

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: Information Technology

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	Disciplinary Knowledge: Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate Programme. Execute strong theoretical and practical understanding generated from the specific graduate Programme in the area of work.
PO2	Critical Thinking and Problem solving: Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions
PO3	Social competence: Display the understanding, behavioral skills needed for successful social adaptation, work in groups, exhibit thoughts and ideas effectively in writing and orally.
PO4	Research-related skills and Scientific temper: Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research
PO5	Trans-disciplinary knowledge: Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem.
PO6	Personal and professional competence: Performing dependently and collaboratively as a part of a team to meet defined objectives and carry out work across interdisciplinary fields. Execute interpersonal relationships, self-motivation and adaptability skills and commit to professional ethics.
PO7	Effective Citizenship and Ethics: Demonstrate empathetic social concern and equity centered national development, and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility.
PO8	Environment and Sustainability: Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

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

**Year of implementation- 2024-2025**

**Name of the Department-Information Technology**

<b>Semester</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Vertical</b>	<b>Credit</b>
<b>I</b>	24ITMJ111	<b>Programming Principles with C</b>	Major	2
	24ITMJ112	<b>Digital Electronics</b>	Major	2
	24ITMJ11	<b>Major Practical-1 &amp; 2</b>	Major	2
	24ITOE131	<b>Introduction to IT and Internet</b>	OE	2
	24ITOE132	<b>Cyber Law</b>	OE	2
	24ITVC141	<b>Database Management System</b>	VSC	2
	24ITSE142	<b>OS with Linux</b>	SEC	2
<b>II</b>	24ITMJ211	<b>Object Oriented Programming with C++</b>	Major	2
	24ITMJ212	<b>Data Structure</b>	Major	2
	24ITMJ21	<b>Major Practical-1 &amp; 2</b>	Major	2
	24ITMR221	<b>Fundamentals of Mathematics &amp; Statistics Part-1</b>	Minor	2
	24ITOE231	<b>Decision Making using Information Technology</b>	OE	2
	24ITOE232	<b>E-Commerce</b>	OE	2
	24ITVC241	<b>Web Designing</b>	VSC	2
	24ITSE242	<b>Python Programming</b>	SEC	2

# **SEMESTER- I**

Course Code	MAJOR SEM – I	Credits	Lectures/Week
24ITMJ111	Paper I- Programming principles with C	2	2
<p><b>Course Outcomes:</b>            After successful completion of this course, students would be able</p> <p><b>CO1:</b> Recognize basic logical concepts and principles of C.  <b>CO2:</b> Understand basic concepts of C using suitable examples.  <b>CO3:</b> Use different problem-solving strategies to address a given problem.  <b>CO4:</b> Analyze errors in a given program and determine appropriate solutions.</p>			
Unit	Topics	No of Lectures	
I	<p><b>Introduction:</b> Algorithms, History of C, Structure of C Program. Program Characteristics, Compiler, Linker and preprocessor, pseudo code statements and flowchart symbols, Desirable program characteristics. Program structure. Compilation and Execution of a Program, C Character Set, identifiers and keywords, data types and sizes , constants and its types, variables, Character and character strings, typedef, typecasting</p> <p><b>Type of operators:</b> Arithmetic operators, relational and logical operators, Increment and decrement operators, assignment operators, the conditional operator, Assignment operators and expression, Precedence and order of Evaluation and C Preprocessor</p> <p><b>Control Flow:</b> Statements and Blocks, If-Else, Else-If, Switch, Loops- While and For Loops-Do-while, Break and Continue, Goto and Labels. Arrays.</p>	15	
II	<p><b>Functions and Program Structure:</b> Basics of functions. User defined and Library functions, Function parameters, Return values, Recursion</p> <p><b>Pointer:</b> Pointer and Addresses, Pointer and Function Arguments, Dynamic memory allocation.</p> <p><b>Structures:</b> Basics of structures, Structures and Functions, Arrays of Structures, Pointers to Structures, Unions, Bit-fields.</p>	15	
<b>Reference:</b>			

1. Let us C Yashwant P. Kanetkar BPB publication
2. Programming in ANSI C by E.Balagurusamy, Tata McGraw-Hill
3. Programming Language by Brian W. Kernighan and Denis M. Ritchie, PHI publication.

**Additional References:**

Mastering C by K R Venugopal, Tata McGraw-Hill

Programming with C by Byron Gottfried, Tata McGRAW-Hill

Course Code	MAJOR SEM – I	Credits	Lectures/Week
24ITMJ112	Paper II - Digital Electronics	2	2
<p><b>Course Outcomes:</b>            After successful completion of this course, students would be able to  <b>CO1:</b> Recall the principles of the Number system.  <b>CO2:</b> Understand the structure of various number systems, binary arithmetic and its applications in digital design.  <b>CO3:</b> Apply the Boolean algebra using logic gates and Karnaugh Maps  <b>CO4:</b> Construct and design Combinational and Sequential Logic circuits</p>			
Unit	Topics	No of Lectures	
I	<p><b>Number System:</b> Analog System, digital system, numbering system, binary number system, octal number system, hexadecimal number system, conversion from one number system to another, floating point numbers, weighted codes binary coded decimal, non-weighted codes Excess – 3 code, Gray code.</p> <p><b>Binary Arithmetic:</b> Binary addition, Binary subtraction, Negative number representation, Subtraction using 1's complement and 2's complement.</p> <p><b>Boolean Algebra and Logic Gates:</b> Introduction, Logic (AND OR NOT), Boolean theorems, Boolean Laws, De Morgan's Theorem, Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit, exclusive OR and Exclusive NOR gates, Universal Logic gates, Implementation of other gates using universal gates.</p>	15	
II	<p><b>Minterm, Maxterm and Karnaugh Maps:</b> Introduction, minterms and sum of minterm form, maxterm and Product of maxterm form, Reduction technique using Karnaugh maps – 2/3/4 variables K-maps, Grouping of variables in K-maps, K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression.</p> <p><b>Multiplexer, Demultiplexer, Encoder and Decoder:</b> Introduction, Multiplexer, Demultiplexer, Decoder, Encoders.</p> <p><b>Sequential Circuits:</b> Flip-Flop: Introduction, Terminologies used, S-R flip-flop, D flip-flop, JK flip-flop, Race-around condition, Master – slave JK flip-flop, T flip-flop.</p>	15	

**Reference:**

- Digital Electronics and Logic Design, N.G. Palan, Tech Nova, 1st Edition, 2000.
- Make Electronics, Charles Platt, O' Reilly, 1st Edition, 2010.
- Modern Digital Electronics, R.P. Jain, Tata McGraw Hill, 4th Edition, 2009.
- Digital Principles and Application, Malvino and Leach, 8th Edition, 2014

Course Code	MAJOR SEM-I Practicals	Credits	Lectures/Week
24ITMJP11	IT Practical 1 (Part A+B)	2	4

**Part A- Programming Principles with C Practical****Course Outcomes:**

Learners will be able to,

**CO1:** Recall and list the basic components and structures used in developing C programs for applications.

**CO2:** Explain the principles of functional hierarchical organization in C programming and how functions and modules are organized in a program.

**CO3:** Apply C programming techniques to manipulate, process, and store textual information, characters, and strings.

**CO4:** Analyze C programs to identify syntax, runtime, and logic errors and distinguish between them through debugging and testing.

1	a. Write an algorithm and draw flowchart for Area of circle. b. Develop an algorithm and draw flowchart to print the given no. is even or odd. c. Create an algorithm and draw flowchart to print 1 to 10 numbers. d. Generate an algorithm and draw flowchart for sum of 1 to 5 numbers. e. Design an algorithm and draw flowchart to compute the addition of digits of a given number
2	a. Create a program using a while loop to reverse the digits of a number. b. Design a program to calculate the factorial of a given number. c. Develop a program to find the roots of quadratic equations. d. Write a program to print the Fibonacci series..
3	a. Write a program in C to check entered character vowel or consonant b. Develop a program to C program to print day name of week using switch-case. c. Create a program to read three values from the keyboard and print out the largest of them without using the if statement.
4	a. Implement a program to print the pattern of asterisks as shown below : <pre> * * * * * *</pre>

	<p>****</p> <p>b. Implement a program to print the pattern of asterisks as shown below :</p> <p>****</p> <p>***</p> <p>**</p> <p>*</p> <p>c. Write a program to print Floyd's Triangle.</p>
5	<p>a. Create a program to print the area of the square using a function.</p> <p>b. Develop a program using a recursive function.</p> <p>c. Demonstrate program to square root, abs() value using function.</p> <p>d. Write a program using a goto statement.</p>
6	<p>a. Write a program to print roll no and names of 10 students using an array.</p> <p>b. Demonstrate a program to read a matrix of size m*n.</p> <p>c. Develop a program to sort the elements of an array in ascending or descending order.</p>
7	<p>a. Write a program to extract the portion of a character string and print the extracted part.</p> <p>b. Demonstrate a program to find if the given string is palindrome or not.</p> <p>c. Implement a program using strlen(), strcmp() function.</p>
8	<p>a. Write a program to display the values using different data types and its address using a pointer.</p> <p>b. Implement a program to perform addition and subtraction using a pointer.</p>
9	<p>a. Write a program to copy the contents of the file from one file into another.</p>
10	<p>Implement a program to print the structure using</p> <ul style="list-style-type: none"> <li>• Title</li> <li>• Author</li> <li>• Subject</li> <li>• Book ID</li> </ul> <p>Print the details of two students.</p>

**Part B- Digital Electronics Practicals**

**Course Outcomes:**  
After successful completion of this course, students would be able to  
**CO1:** State the purpose of the Logic Gates, their ICs and universal gates  
**CO2:** Understand the structure of various number systems, binary arithmetic and its applications in digital design  
**CO3:** Apply the Boolean algebra using logic gates and Karnaugh Maps  
**CO4:** Interpret Combinational and Sequential Logic circuits

1	<p><b>Study of Logic gates and their ICs and universal gates:</b></p> <p>a. Study of AND, OR, NOT, XOR, XNOR, NAND and NOR gates</p>
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	b. IC 7400, 7402, 7404, 7408, 7432, 7486, 74266
<b>2</b>	<b>Study of Logic gates and their ICs and universal gates:</b> a. Implement AND, OR, NOT, XOR, XNOR using NAND gates. b. Implement AND, OR, NOT, XOR, XNOR using NOR gates.
<b>3</b>	<b>Implement the given Boolean expressions using a minimum number of gates.</b> a. Verifying De Morgan's laws. b. Implement other given expressions using a minimum number of gates. c. Implement other given expressions using a minimum number of ICs.
<b>4</b>	<b>Implement combinational circuits.</b> Design and implement combinational circuits based on the problem given and minimizing using K-maps.
<b>5</b>	<b>Implement code converters.</b> a. Design and implement Binary – to – Gray code converter. b. Design and implement Gray – to – Binary code converter.
<b>6</b>	<b>Implement code converters.</b> a. Design and implement Binary – to – BCD code converter b. Design and implement Binary – to – XS-3 code converter
<b>7</b>	<b>Implement Encode and Decoder.</b> a. Design and implement 8:3 encoder. b. Design and implement 3:8 decoder.
<b>8</b>	<b>Implement Multiplexer and Demultiplexers</b> a. Design and implement a 4:1 multiplexer. Study of IC 74153, 74157 b. Design and implement 1:4 demultiplexer. Study of IC 74139
<b>9</b>	<b>Implement Multiplexer and decoder.</b> a. Implement the given expression using IC 74151 8:1 multiplexer. b. Implement the given expression using IC 74138 3:8 decoder.
<b>10</b>	<b>Study of flip-flops.</b> a. Study of IC 7473.                      b. Study of IC 7474. c. Study of IC 7476.                      d. Conversion of Flip-flops.

**Note:** Students are required to complete a minimum of 80% of all the practicals (Part A & B).

Course Code	OPEN ELECTIVE SEM – I	Credits	Lectures/ Week
24ITOE131	Paper I Introduction to IT and Internet	2	2
<p><b>Course Outcomes:</b></p> <p>After successful completion of this course, students would be able to</p> <p><b>CO1:</b> Describe various components of a computer, network and e-security systems</p> <p><b>CO2:</b> Explain the characteristics and usage of various elements of a computer, a network and operating systems</p> <p><b>CO3:</b> Use various input, output, memory and local network devices</p> <p><b>CO4:</b> Analyze the basic terminology related to data and information</p>			
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</li> </ul>	15	

	the Internet of Things, Domain Name Systems.	
<b>II</b>	<p>IT Risk - Definition, Measuring IT Risk, Risk Mitigation and 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>	<b>15</b>
<p><b>Reference:</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>24ITOE132</b>	<b>Paper II – Cyber Law</b>	<b>2</b>	<b>2</b>
<p><b>Course Outcomes:</b>  After successful completion of this course, students would be able to  <b>CO1:</b> Identify the Legal And Policy Developments In Various Countries To Regulate Cyberspace  <b>CO2:</b> Understand the Social And Intellectual Property Issues Emerging From ‘Cyberspace.  <b>CO3:</b> Develop the Understanding Of Relationship Between Commerce And Cyberspace  <b>CO4:</b> Analyze the knowledge Of Information Technology Act And Legal Framework Of Right To Privacy, Data Security And Data Protection.</p>			
<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>	
<p><b>Reference:</b></p> <ul style="list-style-type: none"> <li>● Cyber law –The Indian perspective by Pavan Duggal</li> <li>● The Indian Cyber Law with The Information Technology Act 2000 by Suresh T Viswanathan Edition 2022</li> </ul> <p>Additional References:</p> <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
24ITVC141	Paper I - Database Management Systems	2	4
<p><b>Course Outcomes:</b></p> <p>After successful completion of this course, students would be able to</p> <p><b>CO1:</b> List common database modeling techniques, such as entity-relationship diagrams (ERDs) or UML class diagrams.</p> <p><b>CO2:</b> Explain the relational model and its key components, such as tables, columns, and relationships.</p> <p><b>CO3:</b> Demonstrate SQL queries to retrieve, manipulate, and analyze data stored in a database.</p> <p><b>CO4:</b> Examine the effectiveness of database management solutions in terms of data integrity, performance, and scalability.</p>			
1	Draw E-R diagram and convert entities and relationships to relation table for a given scenario: (Bank, College)		
2	Write relational algebra queries for a given set of relations.		
3	<p><b>Defining data</b> Using CREATE, ALTER, DROP, TRUNCATE and RENAME statements</p>		
4	<p><b>Manipulating data</b> Using INSERT, UPDATE, DELETE and SELECT statements</p>		
5	<p><b>Creating and managing the tables</b> Creating table with constraints: NOTNULL, UNIQUE, PRIMARY KEY, FOREIGN KEY</p>		
6	<p><b>Restricting and sorting data</b> Using DISTINCT, IN, AS, SORT, LIKE, ISNULL, OR Using Group By, Having clause, Order By clause</p>		
	<p><b>Aggregate and Mathematical functions:</b> AVG, MIN, MAX, SUM, COUNT, ABS, SQRT, ROUND, TRUNCATE, SIGN, POWER, MOD, FLOOR, CEIL</p>		
7	<p><b>Views and Joins: For a given set of relation tables perform the following</b> Creating view, Dropping view, Selecting from a view</p>		
8	<p><b>Sequence</b> Create, Alter &amp; Drop Sequence</p>		
9	<p><b>Database trigger</b> Using CREATE OR REPLACE TRIGGER</p>		
10	<p><b>Index</b> Create and Drop index</p>		

**Note:** Students are required to complete a minimum of 80% of all the practicals.

Course Code	SKILL ENHANCEMENT COURSE SEM – I	Credits	Lectures/Week
24ITSC151	Paper I - Linux Operating System	2	4

**Course Outcomes:**

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

**CO1:** List the basic commands of the unix operating system and use them in the Linux environment.

**CO2:** Understand the concepts of control structure, loops, case and functions in shell programming and apply them to create shell scripts.

**CO3:** Associate the concepts of arrays with Linux and apply them to create, compile and execute C programs in Linux terminal

**CO4:** Compare different editors (vi, gedit, nano) and use them to create shell script and C program for given problem

**SEC SEM-I Linux with OS – Practical**

1	Installation of Ubuntu Linux operating system. a) Booting and Installing from ( USB/DVD) b) Using Ubuntu Software center / Using Synaptic c) Explore useful software packages. d) Using the Terminal startup and shutdown
2	<b>Basic General purpose utility Commands:</b> cal, date, echo, man, printf, script, who, whoami, uname, passwd, tty
3	<b>Working with Files System I</b> A. File System Commands: pwd,cd, mkdir, rmdir, touch, ls with options, help, man, more, less, find,
4	<b>Working with Files System II</b> A. File handling Commands: cat, cp, rm, mv A. File Permission Commands: chmod, chgrp, change owners
5	<b>Filter and Redirection Commands</b> A. Linux Filter Commands: cut,grep, egrep, fgrep, diff, comm, tr, uniq, wc, od, sort, gzip, unzip, head, tail A. I/O redirection: Demonstrate use of the redirection of output using the symbols >, <,   (pipe symbol)
6	<b>Administrative and Networking commands</b> A. Networking Commands: who, whoami, ping, telnet, ftp, ssh, etc A. Administration Commands: sudo, who, su B. Demonstrate vi Editor and its working: Start / Exit / Create / Append / Delete files using vi editor

7	<p>Basic Shell scripting:</p> <p>A. To display simple hello using shell script.</p> <p>A. To create a simple calculator shell script with and without expr statement</p> <p>B. To print the date and time using shell script</p> <p>C. To accept username and age in variables and print the details</p> <p>D. To demonstrate the exit and exit status commands</p>
8	<p>Shell scripting, I:</p> <p>A. To demonstrate the if -elif-fi statement in script.</p> <p>A. To demonstrate the logical operator using if statement</p>
9	<p>Shell scripting II:</p> <p>A. To demonstrate conditional statements in scripts using for loop, until loop and while loop.</p> <p>A. To demonstrate Break and Continue statement</p> <p>B. To demonstrate Redirection Operator using shell script</p>
10	<p>Installation of C/Java/Python Compiler and creating an environment for app development.</p> <p>Basic programming using C or Python Languages.</p>

**Note:** Students are required to complete a minimum of 80% of all the practicals.

# **SEMESTER- II**

Course Code	MAJOR SEM – II	Credits	Lectures/Week
24ITMJ211	Paper I - Object Oriented Programming with C++	2	2
<b>Course Outcomes:</b> After successful completion of this course, students would be able to <b>CO1-</b> Recall the basic programming principles <b>CO2-</b> Explain the difference between object oriented programming and procedural programming. <b>CO3-</b> Build C++ classes using appropriate encapsulation and design principles <b>CO4-</b> Implement a program using more advanced C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.			
Unit	Topics	No of Lectures	
I	<b>INTRODUCTION OF OBJECT-ORIENTED CONCEPTS:</b> Introduction, Objects, Class and Instance, Polymorphism, Inheritance, Object-Oriented Analysis, Finding the Objects, Object-Oriented Programming, Object-Oriented Design, Object-Oriented Analysis, Elements of Object Model, Grady Booch Approach.  <b>STARTING WITH C++:</b> C++ Overview, C++ Character Set, C++ Tokens, Variables, Counting Tokens, Data Types, Qualifiers, Range of Data Types, Your First C++ Program, Structure of a C++ Program, Styles of, Writing C++ Programs, Programming Examples  <b>FEATURES OF C++:</b> Introduction, Operators and Expressions, Declaring Constants, Type Conversion, Decision Making: An Introduction, Unconditional Branching Using Goto, Introduction to Looping <b>OPERATORS AND REFERENCES IN C++:</b> Introduction, Scope Resolution Operator, Reference Variables, The Bool Data Type, The Operator New and Delete, Malloc Vs. New, Pointer Member Operators.  <b>FUNCTION IN C++:</b> Introduction, Function, Declaration/Prototyping,,The Main Function in C++,Recursion, Call by Reference, Call by Reference Vs Call by Address, Return by Reference, Inline Function, Function Overloading, Function with Default Arguments,Virtual Functions	15	

<b>II</b>	<p><b>CLASS AND OBJECTS IN C++:</b> Working with Class, Structure in C++, Accessing Private Data Passing and Returning Object, Array of Object, Friend Function, Static Class Members, Constant Member Function</p> <p><b>WORKING WITH CONSTRUCTOR AND DESTRUCTOR:</b> Introduction, Constructor with Parameters, Implicit and Explicit Call to Constructor, Copy Constructor, Dynamic Initialization of Objects, Dynamic Constructor, Destructor.</p> <p><b>WORKING WITH OPERATOR OVERLOADING:</b> Introduction, Operator Overloading with Binary Operator Overloading Assignment (=) Operator, Overloading Unary Operators, Overloading Using Friend Function, Rules of Operator Overloading, Type Conversion</p> <p><b>WORKING WITH INHERITANCE IN C++:</b> Introduction, Types of Inheritance, Public, Private and Protected Inheritance, Multiple Inheritance, Hierarchical Inheritance, Virtual Base Class, Constructor and Destructor in Inheritance.</p>	<b>15</b>
<p><b>Reference:</b></p> <ul style="list-style-type: none"> <li>● Object-oriented Programming C++ Simplified, Hari Mohan Pandey, University Science Press, 1st Edition 2017</li> <li>● Object Oriented Programming in C++, E Balagurusamy, Tata McGraw- Hill, 5th Edition 2011</li> <li>● Object-Oriented Programming in C++, Robert Lafore, Sams, 4th Edition 2002</li> <li>● Programming with ANSI C++, Bhushan Trivedi, Oxford University Press, 2nd Edition</li> </ul> <p><b>Additional References:</b></p> <ul style="list-style-type: none"> <li>● Demystified Object- Oriented Programming with C++, Dorothy R. Kirk, Packt Publishing Lt, 1st Edition 2021</li> <li>● C++ Programming: An Object-Oriented Approach, Behrouz A. Forouzan , Richard F. Gilberg, McGraw-Hill Education, 1st edition 2020</li> <li>● C++ How to Program, Paul Deitel, Harvey Deitel, Pearson Education, 10th Edition 2017</li> </ul>		

Course Code	MAJOR SEM – II	Credits	Lectures/ Week
24ITMJ212	Paper II- Data Structures	2	2
<p><b>Course Outcomes:</b></p> <p>After successful completion of this course, students would be able to</p> <p><b>CO1:</b> Describe and understand elementary data structures such as stack, queue, linked list, tree</p> <p><b>CO2:</b> Understand the various concepts for developing algorithmic solutions</p> <p><b>CO3:</b> Design, use and write programs for elementary data structures such as stack, queue, linked list, tree</p> <p><b>CO4:</b> Interpret the use of different data structures on different types of problems.</p>			
Unit	Topics	No of Lectures	
I	<p><b>Introduction:</b> Data and Information, Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types</p> <p><b>Simple Data Structures:</b> <b>Array:</b> Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Multi-dimensional Arrays, Memory Representation of Two Dimensional Arrays, Advantages and Limitations of Arrays. <b>Stack:</b> Introduction, Operations on the Stack, Memory Representation of Stack, Array Representation of Stack, Evaluation of postfix expression, Recursion. <b>Queue:</b> Introduction, Operations on the Queue, Memory Representation of Queue, Array representation of Queue, Circular Queue. <b>Basic Sorting Techniques</b> - Bubble, Selection, Insertion and Merge Sort and their comparative analysis. <b>Searching Techniques</b> - Linear Search, Binary Search and their comparative analysis.</p>	15	
II	<p>Linked List, singly Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation, Insertion in Linked List, Deletion from Linked List, Circular Linked List, Doubly Linked List, Traversal, Search, Insert and Delete in a doubly Linked List, Implementing other Data Structures.</p>	15	

	<b>Trees:</b> Tree terminologies, Binary Tree, Properties of Binary Tree, Memory Representations of Binary Tree, Binary Tree traversals, Binary Search Tree, Operations on Binary Search Tree.	
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**Reference:**

- Schaum's Outlines Data structure Seymour Lipschutz Tata McGraw Hill 2 nd 2005
- Data structure – A Pseudocode Approach with C AM Tanenbaum, Y Langsam and MJ Augustin Prentice Hall India 2 nd 2006

**Additional References:**

- A Simplified Approach to Data Structures Lalit Goyal, Vishal Goyal, Pawan Kumar SPD 1 st 2014
- An Introduction to Data Structure with Applications Jean – Paul Tremblay and Paul Sorenson Tata MacGraw Hill 2 nd 2007
- Data Structure and Algorithm Maria Rukadikar SPD 1 st 2017

Course Code	MAJOR SEM-II Practicals	Credits	Lectures / week
24ITMJP21	IT Practical 2 (Part A+B)	2	4

**PART-A : Object Oriented Programming with C++**

Course Outcomes : The student should be able to

**CO1:**Identify and list the errors and warnings generated for a given C++ program input.

**CO2:**Highlight and describe the key characteristics of the C++ programming language.

**CO3:**Apply C++ programming concepts to develop structured and efficient programs.

**CO4:**Evaluate the essential skills required to compile, debug, and test C++ programs effectively.

1a.	Write a C++ program to create a simple calculator.
b.	Create a C++ program to convert seconds into hours, minutes and seconds.
c.	Demonstrate a C++ program to find the volume of a square, cone, and rectangle.
2a.	Write a C++ program to find the greatest of three numbers.
b.	Develop a C++ program to find the sum of even and odd n natural numbers
c.	Create a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
3a.	Develop a C++ program using classes and object Student to print the name of the student, roll_no. Display the same.
b.	Create a C++ program for Structure bank employees to print the name of the employee, account_no. & balance. Display the same also display the balance after withdraw and deposit
4a.	Demonstrate a Program to find Maximum out of Two Numbers using the friend function. Note: Here one number is a member of one class and the other number is a member of some other class.
b.	Develop a C++ Program using a copy constructor to copy data of an object to another object.
5a.	Write a C++ program to overload new/delete operators in a class.
b.	Develop a C++ program to access members of a STUDENT class using pointer to object members
6	Write a C++ Program that illustrates the different types of inheritance.
7	Create a C++ Program to design a student class representing student roll no. and a test class (derived class of student) representing the scores of the student in various subjects and sports class representing the score in sports. The sports and test class should be inherited by a result class having the functionality to add the scores and display the final result for a student.

8	Create a C++ program to maintain the records of a person with details (Name and Age) and find the eldest among them. The program must use this pointer to return the result.
9	Write a C++ program illustrating the use of virtual functions in class.
10	Implement a C++ program to design a class representing the information regarding digital library (books, tape: book & tape should be separate classes having the base class as media). The class should have the functionality for adding new items, issuing, depositing etc. the program should use the runtime polymorphism.

### Part B- Data Structures Practicals

#### Course Outcomes:

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

**CO1:** Identify and list the errors and warnings for a given input program, specifically focusing on data structure-related issues.

**CO2:** Explain and demonstrate the execution process of programs, with an emphasis on how data structures are managed and utilized during execution.

**CO3:** Solve problems by applying appropriate data structures to efficiently implement and optimize algorithms.

**CO4:** Analyze modularized program code, specifically focusing on the integration and implementation of data structures in various operating system algorithms.

#### Data structures – Practical

1	Create a simple programs using one dimensional and two dimensional array
2	Write a program to implement a stack
3	Develop a program to evaluate a postfix expression
4	Demonstrate a program to implement a linear queue
5	Create a program to implement a circular queue
6	Write a program to perform linear search and binary search on the given elements.
7	Develop a program to implement different sorting techniques such as insertion, bubble, merge and selection sort
8	Write a program to implement a singly linked list
9	Demonstrate a program to implement a doubly linked list
10	Implement a program to create and traverse a binary search tree

**Note:** Students are required to complete a minimum of 80% of all the practicals.

Course Code	MINOR SEM – II	Credits	Lectures/Week
24ITMR221	Paper I- Fundamentals of Mathematics	2	2
<b>Course Outcomes:</b> After successful completion of this course, students would be able to <b>CO1-</b> Describe the basic concepts of sets, permutations, relations, graphs, trees <b>CO2-</b> Understand sets and perform operations and algebra on set <b>CO3-</b> Apply the concepts of graphs to solve various problems in day to day life. <b>CO4-</b> Relate relationships using directed, undirected, weighted graphs and trees			
Unit	Topics	No of Lectures	
I	<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 <b>Relations:-</b> Introduction, Product Sets, Relations, Pictorial Representations of Relations, Composition of Relations, Types of Relations, Closure Properties, Equivalence Relations, Partial Ordering Relations.  <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	15	
II	<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  Introduction to Graphs and Operations on Graphs Definition and examples of graphs, 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.,Kruskal's Algorithm, Prim's algorithm,Dijkstra's Algorithm,Trees and traversing	15	

**Reference:**

- Kenneth H. Rosen. Discrete Mathematics and its applications. (7th edition) McGraw-Hill Higher Education, 2017.
- Bernard Kolman, Robert C. Busby, and Sharon Cutler Ross. Discrete Mathematical Structures (6th edition). Prentice-Hall, Inc. Upper Saddle River, NJ, USA, 2003.

**Additional References:**

- John Clark and Derek Holton, a first look at Graph Theory, 2013

<b>Course Code</b>	<b>OPEN ELECTIVE SEM – II</b>	<b>Credits</b>	<b>Lectures/ Week</b>
<b>24ITOE231</b>	<b>Paper I– Decision Making using Information Technology</b>	<b>2</b>	<b>2</b>
<p><b>Course Outcomes:</b>  After successful completion of this course, students would be able to  <b>CO1-</b> Recall the past outcomes or results for decision-making, with the aid of IT systems  <b>CO2-</b> Infer how technology supports business decision making  <b>CO3-</b> Identify the emerging technologies like ERP, CRM, SCM and trends in enterprise applications  <b>CO4-</b> Differentiate and identify the several database management and data warehouse approaches.</p>			
<b>Unit</b>	<b>Topics</b>	<b>No of Lectures</b>	
<b>I</b>	Overview of MIS: Understanding Major Functional Systems Marketing & Sales Systems, Finance & Accounting Systems, Manufacturing & Production Systems, Human Resource Systems, Inventory Systems,Subsystems, description and organizational levels Decision support system: Definition Relationship with MIS, Evolution of DSS, Characteristics, classification, objectives, components, applications of DSS, Concepts of ERP, Application, ERP Life Cycle Concept of e-CRM: E-CRM Solutions and its advantages, How technology helps? Concept of E-SCM, Strategic advantages, benefits, E-SCM Components and Chain Architecture,Major Trends in e-SCM	<b>15</b>	
<b>II</b>	Introduction to DBMS: 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.	<b>15</b>	
<p><b>Reference:</b>  1. Information Technology for Management, 6TH ED (With CD ) By Efraim Turban, Dorothy Leidner, Ephraim Mclean, James Wetherbe  2. Database System concepts 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>24ITOE232</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			
<b>CO1-</b> Know how the business is carried out through electronic media			
<b>CO2-</b> Understand the types and ways of doing business over internet			
<b>CO3-</b> Apply the knowledge after becoming a professional or an entrepreneur			
<b>CO4-</b> Analyze the security concerns while transacting using electronic media			
<b>Unit</b>			
<b>Topics</b>		<b>No of Lectures</b>	
<b>I</b>	Introduction to E-Business and E-Commerce:- 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>	E-Business applications, E-Procurement and E- Payment Systems:- 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>Reference:</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
24ITVC241	Paper I- Web Designing	2	4
<p><b>Course Outcomes:</b>  After successful completion of this course, students would be able to:</p> <p><b>CO1-</b> Recall and explain HTML basics for static page design.  <b>CO2-</b> Apply CSS and multimedia elements to design structured and responsive web pages.  <b>CO3-</b> Develop dynamic and interactive web pages using JavaScript.  <b>CO4-</b> Analyze user requirements and develop backend functionality using PHP and integrating it into a complete mini web project.</p>			
<b>1</b>	<b>Web Page Structure and Formatting</b>		
<b>a</b>	Design a web page using various text formatting tags like headings, paragraphs, bold, italic, underline, lists.		
<b>b</b>	Create links between multiple pages and demonstrate automatic redirection using <meta> tag.		
<b>c</b>	Use ordered lists, unordered lists, and nested lists to structure a menu.		
<b>2</b>	<b>Styling with CSS</b>		
<b>a</b>	Design a web page by applying Inline, Internal, and External CSS styles.		
<b>b</b>	Use of different selectors: class, ID, descendant, pseudo-classes (like :hover, :first-child).		
<b>3</b>	<b>Semantics, Layout, and Media Embedding</b>		
<b>a</b>	Create a web page using semantic tags like <header>, <nav>, <section>, <article>, <footer>.		
<b>b</b>	Embed an <b>image</b> , an <b>audio file</b> , and a <b>video file</b> inside the web page.		
<b>4</b>	<b>Advanced HTML Elements – Tables and Forms</b>		
<b>a</b>	Design a web page with different tables.		
<b>b</b>	Creating a <b>Form</b> using all types of controls (text fields, password, radio buttons, checkboxes, file upload, select dropdown, etc.).		
<b>5</b>	<b>JavaScript</b>		
<b>a</b>	Using JavaScript, design a web page to accept a number from the user and print its Factorial.		

<b>b</b>	Using JavaScript, a web page that prints Fibonacci series/any given series.
<b>6</b>	<b>JavaScript Objects</b>
<b>a</b>	Write a JavaScript program to display all the prime numbers between 1 and 100.
<b>b</b>	Write a JavaScript program to accept a number from the user and display the sum of its digits.
<b>7</b>	<b>JavaScript Events</b>
<b>a</b>	Write a JavaScript program to design a simple calculator.
<b>b</b>	Design a form and validate all the controls placed on the form using JavaScript.
<b>8</b>	<b>Basic PHP</b>
<b>a</b>	Write a PHP code to find the greater of 2 numbers. Accept the no. from the user.
<b>b</b>	Write a PHP program to display the following Binary Pyramid: 1 0 1 1 0 1 0 1 0 1 1 0 1 0 1
<b>9</b>	<b>Advanced PHP</b>
<b>a</b>	Write a PHP program to demonstrate different string functions.
<b>10</b>	<b>Mini Web Project</b>
<b>a</b>	Build a <b>small website</b> for a fictional entity (portfolio, college, or small business): <ul style="list-style-type: none"> <li>● Minimum 5 interconnected pages.</li> <li>● Use HTML5 Semantic tags.</li> <li>● Apply external CSS styles.</li> <li>● Add JavaScript for form validation and basic interactivity (like a popup or modal).</li> <li>● Make the website <b>mobile-responsive</b>.</li> </ul>

**Note:** Students are required to complete a minimum of 80% of all the practicals.

Course Code	SKILL ENHANCEMENT COURSE SEM – II	Credits	Lectures/ Week
24ITSE242	Paper I - Python Programming	2	4

**COURSE Outcomes:**

CO1- Recall basic input/output functions in Python and arithmetic operations.

CO2- Express proficiency in the handling of strings and functions.

CO3- Implement Conditionals and Loops for Python Programs

CO4- Analyze the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.

**SEC SEM-II Python Programming Practical**

1	Write a program to accept two integers and print their sum.
	Write a program to find whether a given number is even or odd.
	Implement a program to find the largest among the three integers.
2	Implement a program that inputs a student's marks in three subjects (out of 100) and prints the percentage marks.
	Create a program to input percentage marks of a student and find the grade as per following criterion: Marks        Grade $\geq 90$ A 75-90        B 60-75        C Below 60     D
	Demonstrate a program to accept the height in cm and convert it into feet and inches.
3	Create a program to accept the year and check if it is a leap year or not.
	Write a program to print the sum of natural numbers between 1 to 100.
	Demonstrate a program to calculate the factorial of a number.
4	Write a program to create a class by name Students, and initialize attributes like name, age, and grade while creating an object.
	Write a program to create a child class Teacher that will inherit the properties from the parent class Staff.

	Write a python program to create a multiple inheritance using two super classes as Ferrari, Benz and the subclass as Car
5	Write a Python program to demonstrate use of the following advanced functions: 1. lambda            2. map            3. reduce
6	Perform File manipulations- open, close, read, write, append and copy from one file to another.
7	<b>Working with packages-1:</b> Create a user-defined package and import modules from the package.
	Develop Python program to demonstrate use of NumPy package for creating, accessing and performing different array operations.
8	<b>Working with packages-2:</b> Implement Python program to perform following operations using panda package: 1. Create Series from Array 2. Create Series from List 3. Access element of series 4. Create DataFrame using List or dictionary
	Implement a python program to load a CSV file into a Pandas DataFrame and perform operations.
9	<b>Working with GUI:</b> Write a python GUI program to import the Tkinter package and create a window and set its title.
	Write a python GUI program that adds labels and buttons to the Tkinter window.
10	<b>Working with MySQL:</b> Write a program to create a connection between database and python.
	Implement a python program to select records from the database table and display the result.

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

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

- 1) Continuous Internal Assessment(CIA) Assignment – 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.

Question	Based on	Marks
Q.1	Unit I	15
Q.2	Unit II	15

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

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

#### Paper Pattern of Theory Paper:

<b>DES's Kirti M. Doongursee College (AUTONOMOUS), Dadar (W), Mumbai-28</b>		
<b>Regular / Additional / ATKT Examination</b>		
<b>Duration: 1 Hour</b>		<b>Max Marks: 30</b>
<b>Date:</b>	<b>Time:</b>	<b>Code:</b>
<i>(For office use)</i>		
<b>N. B.</b>	i)	<i>All Questions are compulsory.</i>
	ii)	<i>Mixing of sub-questions is not allowed</i>
	iii)	<i>Draw neat labeled diagrams wherever necessary.</i>
<b>Q. No.</b>		<b>Marks</b>
<b>Q.1 A)</b>		<b>05</b>
<b>OR</b>		
<b>Q.1 B)</b>		<b>05</b>
<b>Q.1 C)</b>		<b>05</b>
<b>OR</b>		
<b>Q.1 D)</b>		<b>05</b>
<b>Q.1 E)</b>		<b>05</b>

<b>OR</b>		
<b>Q.1 F)</b>		<b>05</b>
<b>Q.2 G)</b>		<b>05</b>
<b>OR</b>		
<b>Q.2 H)</b>		<b>05</b>
<b>Q.2 I)</b>		<b>08</b>
<b>OR</b>		
<b>Q.2 J)</b>		<b>08</b>
<b>Q.2 K)</b>		<b>02</b>
<b>OR</b>		
<b>Q.2 L)</b>		<b>02</b>

### **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.**