Differentiate and identify the several database management and data warehouse approaches.</li> </ul>			
Unit	Topics	No of Lectures	
I	<p><b>Overview of MIS</b></p> <p>Understanding Major Functional Systems Marketing &amp; Sales Systems, Finance &amp; Accounting Systems, Manufacturing &amp; Production Systems, Human Resource Systems, Inventory Systems Sub systems, description and organizational levels</p> <p><b>Decision support system:</b> Definition Relationship with MIS, Evolution of DSS, Characteristics, classification, objectives, components, applications of DSS Concepts of ERP, Application, ERP Lifecycle</p> <p><b>Concept of e-CRM:</b> E-CRM Solutions and its advantages, How technology helps?</p> <p>Concept of E-SCM, Strategic advantages, benefits, E-SCM Components and Chain Architecture, Major Trends in e-SCM</p>	15	
II	<p><b>Introduction to DBMS</b></p> <p>Meaning of DBMS, Need for using DBMS. Concepts of tables, records, attributes, keys, integrity constraints, schema architecture, data independence. Concepts and Characteristics of Data Warehousing and Data Mining, Importance of data warehouse for an organization. The scope and the techniques of Data mining in Business Applications.</p>	15	
<p><b>Textbooks:</b></p> <p>1. Information Technology for Management, 6TH ED (With CD ) By Efraim Turban, Dorothy Leidner, Ephraim Mclean, James Wetherbe Database System concepts by by Abraham Silberschatz , Henry F. Korth , S. Sudarshan.</p>			

<b>Course Code</b>	<b>OPEN ELECTIVE SEM – II</b>	<b>Credits</b>	<b>Lectures /Week</b>
<b>24CSOE232</b>	<b>Paper II - E-Commerce</b>	<b>2</b>	<b>2</b>
<b>Course Outcomes:</b>			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> <li>• To know how the business is carried out through electronic media</li> <li>• To understand the types and ways of doing business over internet</li> <li>• To apply the knowledge after becoming a professional or an entrepreneur</li> <li>• To analyze the security concerns while transacting using electronic media</li> </ul>			
<b>Unit</b>			
<b>Unit</b>	<b>Topics</b>	<b>No of Lectures</b>	
<b>I</b>	<b>Introduction to E-Business and E-Commerce:-</b> Define the e-Commerce and e-Business, Define e-Commerce Types of EC transactions. Define e-Business Models. Internet Marketing and e-Tailing. Elements of e-Business Models. Explain the benefits and limitations of e-Commerce.	<b>15</b>	
<b>II</b>	<b>E-Business applications, E-Procurement and E- Payment Systems:-</b> Integration and e-Business suits. ERP, e-SCM, CRM, E-Payment. E-Procurement definition, processes, methods and benefits. Discuss the categories and users of smart cards. Describe payment methods in B2B EC	<b>15</b>	
<b>Textbooks:</b>			
<ul style="list-style-type: none"> <li>• Electronic Commerce: A Managerial Perspective, Turban, E. et al., Prentice Hall-2008.</li> <li>• Frontiers of e-commerce, Ravi Kalakota, Pearson.</li> </ul>			
<b>Additional References:</b>			
<ul style="list-style-type: none"> <li>• Electronic Business and Electronic Commerce Management, 2nd edition, Dave Chaffey, Prentice Hall, 2006</li> <li>• . e-Learning Tools and Technologies, Horton and Horton, Wiley Publishing</li> </ul>			

Course Code	VOCATIONAL SKILL COURSE SEM – II	Credits	Lectures/ Week
24CSVC241	Paper I - Introduction to JavaScript and PHP	2	2
<p><b>Course Outcomes:</b></p> <p>After successful completion of this course, students would be able to</p> <ul style="list-style-type: none"> <li>• Describe the concepts of World Wide Web, and the requirements of effective web design.</li> <li>• Develop web pages using the HTML and CSS features with different layouts as per need of applications</li> <li>• Use the JavaScript to develop the dynamic web pages.</li> <li>• Construct simple web pages in PHP and to represent data in XML format</li> <li>• Use server side scripting with PHP to generate the web pages dynamically using the database connectivity.</li> </ul>			
Unit	Topics	No of Lectures	
I	<p><b>JavaScript:</b>Introduction, Difference between Client-side and Server-side Scripting, JavaScript Variables and Constants, Data Types, JavaScript Operators, Comments, Functions, JavaScript Objects, Dialog Boxes</p> <p><b>Statements:</b>Conditional Statements – if else, switch, Loops – while, do while, for, for in, for of, Loop Control – break, continue, labels</p> <p><b>JavaScript Objects:</b> User-defined Objects, with Keyword, Native Objects – Array, String, Date, Math, Number, RegExp</p> <p><b>Events and Event Handlers:</b> HTML Events, DOM Events, DOM Event Listeners</p>	15	
II	<p><b>PHP:</b> Introduction, Server-side Scripting, PHP Syntax and Comments, Variables and Constants, Data Types, Looping, Functions, PHP Form Handling, PHP Arrays, PHP Strings, PHP GET and POST, PHP RegEx, Basic PHP Errors.</p> <p><b>Advanced PHP:</b> PHP Sessions, PHP Cookies, Validating and Sanitizing Data with PHP Filters, PHP mail function.</p> <p><b>MySQL:</b>Why MySQL? Connect to MySQL, Creating Database and Tables, Selecting Data, Updating Data, Deleting Data, Limiting Data.</p>	15	
<p><b>Textbooks:</b></p> <ul style="list-style-type: none"> <li>• The Complete Reference HTML &amp; CSS</li> <li>• Learning PHP, MySQL, JavaScript, CSS &amp; HTML5</li> <li>• Learning Web Design A Beginner’s Guide to Html, CSS, JavaScript, And Web Graphics</li> <li>• The Complete Reference JavaScript</li> </ul>			

<b>Course Code</b>	<b>SEM I –</b>	<b>Credits</b>	<b>Practical/Week</b>
<b>24CSVC241</b>	<b>Introduction to JavaScript and PHP Practical</b>	<b>1</b>	<b>2</b>
<b>Course Outcomes:</b> After successful completion of this course, students would be able to <ul style="list-style-type: none"> <li>• (Remember) HTML Basic Java Script Commands and its usage.</li> <li>• (Understanding) Demonstrate the creation and execution of Java scripts in Web Page.</li> <li>• (Apply). Implement Document Object Model and events in web pages using JavaScript.</li> <li>• (Analyze) Execute PHP programming language programs in XAMPP Platform</li> </ul>			
<b>Practical</b>			
<b>1</b>	Using JavaScript, design a web page to accept a number from the user and print its Factorial.		
<b>2</b>	Using JavaScript, a web page that prints Fibonacci series/any given series		
<b>3</b>	Write a JavaScript program to display all the prime numbers between 1 and 100.		
<b>4</b>	Write a JavaScript program to accept a number from the user and display the sum of its digits.		
<b>5</b>	Write a JavaScript program to design a simple calculator.		
<b>6</b>	Design a form and validate all the controls placed on the form using JavaScript.		
<b>7</b>	Write a PHP code to find the greater of 2 numbers. Accept the no. from the user.		
<b>8</b>	Write a PHP Program to accept a number from the user and print it factorial.		
<b>9</b>	Write a PHP program to demonstrate different array functions.		
<b>10</b>	Write a PHP program to demonstrate use of sessions and cookies		
<b>11</b>	Write a PHP program to create: Create a database College Create a table Department (Dname, Dno, Number_of_faculty)		
<b>12</b>	Write a PHP program to Update rows in a table Delete rows from a table		

Course Code	<b>SKILL ENHANCEMENT COURSE SEM - II</b>	Credits	Lectures /Week
24CSSC251	<b>Paper I - Introduction to SQL</b>	2	2
<b>Course Outcomes:</b>			
After successful completion of this course, students would be able to			
<ul style="list-style-type: none"> <li>• Describe different concepts of SQL.</li> <li>• Understand the concepts of SQL.</li> <li>• Apply SQL concepts.</li> <li>• Analyze the performance of File organizations.</li> </ul>			
Unit	Topics	No of Lectures	
I	<p>What is SQL, Benefits of SQL, Downloading and installing SQL Server, Downloading and Installing SQL Server Express, Downloading SQL Server Management Studio(SSMS), Starting the database engine services, Connect to SQL Server with SSMS, Basics of SSMS and its features, Logical process for executing queries in SQL Server.</p> <p>Create Login, Creating SQL Database User (Understanding the Types of Users, Selecting type of User, Create users with SSMS, Additional options, Create User using T-SQL), Create a database schema, Join a Role, Grant permission to a principal role, Create a server Role and Application Role, Create Credentials. Note: Perform above all operations using SSMS and transact-SQL. SQL Operators, SQL Data types</p> <p><b>DDL Statements</b> - Creating Databases, Using Databases, data types, Creating Tables (with integrity constraints – primary key, default, check, not null), Altering Tables, Renaming Tables, Dropping Tables, Truncating Tables, Backing Up and Restoring Databases.</p> <p><b>DML Statements</b> – Viewing the structure of a table insert, update, delete, Select all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause, having Clause</p>	15	
II	<p><b>Functions</b> – String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round,</p>	15	

	<p>truncate) Date Functions (adddate, datediff, day, month, year, hour, min, sec, now, reverse)</p> <p><b>Stored procedures</b> (Create, Execute, create with multiple parameter)</p> <p><b>Joining Tables</b> – inner join, outer join (left outer, right outer, full outer)</p> <p><b>Subqueries</b> – subqueries with IN, EXISTS, subqueries restrictions, Nested subqueries, ANY/ALL clause, correlated subqueries</p> <p><b>Views</b> (creating, altering dropping, renaming and manipulating views)</p> <p><b>DCL Statements</b> (creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges)</p> <p><b>Indexing</b> (Create and drop)</p>	
<p><b>Textbooks:</b></p> <ul style="list-style-type: none"> <li>• Ramakrishnam, Gehrke, Database Management Systems, McGraw-Hill, Third Edition, 2014</li> <li>• Ramez Elmasri &amp; Shamkant B.Navathe, Fundamentals of Database Systems, Pearson Education, Sixth Edition, 2010</li> </ul> <p><b>Additional References:</b></p> <ul style="list-style-type: none"> <li>• Learn SQL: A Practical Guide for SQL Server and Database Fundamentals by Jacob Schulz, 2021</li> <li>• SQL Programming   The Ultimate Guide for Beginner's to Advance by A. Khan, January 2022</li> <li>• Querying SQL Server: Run T-SQL operations, data extraction, data manipulation, and custom queries to deliver simplified analytics by Adam Aspin, July 2022</li> </ul>		

<b>Introduction to SQL – Practical</b>	
<b>1</b>	Installing SQL Server Express and exploring its features.
<b>2</b>	<p>Perform following:</p> <ul style="list-style-type: none"> <li>• Create Login</li> <li>• Create SQL database user</li> <li>• Create user type of user</li> <li>• Create a database schema</li> <li>• Join a Role</li> <li>• Grant permission to a principal role</li> <li>• Create a server Role and Application Role</li> <li>• Create Credentials.</li> </ul>

3	Perform following: <ul style="list-style-type: none"> <li>● Viewing all databases</li> <li>● Creating a Database</li> <li>● Viewing all Tables in a Database</li> <li>● Creating Tables (With and Without Constraints)</li> <li>● Inserting/Updating/Deleting Records in a Table</li> <li>● Saving (Commit) and Undoing (rollback)</li> </ul>
4	Perform the following: <ul style="list-style-type: none"> <li>● Altering a Table</li> <li>● Dropping/Truncating/Renaming Tables</li> <li>● Backing up / Restoring a Database</li> </ul>
5	Perform the following: <ul style="list-style-type: none"> <li>● Simple Queries</li> <li>● Simple Queries with Aggregate functions</li> <li>● Queries with Aggregate functions (group by and having clause)</li> </ul>
6	Queries involving <ul style="list-style-type: none"> <li>● Date Functions</li> <li>● String Functions</li> <li>● Math Functions</li> </ul>
7	Join Queries <ul style="list-style-type: none"> <li>● Inner Join</li> <li>● Outer Join</li> </ul>
8	Subqueries <ul style="list-style-type: none"> <li>● With IN clause</li> <li>● With EXISTS clause</li> </ul>
9	Views <ul style="list-style-type: none"> <li>● Creating Views (with and without check option)</li> <li>● Dropping views</li> <li>● Selecting from a view</li> </ul>
10	DCL statements <ul style="list-style-type: none"> <li>● Granting and revoking permissions</li> </ul>

**Evaluation Scheme for First Year (UG) under NEP (2 credits)**

**I. Internal Evaluation for Theory Courses – 20 Marks**

**1) Continuous Internal Assessment(CIA) Assignment - Tutorial/ Case Study/ Project / Presentations/ Group Discussion / Ind. Visit. – 10 marks**

**2) Continuous Internal Assessment(CIA) ONLINE Unit Test – 10 marks**

**II. External Examination for Theory Courses – 30 Marks**

**Duration: 1 Hours**

**Theory question paper pattern: All questions are compulsory.**

<b>Question</b>	<b>Based on</b>	<b>Marks</b>
<b>Q.1</b>	<b>Unit I</b>	<b>15</b>
<b>Q.2</b>	<b>Unit II</b>	<b>15</b>

**: All questions shall be compulsory with internal choice within the questions.**

**· Each Question may be sub-divided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.**

**III. Practical Examination**

**· Each core subject carries 50 Marks.**

**· Duration: 2 Hours for each practical course.**

**· Minimum 80% practical from each core subjects are required to be completed.**

**· Certified Journal is compulsory for appearing at the time of Practical Exam**

**NOTE: To pass the examination, attendance is compulsory in both Internal & External (Theory + Practical) Examinations.**