IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO'S) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT-I FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING (CL Hrs-4, Marks-8)			
1	**TLO1.1** Differentiate between OOP and POP **TLO1.2** Explain the Features of OOP **TLO1.3** Use of control Structures, Arrays, Functions, Structures	**1.1** Different programming paradigms **1.2** Limitations of Procedural Programming and Need of OOP **1.3** Features of OOP **1.4** Beginning with C++: Tokens, Expressions, Control Structures, Array, Functions, Structures	Hands-on Demonstration Presentations	CO1, CO2
	UNIT-II FUNCTIONS IN C++ (CL Hrs-6, Marks-12)			
2	**TLO2.1** Structure of C++ Program **TLO2.2** functions using different function approaches. **TLO2.3** Use of Call by value and Call by reference	**2.1** Functions in C++ **2.2** The main function **2.3** Function Prototyping **2.4** Call by Reference, Return by Reference **2.5** Inline Functions **2.6** Default Argument and const Arguments	Hands-on Demonstration Presentations	CO2
	UNIT-III CLASSES AND OBJECTS (CL Hrs-10, Marks-14)			
3	**TLO3.1:** Define Class and object **TLO3.2:** Understand memory allocation concepts. **TLO3.3:** Differentiate between constructors and destructors.	**Classes & Objects** **3.1** Specifying a class, Defining member functions, Nesting of Member Functions, Private Member Functions **3.2** Creating objects, Memory allocation for objects, Static data and member function, Array of objects and Objects as function arguments **3.3** Constructors and their types, Constructor Overloading, Constructors with Default Arguments, Dynamic Initialization Of Objects **3.4** Destructors **3.5** String Class and objects, manipulating string objects, Relational Operations, string characteristics, accessing characters in strings, Comparing and swapping strings	Hands-on Demonstration Presentations	CO3
	UNIT- IV INHERITANCE (CL Hrs-08, Marks-12)			
4	**TLO4.1:** Define inheritance. **TLO4.2:** Explain the need for inheritance. **TLO4.3:** Implement various types of inheritances.	**4.1** Introduction Base Classes, Derived classes Member declaration: Public, Private, protected **4.2** Types Of Inheritance Single, Multilevel, Multiple, Hierarchical, Hybrid **4.3** Virtual base classes **4.4** Abstract classes **4.5** Constructors in derived classes	Hands-on Demonstration Presentations	CO4

UNIT –V POLYMORPHISM AND TYPE CONVERSION (CL Hrs-10, Marks-14)				
5	**TLO 5.1:** Explain the concept of operator overloading. **TLO 5.2:** Understand and implement object-oriented programming language key features like polymorphism. **TLO 5.3:** Describe pointers in C++. **TLO 5.4:** Implement type conversion for various data types.	**5.1** Compile Time Polymorphism Functions overloading Operator Overloading (unary and binary) Overloading Vs Overriding **5.2** Run Time Polymorphism Pointers in C++, Pointers to Objects 'This' Pointer, Pointers to Derived Classes, Virtual functions, Static and dynamic binding **5.3** Type Conversion: Introduction, basic to class type, class to basic type, one class to another type, data conversion example	Hands-on Demonstration Presentations	**CO5**
UNIT –VI FILES AND EXCEPTION HANDLING (CL Hrs-7, Marks-10)				
6.	**TLO 6.1:** Define files in C++. **TLO 6.2:** Implement various operations that can be performed on files. **TLO 6.3:** 6c. Execute a program to handle exceptions in the programs	Files: **6.1.** C++ Streams and Stream Classes **6.2.** Unformatted IO Operations **6.3.** File Stream Classes **6.4.** Opening and Closing a File **6.5.** Deleting a File **6.6.** File Modes Exception Handling: **6.7.** Introduction, basics of exception handling, types of exceptions. **6.8.** Structure to handle an exception, exception handling mechanism **6.9.** Throwing mechanism, catching mechanism, re-throwing an exception, specifying exceptions.	Hands-on Demonstration Presentations	**CO6**

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1:** Write Simple C program using constant and variables. **LLO1.2:** Use of different operators. **LLO1.3:** Use the various expressions in the C Program.	*Write a Program using Input and Output Statements.	2	CO1
2	**LLO 2.1:** Write a C program based on arrays and structure. **LLO 2.1:** Write a C program using an array of Structure.	*Write a Program using structure and array of structure.	2	CO1
3	**LLO 3.1:** Write user defined functions in C++.	*Write a Program using call by value.	2	CO2
4	**LLO 4.1:** Write user defined functions in C++.	*Write a Program using call by reference.	2	CO2

5	**LLO 5.1:** Understand the concept of polymorphism. **LLO 5.2:** Write a programs to implement the concept of function Overloading.	*Write a Program using Function Overloading.	2	CO3
6	**LLO 6.1:** Define Class and create objects. **LLO 6.2:** Write a program using class and objects.	*Write a Program using Class and Objects.	4	CO3
7	**LLO 7.1:** Write a program using class and array of objects.	Write a Program using array of Objects.	2	CO3
8	**LLO 8.1:** Implement the concept of object as function argument.	*Write a Program using object as function argument.	2	CO3
9	**LLO 9.1:** Use of static data members and member functions.	*Write a Program using static members. (variables and functions)	2	CO3
10	**LLO 10.1:** Write a Program using friend functions.	*Write a Program using Friend Function.	2	CO3
11	**LLO 11.1:** Use of constructor to initialize objects. **LLO11.2:** write a Program using constructors and destructors.	*Write a Program using Constructor and Destructor.	4	CO3
12	**LLO 12.1:** Apply the logic to implement different types of constructor in single program.	Write a Program using Constructor Overloading.	2	CO3
13	**LLO 13.1:** Understand various predefined string functions. **LLO 13.2:** Implement program using predefined string functions.	Write a program to perform following string operations using pre-defined string functions:- a) String concatenation b) String Comparison c) Find position of an character in a given string d) String reversing	4	CO3
14	**LLO 14.1:** Understand various predefined string functions. **LLO 14.2:** Implement program using predefined string functions.	*Write a program to perform following string operations without using pre-defined string functions :- a) String concatenation b) String Comparison c) Find position of an character in a given string d) String reversing	4	CO3
15	**LLO 15.1:** Understand the concept of Inheritance. **LLO 15.2:** Implement single inheritance.	*Write a Program using single Inheritance.	2	CO4
16	**LLO 16.1:** Understand the concept of Inheritance. **LLO 16.2:** Implement multilevel inheritance.	*Write a Program using multilevel Inheritance.	2	CO4

17	**LLO 17.1:** Understand the concept of Inheritance. **LLO17.2:** Implement multiple inheritance.	*Write a Program using Multiple Inheritance.	2	CO4
18	**LLO 18.1:** Understand the concept of diamond problem. **LLO17.2:** Implement hybrid inheritance.	*Write a Program using Virtual Base Class.	2	CO4
19	**LLO 19.1:** Understand the concept of polymorphism. **LLO 19.2:** Write programs to implement the concept of operator overloading.	*Write a Program for Operator Overloading. (Unary and Binary operator)	4	CO5
20	**LLO 20.1:** Understand the concept of polymorphism. **LLO 20.2:** Write a programs to implement the concept of operator overloading using friend function.	Write a Program for Operator Overloading using friend function. (Unary and Binary operator)	4	CO5
21	**LLO 21.1:** Understand the concept of Pointer. **LLO 21.2:** Implement this pointer.	*Write a Program using 'this' Pointer.	2	CO5
22	**LLO 22.1:** Understand the concept of function Overriding. **LLO 22.2:** Implement virtual functions.	*Write a Program using Virtual Function.	2	CO5
23	**LLO 23.1:** Understand conversion of basic to class type, class type to basic type, class type to class type.	*Write a program to implement type conversion concept.	2	CO5
24	**LLO 24.1:** Understand the concept of file processing. **LLO 24.2:** Implement various file operations. **LLO 24.3:** Write a program for exception handling.	*Write a Program For File Processing.	2	CO6

Note: Out of the above suggestive LLOs –

1. '*' Marked Practicals (LLOs) Are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/CASE STUDIES /ACTIVITIES FOR SPECIFIC LEARNING/SKILLS

Self Learning Assessment- Yes

Suggestive list of Case studies for SLA:

1. **Expense Tracker and Savings Calculator**
   i. A boy gets the same amount of pocket money every month. I use the pocket money for bought some college necessities and snacks. However, he also wanted to save some of the remaining money pocket that he has, although not necessarily every month. He asked his friend who studied Informatics to make an application to calculate it all by displaying monthly expenses.

total expenses, and current savings this.

ii Notes

- Display data iteratively
- Using Class

2. **Gas Station Price Calculation System**
   i. At a gas station, you want to make a program that can calculate the total price which will be issued for two types of gasoline, namely ABC and XYZ. ABC has a price of Rs. 7,000/liter, while XYZ is Rs. 9,000/liter.
- Output from the program is expected to be in the form of a receipt that has buyer details
   i. (Total liters, type gasoline, customer name, total price)
3. **Restaurant Menu and Delivery System**
   i. Develop a system where a restaurant has a menu and provides delivery order services for customers whose homes are more than 4 KM will be charged a delivery fees of Rs.500, if it is less than that distance, it will be charged delivery fees of Rs.100. If the total purchase is more than Rs.4000 will get a discounted fee Rs.400. If the total purchase exceeds Rs.6000, discount will be given 25%.
   ii. -The output that comes out is expected in the form of a payment slip.
4. **Library Management System**: Develop a program to handle basic banking operations such as account creation, deposits, withdrawals, and balance inquiries.
5. **Bank Management System**: Develop a system for creating and managing customers, accounts and transactions as well as performing banking services such as withdrawals, deposits, and transfers. It also allows customer to view their account information including balances, recent transaction.
6. **Student Management System**: Create a system to manage student information, including adding new students, updating records, and generating reports.
7. **Hospital Management System:** Design a program to manage patient information, doctor schedules, and appointment bookings.
8. **Inventory Management System:** Implement a system to track information about products, including their quantity, price and other details and generate reports.
9. **Hotel Booking System:** Create a program to handle hotel room bookings, cancellations, and availability checks, make different packages including activities for kids and adults, apply discount charges on activities and generate final bill report.
10. **Payroll System:** Develop a system to manage employee records, tracking hours worked and calculating tax and generate reports.
11. **Online Quiz System:** Design an application to conduct online quizzes, store results, and provide instant feedback.
12. **Car Rental System**: Implement a program to manage car rentals, including booking, returning cars, and calculating rental fees.
13. **Bus Reservation System**: Create a system to manage bus reservations, including seat selection, booking, and cancellations.
14. **Shopping Cart System**: Develop an e-commerce shopping cart system that allows users to add items to their cart, view the cart, and proceed to checkout.
15. **Ticket Booking System**: Implement a system for booking tickets for events such as movies, concerts, or travel.
16. **Flight Reservation System:** Develop a program to handle flight bookings, cancellations, and check-ins.
17. **Medical Information System:** Implement a system to store and organize patient medical information such as clinical data, lab results.
18. **Tic Tac Toe game:** Design a game for layers take turns putting their marks in empty squares. The first player to get 3 of her marks in a row (up, down, across, or diagonally) is the winner.

19. **E-Learning Management System:** The University of ABC, a large public institution, faced challenges related to providing quality education to a diverse student population spread across different geographical locations. Traditional classroom-based teaching methods struggled to accommodate the needs of working professionals and students with varied schedules. The primary objectives included providing tools for course creation, student enrollment, assessments, and progress tracking to facilitate a seamless transition to online education
20. **Unit Converter:** Design a system to convert different physical quantities like Mass, Length, Area, Temperature, Time, Currency etc. to be converted one unit into another.
21. **Supermarket Billing System:** Design a system in a place where customer come to purchase their daily products and pay for that. So, there is need to calculate how many products are sold and generate the bill for the customer. The system will be able to generate the bill. Store how many products are sold, store products and their prices with other information, and see the rates of discounts on the products.
22. **Food Bank Management System:** Develop a system to manage and organize data including adding donors, receivers, and staff profiles, update the pantry capacity, and generate report
23. **Error detection and correction code System:** Design a system for different error detection and correction methods.
24. **Calculator for Scientific Operations:** Design a code to perform different scientific calculations.
25. **Book Donation System:** Develop a system to manage and organize data including adding details of donors and details of book, receivers, and staff profiles, update the book capacity, and generate report.

Note:

1. The above is suggestive list of case studies for SLA
2. The faculty must allocate any 1 Case study to individual student. Considering the students technical skills.

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- At the department level, encourage students to start a coding club
- Students are encouraged to register themselves in various MOOCs such as Infosys Springboard, Swayam etc. to further enhance their learning.

Assignment

Prepare a journal of practicals performed in the laboratory.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Basic configuration systems with editor supporting C++ language program execution	All

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Fundamentals Of Object Oriented Programming	CO1	4	-	4	4	8
2	II	Functions In C++	CO2	6	4	4	4	12
3	III	Classes And Objects	CO3	10	4	2	8	14
4	IV	Inheritance	CO4	8	6	4	2	12
5	V	Polymorphism And Type Conversion	CO5	10	4	4	6	14
6	VI	Files And Exception Handling	CO6	7	2	4	4	10
			Grand Total	**45**	**20**	**22**	**28**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning and Seminar/Presentation	Lab. Performance, viva voce

X. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)		
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	1	2	-	2	3	-	1	2
CO2	3	2	3	3	2	2	3	-	2	3
CO3	3	2	3	3	-	-	3	-	-	3
CO4	3	2	3	3	-	2	3	-	-	3
CO5	3	2	3	3	-	2	3	-	2	3
CO6	3	2	3	3	-	2	3	-	2	3

Legends:- High:03, Medium:02, Low:01, No Mapping: -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	E. Balagurusamy	Object Oriented Programming with C++	McGraw Hill Education (India) Private Limited, New Delhi
2	Herbert Schildt	C++ The Complete Reference, 4th Edition	McGraw Hill/ Oshome, New Delhi
3	Yashwant P. Kanetkar	Let Us C++, 2nd Edition	BPB Publication

XII. LEARNING WEBSITES & PORTALS

1. www.nptel.com
2. https://www.quora.com
3. https://www.softwaretestinghelp.com
4. https://www.cplusplus.com
5. https://www.learncpp.com

Name & Signature:

Mrs. Usha C. Khake
Lecturer in Computer Engineering

Mrs. Lalita S. Korde
Lecturer in Computer Engineering

Mrs. Heena F. Khan
Lecturer in Information Technology

(Course Experts)

Name & Signature:

Dr.D N Rewadkar
(Programme Head)

Name & Signature:

Mr. S. B. Kulkarni
(CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CM/IT
PROGRAMME CODE	06/07
COURSE TITLE	DIGITAL TECHNIQUES AND MICROPROCESSOR PROGRAMMING
COURSE CODE	CM31204
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM31204	DIGITAL TECHNIQUES AND MICROPROCESSOR PROGRAMMING	AEC	3	1	2	2	8	4	3	30	70	100	40	25	10	25@	10	25	10	175

Total IKS Hrs for Term: 1 Hrs

Abbreviations: **CL**-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment, **SA** -Summative assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment,*# - Online Examination,@$ - Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours.**
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

As a computer engineering student, it is essential to know the fundamentals of digital electronics to understand the concept of microprocessor and its application. The microprocessor is challenging, to meet the challenges of growing advanced microprocessor technology. The student should be conversant with microprocessor programming

III. COURSE-LEVEL LEARNING OUTCOMES (CO's)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Use the number system and codes of the digital system.
CO2: Simplify Boolean expressions for logic circuit.
CO3: Analyze 8086 microprocessor functionality.
CO4: Develop assembly language programs.
CO5: Use procedure and macro in assembly language programs.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT-I NUMBER SYSTEM, CODES & LOGIC GATES AND BOOLEAN ALGEBRA (CL Hrs-10, Marks-18)				
1.	**TLO1.1** Convert codes from one number system to another. **TLO1.2-** Perform arithmetic operations with different number systems. **TLO1.3** Differentiate various logic gates and apply the logic on Boolean algebra. **TLO1.4** Explain theorems for Boolean algebra. **TLO1.5** Create simplified logic circuits	**1.1** Introduction to Number systems: Decimal, Binary, Octal, hexadecimal **1.2** Binary arithmetic: Addition, subtraction, multiplication, Division **1.3** One's complement, Two's Complement, Signed Numbers, Codes, Error code. **1.4** LogicGates: Introduction, Working principles and Truth of AND, OR, NOT, NOR, NAND, EX-OR, EX-NOR Gates, Universal Gates. **1.5** Boolean Algebra: Basic Boolean Operations, Basic Laws of Boolean Algebra, Duality Theorem, De-Morgan's Theorems	Classroom Learning/ Flipped Classroom/ Collaborative Learning/ Use of logic simulator like Virtual Labs/online converters etc	**CO1**
UNIT-II COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS (CL Hrs-10, Marks-16)				
2	**TLO2.1** Construct K-MAP using logic functions and vice versa. **TLO2.2** Simplify equations in the minterms/maxterms. **TLO2.3** Design Multiplexer and De-Multiplexer. **TLO2.4:**Implement combinational logic design with multiplexers. **TLO2.5:**Implement combinational logic design with demultiplexers.	**2.1** KARNAUGH map representation, Simplification of logic function using K-MAP. **2.2** Minimization of logical function specified in minterms/maxterms or truth table Don't care conditions. **2.3** Multiplexers and their use in combinational, logic design **2.4** De-multiplexer/decoders and their use in combinational logic design **2.5** De-multiplexer: 4 to 16-line DEMUX. Demux design using the sop method. 1:4, 1:8, 1:16 DEMUX. **2.6** Clock signal, flipflop, latches, counter, buffer and tri-state buffer (only concept)	Lecture Using Chalk-Board Flipped Classroom Collaborative Learning Virtual Lab	**CO2**
UNIT- III MICROPROCESSOR ARCHITECTURE & MICROCOMPUTER SYSTEMS(CL Hrs-08, Marks-10)				
3	**TLO3.1:** Describe Microprocessor architecture. **TLO 3.2:** Understand 8086 registers and instruction format. **TLO 3.3:** Draw a timing diagram for the read/write memory cycle.	**3.1** Microprocessor – Introduction, Features, and its Operations **3.2** 8086 Microprocessor - Introduction, Architecture, and Working, Pin configuration, Memory segmentation in 8086. **3.3** Minimum mode and Maximum mode configuration of 8086, Timing diagram Minimum mode and Maximum mode 8086.	Classroom Learning Flipped Classroom Cooperative Learning	**CO3**
UNIT –IV 8086 ASSEMBLY LANGUAGE PROGRAMMING (CL Hrs-10 Marks-16)				

4	**TLO 4.1** Write and execute 8086 programs for addition and subtraction. **TLO 4.2** Write programs implementing branching.	**4.1** Instruction format and Addressing modes in 8086, Assembler and Directives. **4.2** 8086 Instructions set and classification of instructions - Arithmetic, Logical, Data transfer, String, Bit manipulation, Flag manipulation, Branching, Machine Control.	Classroom Learning Collaborative Learning Flipped Classroom Program development tools and simulators	**CO4**
UNIT V –PROCEDURE AND MACRO IN ASSEMBLY LANGUAGE PROGRAM (CL Hrs-07, Marks-10)				
5	**TLO 5.1** Write and execute assembly language programs using procedures. **TLO 5.2** Write and execute assembly language programs using macros.	**5.1** Procedures - Defining Procedure, Directives used, FAR and NEAR, CALL and RET instructions, Assembly Language Programs using Procedure. **5.2** Macros - Defining Macros, Assembly Language Programs using Macros, Directives used.	Classroom Learning Collaborative Learning Flipped Classroom Program development tools and simulators	**CO5**

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

Sr. No	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Number of hrs.	Relevant COs
1	**LLO 1.1:**Describe the basic component of digital lab.	*Know the Digital Lab IC Tester, Multimeter, Bread Board, Trainer Kit.	2	CO1
2	**LLO 2.1:** Implement the basic Gate	*Study of Basic Gates ICs (7400, 7404, 7408, 7486, 7432) and verification of Truth tables by monitoring the output of ICs on BreadBoard.	4	CO1
3	**LLO 3.1**: Implement the Derived Gate	*To derive AND, OR, NOT gates using universal gates by forming circuits on the Breadboard.	4	CO1
4	**LLO 4.1:** Verify De-Morgan's Theorem using the basic gate.	*Verify De-Morgan's Theorem by forming the circuit on BreadBoard.	2	CO1
5	**LLO 5.1:** Desing K map for SOP and POS forms, minimized it and designed circuit.	*Minimization and realization of function using K-maps and its implementation by constructing the circuit on the breadboard.	4	CO2
6	**LLO 6.1:** Develop an assembly language program to addition and subtraction 8 bit/16-bit signed/ unsigned numbers	* Write an Assembly language Program(ALP) for Addition and subtraction of two 16-bit numbers.	2	CO4

c) Design a Burglar alarm using electronic components and digital ICs.
d) Design Half adder /Full adder using the basic gate.
e) Design a Half Subtractor /Full Subtractor using the basic gate.

Assignment

a) Write an assembly language program using 8086 to generate the Fibonacci series.
b) Build a Circuit for the LED Flasher.
c) Build a Circuit for Seven Segment Display

IKS: Invention of Zero

https://sites.tufts.edu/tquinto/files/2021/01/HistoryOfZero.pdf

Self-Learning Activity

a) Develop an assembly language program to add 8-bit and 16-bit Unsigned numbers (using procedure).
b) Write an assembly language program to add and subtract two BCD numbers(using MACRO).
c) Write an ALP to multiply two BCD numbers (using MACRO).

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	1) Digital Multimeter: 3 and 1/2 digit 2) Pulse Generator/Function Generator: TTL Pulse Generator 20mA per Channel(max), 0 to 5.0 V (max) 3) DC Regulated Power Supply: 2 x 0-30 V; 0-2 AAutomatic Overload (Current Protection) Constant Voltage and Constant Current Operation Digital Display for Voltage and Current Adjustable Current Limiter Excellent Line and Load Regulation 4) Basic logic gates (AND-7408, OR- 7432, NOT- 7404), Universal gates (NAND7400, NOR-7402) EX-OR-7486, EX-NOR-74266 5) 4:1 Multiplexer IC-74LS153 6) Demultiplexer IC -74139 7) Breadboards, connecting wires, Stripper, Soldering Gun, Soldering Metal, Flux, IC Tester, LEDs, Digital ICs, Data sheets of ICs used in Lab.	1,2,3,4,5
2	1) Personal Computer Intel Pentium Onwards Minimum 2GB RAM. 500Gbyte HDD) installed with Windows 2000 onwards 2) Any Editor to write/edit programs 3) Turbo/Macro Assembler (TASM / MASM) 4) Turbo Linker (LINK/LINK 5) Turbo Debugger (ID/Debug), (DOSBOX utility for higher-end operating systems)	6,7,8,9,10,11,12

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

(Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	NUMBER SYSTEM, CODES & LOGIC GATES AND BOOLEAN ALGEBRA	CO1	10	04	04	10	18
2	II	COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS	CO2	10	03	03	10	16
3	III	MICROPROCESSOR ARCHITECTURE & MICROCOMPUTER SYSTEMS	CO3	8	02	02	06	10
4	IV	8086 ASSEMBLY LANGUAGE PROGRAMMING	CO4	10	04	04	08	16
5	V	PROCEDURE AND MACRO IN ASSEMBLY LANGUAGE PROGRAM	CO5	7	02	04	04	10
Grand Total				**45**	**15**	**17**	**38**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning, and Seminar/Presentation	Lab. Performance, viva voce

X. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)		
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	2	1	1	-	1	1	1		-
CO2	2	2	2	2	-	1	1	2		-
CO3	2	2		1	-	1	1	1		1
CO4	2	2	2	2	-	1	1	-		2
CO5	2	2	2	2	-	1	1	-		2
	Legends:- High:03, Medium:02, Low:01, No Mapping: - *PSOs are to be formulated at the institute level									

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	R P Jain	Modern Digital Electronics	McGraw Hill Education; 4th edition
2	Douglas Hall	Microprocessors and Interfacing: Programming and Hardware, Intel Version	McGraw-Hill Education; 2nd edition
3	Bhurchandi K. M., Roy A. K	Advanced microprocessors and peripherals 3/E	Tata McGraw Hill Education, New Delhi, 2016, ISBN:9781259006135

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://www.nptel.ac.in	All practicals
2	https://www.falstad.com/circuit/	All practicals
3	https://logic.ly/	All practicals

Name & Signature:

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Mrs. Shubhangi P. Dudhe
Lecturer in Information Technology

Mrs. Snehal S. Ingavale
Lecturer in Computer Engineering

(Course Experts)

Name & Signature:

Dr.D.N.Rewadkar
(Programme Head)

Name & Signature:

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(CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CM/IT
PROGRAMME CODE	06/07
COURSE TITLE	RELATIONAL DATABASE MANAGEMENT SYSTEM
COURSE CODE	CM41201
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
CM41201	RELATIONAL DATABASE MANAGEMENT SYSTEM	DSC	3	-	4	1	8	4	3 Hrs	30	70	100	40	25	10	25@	10	25	10	175

Total IKS Hrs for Term: 0 Hrs

Abbreviations: CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, SLA- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment,*# - Online Examination,@$ - Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours.**
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

The objectives of this course are to provide a strong formal foundation in Database Concepts, technology and practice to the students to enhance them into well-informed application developers. After learning this subject, the students will be able to understand the designing of RDBMS and can use any RDBMS package as a backend for developing database applications

III. COURSE-LEVEL LEARNING OUTCOMES (CO's)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Understand Database Management System concepts
CO2: Design a database for a given problem
CO3: Execute SQL commands on the database
CO4: Use performance-tuning objects in SQL
CO5: Implement PL/SQL code on a given database
CO6: Apply security and backup techniques on the database

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Sr. No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
	UNIT-I INTRODUCTION TO DATABASE SYSTEM (CL Hrs-8, Marks-12)			
1.	**TLO1.1**: State the importance of a database management system. **TLO1.2**: Define data, database, DBMS, data independence, data abstraction, and schema. **TLO1.2.1**: State Codd's laws. **TLO1.2.2**: Describe the Overall structure of DBMS. **TLO1.3**: Describe the architecture of DBMS. **TLO1.4**: Distinguish Hierarchical, networking and relational data model. **TLO1.5**: Describe advanced database concepts	**1.1** Database concepts: Data, Database, Database management system, File system versus DBMS, Applications of DBMS, Data Abstraction, Data Independence, Database Schema **1.2** The Codd's rules, the Overall structure of DBMS **1.3** Architecture: Two-tier andThree-tier architecture of DBMS. **1.4** Data Models: Hierarchical, Networking, and Relational Data Models **1.5** Introduction to advanced database concepts: Data mining, Data Warehousing, Big data	Hands-on Demonstration Presentations	**CO1**
	UNIT-II 2 RELATIONAL DATA MODEL (CL Hrs-6, Marks-10)			
2.	**TLO2.1**: Define table, row, column, domain, attribute **TLO2.2**: State types of keys and give examples of each. **TLO2.3**: Describe data constraints. **TLO2.4**: Draw an ER diagrams **TLO2.5**: Describe database design in terms of 1NF, 2NF and 3NF	**2.1** Relational Structure- Tables (Relations), Rows(Tuples), Domains, attributes **2.2** Keys: Super Keys, Candidate Key, Primary Key, Foreign Key **2.3** Data Constraints: Not Null, Unique, Primary Key, Foreign Key, Check, Default. **2.4** Entity Relationship Model,- Strong Entity set, Weak Entity set, Types of Attributes, E-R Diagrams **2.5** Normalization -Normalization based on functional dependencies, Normal forms: 1NF, 2NF, 3NF	Hands-on Demonstration Presentations	**CO2**

UNIT-III INTERACTIVE SQL (CL Hrs-10, Marks-14)				
3.	**TLO3.1.1**: Enlist Oracle data types. **TLO3.1.2**: Compare DDL, DML, DCL and TCL. **TLO3.1.3:** Write SQL queries on DDL, DML, DCL and TCL. **TLO3.2:** Describe and write SQL queries on GROUP BY, ORDER BY, and HAVING clauses **TLO3.3.1**: Enlist operators and compare between Relational, Arithmetic, Logical, and set operators. **TLO3.3.2**: Write SQL queries to evaluate the use of operators. **TLO3.4.1**: Enlist functions and compare Date, time, String functions and Aggregate Functions. **TLO3.4.2**: Write SQL queries to evaluate the use of functions. **TLO3.5:** Describe INNER and OUTER JOINS and Write SQL queries to evaluate the use of Join	**3.1** SQL: Invoking SQL*PLUS, The Oracle Data- types, Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL), Transaction control language (TCL). **3.2** Clauses: Different types of clauses in SQL **3.3** Operators: Relational, Arithmetic, Logical, set operators. **3.4** Functions: Date and time, String functions, Aggregate Functions. **3.5** Joins: Types of Joins, Nested queries	Hands-on Demonstration Presentations	**CO3**
UNIT- IV ADVANCED SQL: PERFORMANCE TUNING (CL Hrs-06, Marks-10)				
4.	**TLO4.1.1:** Define view, sequence and index. **TLO4.1.2:** Describe the view with its types. **TLO4.1.3:** Write SQL queries to create a view and perform different operations on it. **TLO4.2:** Write SQL queries to create a sequence and perform different operations on it. **TLO4.3.1:** Describe types of indexes. **TLO4.3.2:** Write SQL queries to create an index and perform different operations on it.	**4.1** Creating Views, Views: Types of Views: Read Only View and Updatable Views, Dropping Views. **4.2** Sequences: Creating Sequences, Altering Sequences, Dropping Sequences **4.3** Indexes: Index Types, Creating of an Index: Simple Unique, and Composite Index, Dropping Indexes.	Hands-on Demonstration Presentations	**CO4**
UNIT –V PL/SQL PROGRAMMING (CL Hrs-12, Marks-14)				
5.	**TLO5.1:** Enlist PL/SQL data types and State the advantages of PL/SQL. **TLO5.2.1:** Describe the control	**5.1** Introduction of PL/SQL: The PL/SQL Syntax, The PL/SQL Block Structure, PL/SQL data types, and Advantages of PL/SQL.	Hands-on Demonstration Presentations	**CO5**

	structure with its types. **TLO5.2.2:** Write PL/SQL block to evaluate the use of different control structures. **TLO5.3.1:** Describe exception handling with its types. **TLO5.3.2:** Write PL/SQL block to create different types of Exception. **TLO5.4.1:** Describe the working of cursors. **TLO5.4.2:** Distinguish between Implicit and Explicit cursors. **TLO5.4.3:** Write PL/SQL block to create different types of cursors. **TLO5.5:** Define Procedure, Function Trigger and State advantages. **TLO5.6:** Write PL/SQL block to create stored procedures and function **TLO5.7:** Describe the working of triggers	**5.2** Control Structure: Conditional Control, Iterative Control, Sequential Control. **5.3** Exception handling: Predefined Exception, User defined Exception. **5.4** Cursors: Implicit and Explicit Cursor **5.5** Procedures: Advantages, Creating, Executing and Deleting a Stored Procedure **5.6** Functions: Advantages, Creating, Executing and Deleting a Function. **5.7** Database Triggers: Use of Database Triggers, Types of Triggers, Syntax for Creating Triggers, Deleting Trigger.		
UNIT –VI NoSQL AND DATABASE ADMINISTRATION OVERVIEW (CL Hrs-06, Marks-10)				
6.	**TLO6.1.1:** Compare SQL with NoSQL **TLO6.1.2:** Enlist Benefits of NoSQL **TLO6.2:** Write basic NoSQL queries with MongoDB **TLO6.3.1:** Explain types of failure and its types **TLO6.3.2:** Describe the procedure to take database backup **TLO6.4.:** Describe Database Recovery and its types	**6.1** Introduction to NoSQL-comparison between SQL and NoSQL database system, Benefits of NoSQL, Types of NoSQL databases **6.2** MongoDB: Installation of MongoDB, Quering with MongoDB **6.3** Database Backup-Types offailure, Causes of failure and database backup introduction, Types of database Backup-Physical and logical **6.4** Database Recovery-Recovery Concepts, Recovery Techniques- Roll forward and Rollback	Hands-on Demonstration Presentations	CO6

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

Sr. No	Practical/Tutorial/ Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Relevant COs	Number of hrs
1.	**LLO 1.1:** Create a database schema for a given application	*Draw an ER diagram for a given database.	1	2
2.	**LLO 2.1:** Execute queries using DDL commands.	*Applying Constraints on relation.	2	2
3.	**LLO 3.1:** Execute queries using DDL commands	*Create and execute queries using DDL commands	3	4

Sr. No	Practical/Tutorial/ Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Relevant COs	Number of hrs
4.	**LLO 4.1:** Execute queries using DML commands.	*Create and execute queries using DML commands	3	4
5.	**LLO 5.1:** Execute queries using DCL commands.	*Create and execute queries using DCL and TCL commands.	3	4
6.	**LLO 6.1:** Implement queries using causes	*Write Queries using different types of clauses.	3	2
7.	**LLO 7.1:** Implement queries using different operators	*Write Queries using various types of operators like (Set, Relational, Arithmetic and Logical)	3	4
8.	**LLO 8.1:** Implement queries using different functions in SQL	*Write Queries using various Functions like (Date, Time, String, and Aggregate).	3	4
9.	**LLO 9.1:** Execute queries based on inner-outer joins	*Write Queries using different types of Joins.	3	2
10.	**LLO 10.1:** Implement queries using Views	*Write Queries to Create, Insert, Update and Drop View	4	2
11.	**LLO 11.1:** Implement queries using Sequence	*Write Queries to Create, Alter and Drop Sequence	4	2
12.	**LLO 12.1:** Write queries for Index	*Write Queries to Create Simple and composite Indexes and Drop them.	4	4
13.	**LLO 13.1:** Implement PL/SQL program using Conditional Statement	*Write the PL/SQL Program using 1. IF...THEN...ELSE 2, NESTED IF..THEN ELSE 3. IF THEN ELSEIF	5	2
14.	**LLO 14.1:** Implement PL/SQL program using Iterative Statement	*Write the PL/SQL Program using 1. FOR LOOP 2. REVERSE FOR LOOP	5	2
15.	**LLO 15.1:** Implement PL/SQL program using Iterative WHILE Statement	*Write the PL/SQL Program using WHILE LOOP	5	2
16.	**LLO 16.1:** Implement PL/SQL program using Sequential Statement	*Write the PL/SQL Program using 1. GOTO 2. EXIT 3. CONTINUE	5	2
17.	**LLO 17.1:** Implement PL/SQL program based on Pre-define Exception	*Write the PL/SQL Program using pre-defined	5	2
18.	**LLO 18.1:** Implement PL/SQL program based on User defined Exception	*Write the PL/SQL Program using user-defined Exceptions	5	2
19.	**LLO 19.1:** Create implicit and explicit cursor	*Write the PL/SQL Program to implement Implicit and Explicit Cursor	5	2
20.	**LLO 20.1:** Implement PL/SQL programs using Procedure	*Write the PL/SQL Program to implement the Stored Procedure	5	2
21.	**LLO 21.1:** Implement PL/SQL programs using Function	*Write the PL/SQL Program to implement the Function	5	2

Sr. No	Practical/Tutorial/ Laboratory Learning Outcome (LLO)	Laboratory Experiment/ Practical Titles /Tutorial Titles	Relevant COs	Number of hrs
22.	**LLO 22.1:** Implement trigger for a given database	*Write the PL/SQL Program for Creating Trigger, Deleting Trigger	5	2
23.	**LLO 23.1:** Install MongoDB	*Installing NoSQL database: MongoDB	6	2
24.	**LLO 24.1:** Implement basic NoSQL queries on MongoDB	*Perform Basic queries-Create, Insert, Update, and Delete commands on MongoDB	6	2
			Total Hrs	**60**

Note: Out of the above suggestive LLOs –

1. All Practical's (LLOs) are mandatory.
2. A judicial mix of LLOs is to be performed to achieve the desired outcomes

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Self-Learning

Draw ER Diagram and design database with the help of DDL, DML, DCL, TCL, Index, Sequence,View, PL/SQL, Procedure, Function, Trigger concepts.

Following are some suggestive topics for Self-learning:

1. Library Management System:
2. Student Management System
3. Employee Management system
4. Product Inventory System
5. Hotel Management System
6. Bus reservation Management System
7. Travel agency Management System
8. Bank Management System
9. Airline Management System
10. Blood bank Management System
11. Hospital Management
12. Payroll Management
13. Hostel Management
14. Movie Ticket Reservation system
15. Electricity Bill Management System
16. Insurance Management System
17. ATM Management System
18. Patient health record
19. Online bookstore management
20. Car rental Management System
21. Student Grade database
22. Food Delivery Order Management System
23. Charity Donation Management
24. Online Exam Management System
25. Train Reservation Management System

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, and online coding contests on websites like Hackerrank, Codechef etc.
- The department level, encourage students to start a coding club
- Students are encouraged to register themselves in various MOOCs such as Infosys Springboard, Swayam etc. to further enhance their learning.

Note:

1. The above is suggestive list of topics for SLA
2. The faculty must allocate any 1 topic to individual student. Considering the students technical skills.

Assignment

Prepare a journal of practical performed in the laboratory.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	a) Computer System with all necessary Peripherals and Internet connectivity. b) SQL/Oracle software c) Mongo DB software	ALL

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr. No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Database System	CO1	7	06	06	00	12
2	II	Relational Data Model	CO2	6	02	04	04	10
3	III	Interactive SQL	CO3	12	04	04	06	14
4	IV	Advanced SQL: Performance Tunning	CO4	4	02	04	04	10
5	V	PL/SQL Programming	CO5	12	04	04	06	14
6	VI	NoSQL and Database Administration Overview	CO6	4	02	02	06	10
		Grand Total		**45**	**20**	**24**	**26**	**70**

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Lab performance, Assignment, Self-learning and Seminar/Presentation	Lab. Performance, viva voce

X. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes *(PSOs)		
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	3	3	3	3	3	-	2	1
CO2	3	2	3	2	2	2	3	-	3	1
CO3	2	3	3	3	2	2	3	-	3	1
CO4	2	3	3	3	2	3	3	-	3	1
CO5	2	3	3	3	2	3	3	-	3	1
CO6	3	2	2	2	2	3	3	-	2	1

Legends: - High:03, Medium:02, Low:01, No Mapping: -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No.	Author	Title	Publisher
1	Abraham Silberschtz, Henry Korth and S.Sudharshan	Introduction to Database System	Tata McGraw Hill, 3rd edition,
2	Ivan Bayross	PLSQL	BPB Publication, 3rd edition SQL,
3	Kogent Learning Solutions Inc	Database Management Systems Application	Dreamtech Press 2014

XII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://nptel.ac.in/courses/106105175/ ,	All practicals
2	https://www.w3schools.com/sql ,	All practicals
3	https://www.tutorialspoint.com/sql,	All practicals
4	https://www.studytonight.com/dbms,	All practicals
5	https://docs.mongodb.com/manual/tutorial/install-mongodb-on-windows/	To study advance databases.

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Smt. Priyanka. L. Sonawane
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GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN CE/EE/ET/ME/MT/CM/IT/DDGM
PROGRAMME CODE	01/02/03/04/05/06/07/08
COURSE TITLE	INDIAN CONSTITUTION: CORE CONCEPTS AND VALUES
COURSE CODE	HU21203
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION COURSE	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory Practical				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
HU21203	INDIAN CONSTITUTION: CORE CONCEPTS AND VALUES	VEC	1	–	–	1	2	1	–	–	–	–	–	–	–	–	–	50	20	50

Total IKS Hrs for Term: 0 Hrs

Abbreviations: **CL**-Classroom Learning, **TL**-Tutorial Learning, **LL**-Laboratory Learning, **SLH**-Self Learning Hours, **NLH**-Notional Learning Hours, **FA** - Formative Assessment, **SA** -Summative assessment, **IKS** – Indian Knowledge System, **SLA**- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment,*# - Online Examination,@S - Internal Online Examination

Note:

1. **FA-TH** represents an average of two class tests of 30 marks each conducted during the semester.
2. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
3. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
1. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours.**
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Introducing a course on the Indian Constitution can provide students with a comprehensive understanding of the country's legal framework and democratic principles. Such a course could cover the historical context of its creation, the structure and functions of the government it establishes, and the fundamental rights and duties of citizens. It could also explore the significant amendments and judicial interpretations that have shaped its evolution over time. This foundational knowledge is not only for fostering informed and engaged citizens who can contribute to the nation's democratic processes but also enriches the educational experience by fostering a sense of national identity and ethical responsibility among future engineers. Furthermore, embedding Electoral Literacy and Voter Education in diploma engineering programs strategically empowers these future professionals with an awareness of their electoral privileges and the workings of democracy.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's):

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1: Foster comprehension of the fundamental principles and goals embedded in the Indian constitution.
CO2: Elaborate on the core rights and duties conferred upon Indian citizens by the Constitution.
CO3: Comprehend the distribution of legislative, executive, and financial powers between the Union and the States.
CO4: Understand the functioning of Indian democracy, encompassing its frameworks and mechanisms at local, state, and national levels.
CO5: Cultivate the skills and perspectives required for active participation in electoral processes, the conscientious exercise of voting rights, and the promotion of informed democratic participation within society.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with TLO's.	Suggested Learning Pedagogies	Relevant COs
UNIT-I INTRODUCTION TO INDIAN CONSTITUTION(CL Hrs-03, Marks-NIL)				
1.	**TLO 1.1** Understand the historical context and events leading to the drafting of the Indian Constitution. **TLO 1.2** Comprehend the essential features and understand the significance of the Indian Constitution in shaping India's democratic governance and societal ethos. **TLO 1.3** Analyze the vision and ideals articulated in the Preamble and their relevance in contemporary Indian society.	1.1 Historical background and making of the Indian Constitution 1.2 Salient features and significance of the Indian Constitution 1.3 Preamble: Vision and Ideals of the Indian Constitution	Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning	**CO1**
UNIT - II FUNDAMENTAL RIGHTS, FUNDAMENTAL DUTIES AND DIRECTIVE PRINCIPLES (CL Hrs-04, Marks-NIL)				
2	**TLO2.1** Understand the introduction and structure of Fundamental Rights in Part III of the Indian Constitution. **TLO2.2** Understand the principles of the Right to Equality, Right to Freedom, and Right to Life.	**2.1** Fundamental Rights: Introduction & its Scheme under Part -III **2.2** Right to Equality (Article 14-18) **2.3** Right to Freedom (Article 19-22) **2.4** Right to Life (Article 21) **2.5** Fundamental Duties and their Significance under Part IV-A **2.6** Directive Principles of State Policy under Part – IV: importance and	Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning	**CO2**

	TLO2.3 Identify fundamental duties in general and in particular with the engineering field. **TLO2.4**: Grasp the significance and practical application of Directive Principles of State Policy outlined in Part IV of the Indian Constitution.	implementation.		
	UNIT- III UNION AND STATE EXECUTIVE(CL Hrs-03, Marks-NIL)			
3	**TLO 3.1** 3.1: Gain insight into the structure and functions of the Union executives and the jurisdiction of the Supreme Court. **TLO 3.2** 3.2: Understand the organization and responsibilities of the State Executives and the functions of the State Judiciary(High Courts).	**3.1** Union Government, Union Legislature (Parliament), Lok Sabha and Rajya Sabha (with Powers and Functions), Union Executive, President of India (with Powers and Functions), Prime Minister of India (with Powers and Functions), Union Judiciary (Supreme Court), Jurisdiction of the Supreme Court. **3.2** State Government, State Legislature (Legislative Assembly/ Vidhan Sabha, Legislative Council / Vidhan Parishad), Powers and Functions of the State Legislature, State Executive, Governor Of the State (with Powers and Functions), The Chief Minister Of the State (With Powers and Functions) State Judiciary (High Courts).	Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning	**CO3**
	UNIT-IV AMENDMENTS AND EMERGENCY PROVISIONS(CL Hrs-03, Marks-NIL)			
4	**TLO 4.1** Comprehend the meaning and significance of constitutional amendments, as well as the procedural rules detailed in Article 368 of the Indian Constitution. **TLO 4.2** Recognize the roles of various branches of government in the amendment process, **TLO 4.3** Examine the significant procedures and historical context of major constitutional amendments	**4.1 Introduction to Constitutional Amendments:** Definition and significance of constitutional amendments. Constitutional provisions governing the amendment procedure (Article 368). **4.2 Types of Amendments:** Simple majority amendments, Special majority amendments, Amendments requiring ratification by states. **4.3 Role of the Executives Amendments**: Role of Parliament: Lok Sabha and Rajya Sabha, Role of President: Assent to amendments, Role of State Legislatures: Ratification of certain amendments. **4.4 Major Constitutional**	Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning	**CO4**

		Amendment procedures: Major Constitutional Amendment procedures - 1st, 7th,42nd, 44th, 73rd & 74th, 76th, 86th, 52nd & 91st, 102nd		
UNIT –V ELECTORAL LITERACY (CL Hrs-02, Marks-NIL)				
5	**TLO5.** Electoral Literacy: Develop understanding and proficiency in electoral processes, voter registration, rights and responsibilities of voters, electoral reforms, and initiatives promoting electoral literacy.	**5.1 Understanding the Electoral Process :** Overview of the electoral process: registration, voting, counting, and declaration of results, Role and functions of the Election Commission of India Types of elections: Lok Sabha, Rajya Sabha, State Legislative Assembly, Local Body elections **5.2 Voter Registration and Electoral Rolls:** Importance of voter registration Eligibility criteria for voter registration Process of voter registration: online, offline, and special drives Checking and updating voter details in electoral rolls **5.3 Rights and Responsibilities of Voters:** Understanding fundamental rights related to elections Responsibilities of voters towards ensuring free and fair elections Consequences of electoral malpractices and non-participation **5.4 Electoral Reforms and Initiatives:** Overview of electoral reforms aimed at enhancing transparency, inclusivity, and integrity of elections Role of technology in improving electoral processes: Voter Verifiable Paper Audit Trail (VVPAT), Online voter registration, e-voting Initiatives by the Election Commission and civil society organizations to promote electoral literacy	Presentations Case Studies and Analysis Role-Playing and Simulations Project-Based Learning	CO5

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

NOT APPLICABLE

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

i) **Case Study Analysis:** Select a few landmark Supreme Court cases related to Fundamental Rights (e.g., Kesavananda Bharati v. State of Kerala, Maneka Gandhi v. Union of India) and analyze the court's interpretation and impact on these rights.

ii) **Comparative Analysis**: Compare the provisions of the Right to Equality under Articles 14-18 with similar provisions in the constitutions of other countries. Highlight similarities, differences, and the reasoning behind them.

iii) **Public Awareness Campaign**: Design a public awareness campaign to educate citizens about their Fundamental Rights and Duties. Create informative posters, social media content, and interactive workshops to engage people in discussions about constitutional rights and responsibilities.

iv) Write a reflective essay discussing the historical context and debates surrounding the inclusion of Fundamental Rights in the Indian Constitution.

v) Create a visual timeline depicting the evolution of laws related to equality in India, from independence to the present day. Include major legislative reforms and judicial decisions.

vi) Conduct a comparative analysis of the implementation of Directive Principles in different states of India, identifying successful initiatives and areas needing improvement.

vii) **Case Study Analysis:** Choose a recent constitutional or political issue that has been debated in Parliament. Analyze the roles played by the Loksabha and Rajya Sabha in addressing the issue and the impact of their decisions.

viii) **Case Study Analysis: Analyze a landmark constitutional amendment in India (e.g., the 42nd Amendment) and its impact on governance, fundamental rights, and the balance of power between different branches of government.**

ix) **Infographic Creation:** Create an infographic illustrating the process of amending the Indian Constitution as outlined in Article 368. Highlight key steps and requirements for different types of amendments.

x) **Timeline Project:** Create a timeline highlighting major constitutional amendments in India, such as the 1st, 7th, 42nd, 44th, 73rd & 74th, 76th, 86th, 52nd & 91st, and 102nd amendments. Include key provisions and the political context surrounding each amendment.

xi) **Debate:** Organize a debate on the topic "Should the President have the power to refuse assent to constitutional amendments?" Encourage students to research and present arguments from legal, political, and ethical perspectives.

xi) **Campaign Design:** Design a social media campaign to raise awareness about the importance of voter participation and responsible voting. Create visually engaging posters, infographics, and videos highlighting the consequences of electoral malpractices and non-participation.

xii) **Online Tutorial:** Create a step-by-step tutorial video or guide demonstrating the voter registration process, both online and offline. Include instructions for checking and updating voter details in electoral rolls.

xiii) **Survey Project:** Conduct a survey to assess the awareness and accessibility of voter registration

facilities among different demographic groups in your locality. Analyze the results and propose strategies to improve voter registration rates.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

NOT APPLICABLE

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

NOT APPLICABLE

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Assignment, Self-learning and Terms work Seminar/Presentation	—

X. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)	
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	--	--	--	--	2	--	2		
CO2	--	--	--	--	3	--	2		
CO3	--	--	--	--	3	--	2		
CO4	--	--	--	--	3	--	2		
CO5	--	--	--	--	3	--	2		

Legends:- High:03, Medium:02, Low:01, No Mapping: -
*PSOs are to be formulated at the institute level

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr.No	Author	Title	Publisher
1	M. Laxmikanth	"Indian Polity"	McGraw Hill Education: ISBN-13: 978-9352603633
2	D. D. Basu	Introduction to the Constitution of India	LexisNexis: ISBN-13: 978-8180386477
3	Subhash C. Kashyap	Our Constitution: An Introduction to India's Constitution and Constitutional Law	National Book Trust, India ISBN-13: 78-8123748462
4	Arun K. Thiruvengadam	The Constitution of India: A Contextual Analysis	Oxford University Press ISBN-1 3:978-0199467078
5	Oxford University Press	The Making of India's Constitution	Oxford University Press Oxford UniversityPress

XI. LEARNING WEBSITES & PORTALS

Sr.No.	Link/Portal	Description
1	https://prsindia.org/.	In-depth analysis of parliamentary affairs, legislative processes, and policy Issues in India.
2	https://awmin.gov.in	Official repository providing access to the full text of the Indian Constitution.
3	https://constitution.org.in	Interactive platform offering the text of the Constitution along with annotations and historical context.
4	https://indiankanoon.org	Legal search engine offering a vast database of Indian case law, including constitutional judgments.
5	https://nptel.ac.in	Offers video lectures and course materials on studies of law and the constitution.

Name & Signature: **Mr. S.B. Kulkarni** Lecturer in Mechanical Engineering **(Course Experts)**	
Name & Signature: **Dr.D N Rewadkar** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN IT
PROGRAMME CODE	01/02/03/04/05/06/07/08
COURSE TITLE	DATA STRUCTURE USING C
COURSE CODE	IT31205
PREREQUISITE COURSE CODE & TITLE	PROGRAMMING IN C-CM21204
CLASS DECLARATION	YES

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme										
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
IT31205	DATA STRUCTURE USING C	DSC	3	1	4	0	8	4	3	30	70	100	40	50	20	25#	10	0	0	175

Total IKS Hrs for Term: 0 Hrs

Abbreviations: CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, SLA- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment, *# - Online Examination, @S - Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that semester.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours.**
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Data structures is an important aspect of Computer engineering and Information technology. Data structures are mathematical and logical model of storing and organizing data in particular way in computer. After studying this course student will be able to understand and identify different types of data structures, use algorithms with appropriate data structures to solve real life problems.

III. COURSE-LEVEL LEARNING OUTCOMES (CO'S)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

CO1 Describe Data structures, Complexity and Array operations.
CO2 Use algorithms for searching and sorting techniques with arrays.
CO3 Implement programs for Stack, Queue and Recursion using Arrays.
CO4 Write programs to perform operations on Linked List.
CO5 Write algorithms to implement Tree data structure.
CO6 Describe Graph and its traversing methods

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes(TLO's) aligned to CO's.	Learning content mappedwith TLO's	Suggested Learning Pedagogies	Relevant Cos
	UNIT 1 – Introduction to data structures and Arrays (CL Hrs.- 05 , Marks -10)			
1	**TLO 1.1** Define data structure terminologies. **TLO 1.2** Enlist various data structure Operations. **TLO 1.3** Differentiate between various complexities. **TLO 1.4** Use dynamic memory allocation in programs. **TLO 1.5** Write algorithms to perform operations on array.	1.1 Introduction, Basic Terminology, Organization, Classification of data structure. 1.2 Operations on data structures Traversing, Inserting, deleting Searching, sorting, and Merging. 1.3 Complexity: Time Complexity, Space Complexity, Big 'O' Notation. 1.4 Dynamic memory Allocation. 1.5 Arrays: Introduction, Representation of linear arrays in memory. 1.6 Traversing linear Arrays, Inserting and Deleting. 1.7 Multidimensional Arrays.	Presentations, Chalk , Board	CO1
	UNIT 2 Searching and Sorting Techniques (CL Hrs. -08, Marks-12)			
2	**TLO 2.1** Write algorithm and programs for various searching and sorting techniques **TLO 2.2** Apply Hashing techniques to store and retrieve element from given data set. **TLO 2.3** Use sorting methods to sort data set.	2.1 Searching: Basic search techniques, Linear Search, Binary search. 2.2 Hashing: Hash functions, Collision Resolution, Linear probing, Chaining. 2.3 Sorting: General background. 2.4 Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Merge sort, Radix sort, Quick sort.	Presentations, Chalk , Board	CO2

UNIT 3 Stacks, Queues & Recursion (CL Hrs-10, Marks-13)				
3	**TLO 3.1** Implement Stack and Queue data structure to carry out various data structure operation. **TLO 3.2** Use stack and queues to solve various problem(likes prefix to postfix conversion, evaluation of expression, Tower of Hanoi etc). **TLO 3.3** Differentiate between stack and queue.	3.1 Stacks: Concept, representing stacks in 'C', Applications of stacks. 3.2 Polish Notations (Prefix, postfix, Infix). 3.3 Recursion: Recursive definitions and processes, Recursion in 'C', writing recursive programs factorial, Fibonacci. 3.4 Tower of Hanoi, Implementation of recursive, procedures by means of stack. 3.5 Queues: The queue and its sequential representation, concept of queues, Operation on Queue : Queue is Full, Queue is Empty 3.6 Types of Queue : Linear , Circular , Priority Queue	Presentations, Chalk , Board	CO3
SECTION II				
UNIT 4 Linked Lists (CL Hrs-08, Marks-14)				
4	**TLO 4.1** Implement linked list data structure to carry out various data structure operations. **TLO 4.2** Use Linked list to implement other data structures.	4.1 Introduction singly link list Representation of link list in memory. 4.2 Creating, Traversing, and Searching in Sorted and Unsorted Linked List. 4.3 Memory allocation, garbage Collection. 4.4 Inserting into linked list, Deleting from a linked list. 4.5 Circular singly linked list: Insertion and deletion of node. 4.6 Doubly linked list: Insertion and deletion of node.	Presentations, Chalk , Board	CO4
UNIT 5 . Tree (CL Hrs-09, Marks-14)				

	TLO 5.1 Draw binary tree for given data set. **TLO 5.2** Write algorithm for binary tree traversal. **TLO 5.3** Write algorithms to perform given operation on Binary Search Tree. **TLO 5.4** Create Heap tree for given dataset.	5.1 5.2 5.3 5.4 5.5	Tree Terminologies: Degree of node, level of node, leaf node, Depth/Height of tree, In-degree and Out-degree, path, Ancestor and Descendant node. Tree Types: General Trees, Binary trees, Binary Search Trees Binary Tree Traversal methods: Inorder, Preorder, Postorder traversal using stack. Binary search tree (BST), searching and inserting BST, deleting from BST. Heap: Inserting into a Heap, Deleting the root of Heap, Heap sort.	Presentations, Chalk , Board	
UNIT 6 . Graphs (CL Hrs-05, Marks-12)					
	TLO 6.1 Define terminologies related to Graph. **TLO 6.2** Represent graph using adjacency list and adjacency matrix **TLO 6.3** Solve problems to find out shortest path using Warshall's algorithm. **TLO 6.4** Write algorithm to traverse the given graph.	6.1 6.2 6.3 6.4	Introduction o Graph Terminologies: Graph, Node(Vertices), Arcs(Edges), Directed Graph, Undirected Graph, In-degree and Out-degree, Adjacent, Successor, Predecessor, relation, path, sink. Linear Representation of Graph: Adjacency List, Adjacency Matrix of directed graph. Warshall's Algorithm; Shortest Paths. Linked representation of graph, traversing a graph (BFS,DFS). Applications of Graph.	Presentations, Chalk , Board	

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

Sr. No.	Practical/Tutorial/Laboratory Learning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	No. of Hrs.	Relevant COs
1	LLO1.1 Write a program to allocate Dynamic Memory.	*Implement Programs based on: Structures & Dynamic Memory allocation	2	1

2	LLO2.1 Write a program to perform operations on One Dimensional Array.	*Implement Program to perform insertion and deletion operations on One Dimensional Array.	2	1
3	LLO3.1 Write a program to perform operations on Multidimensional Arrays	Implement Program for matrix operations using Multidimensional Arrays. (Eg. Matrix Addition, Subtraction and Multiplication)	2	1
4	LLO 4.1 Write a program to perform searching technique on given number.	*Implement program to search given number using Linear search technique.	2	2
5	LLO 5.1 Write a program to perform searching techniques on given number.	*Implement program to search given number using Binary search technique.	2	2
6	LLO 6.1 Write a program to perform Bubble sorting technique on given array.	*Implement programs to sort an array using Bubble sort technique.	2	2
7	LLO 7.1 Write a program to perform Selection sort technique on given array.	*Implement programs to sort an array using Selection sort technique.	2	2
8	LLO 8.1 Write a program to perform Insertion sort technique on given array.	*Implement programs to sort an array using Insertion sort technique.	2	2
9	LLO 9.1 Write a program to perform Merge sorting technique on given array.	Implement programs to sort an array using Merge sort technique.	2	2
10	LLO 10.1 Write Program to perform Stack operations on array.	* Implement a Program to perform Push and Pop operations on Stack using array.	2	3

11	LLO 11.1 Write Program to implement Tower of Hanoi.	Implement a Program for Tower of Hanoi using stack.	2	3
12	LLO 12.1 Write Program to perform operations on Linear Queue using array.	*Implement a Program to perform Insert and Delete operations on Linear Queue using array.	4	3
13	LLO 13.1 Write Program to perform operations on Circular Queue using array.	*Implement a Program to perform Insert and Delete operations on Circular Queue using array.	2	3
14	LLO 14.1 Write Programs to traverse single link list	Implement a Program to traverse single link list.	2	4
15	LLO 15.1 Write Programs to search in sorted and unsorted linked list.	Implement a Program to search in sorted and unsorted linked list.	2	4
16	LLO 16.1 Write Programs to perform insert and delete operations on Single link list.	* Implement a Program to perform following operations on Single link list. i. To insert a node at beginning and at given location. ii. To delete a node.	4	4
17	LLO 17.1 Write Programs to perform insert and delete operations on Circular Singly link list.	Implement a Program to perform following operations on Circular Single link list. i. To insert a node at beginning and at given location. ii. To delete a node.	4	4
18	LLO 18.1 Write Programs to perform insert and delete operations on Double link list.	Implement a Program to perform following operations on Double link list. i. To insert a node at beginning ii. To delete a node.	4	4
19	LLO 19.1 Write Programs to implement stack using link list.	Implement stack using Link list.	4	4

20	LLO 20.1 Write Programs to implement Queue using link list.	Implement Queue using Link list.		
21	LLO 21.1 Write Program to create Binary Search Tree and perform given operations	*Implement a Program to create Binary Search Tree and perform Inorder, Preorder and Postorder traversal.	4	5
22	LLO 22.1 Write Program to traverse graph in DFS and BFS.	*Implement a Program to traverse graph in DFS.	4	6
23	LLO 23.1 Write Program to traverse graph in BFS.	Implement a Program to traverse graph in BFS.	4	6
Total Hrs			60	

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Self-Learning NA

Micro project:

a. Develop program in C/C++ to evaluate an arithmetic expression using stack with linked list representation.
b. Develop a program in C/C++ to create a Queue of given persons. Shift the original position of person to a new position based on its changed priority or remove a person from the queue using linked list representation.
c. Develop a program in C/C++ that create tree to store given data set using linked list representation. Locate and display a specific data from data set.
d. Develop a program in C/C++ for performing following banking operations: Deposit, Withdraw and Balance Enquiry. Select appropriate data structures for the same.

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of practical, as well as aid to procure equipment by authorities concerned.

Sr. No.	Equipment Name with Broad Specifications/Instrument Required	Experiment Sr.No.
1	Hardware: Personal computer Pentium IV,2 GHz minimum (i3-i5 preferable), RAM minimum 2 GB.	For all experiments
2	C/C++ Compiler.	

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Unit	Unit Title	Aligned Cos	Learning Hours	R Level	U Level	A Level	Total marks
			SECTION I				
1	Introduction to data structures and Arrays	CO1	05	4	4	2	10
2	Searching and Sorting Techniques	CO2	08	2	4	6	12
3	Stacks, Queues & Recursion	CO3	10	2	4	7	13
		Total	23	08	12	15	35
			SECTION II				
4	Linked Lists	CO4	08	2	4	6	12
5	Trees	CO5	09	2	4	6	12
6	Graphs	CO6	05	2	3	6	11
		Total	22	06	11	18	35
		Grand Total	45	14	23	33	70

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)	Summative Assessment (Assessment of Learning)
Each Practical will be assessed considering 60% weightage to the process, 40% weightage to the product.	End Semester Exam based on Practical performance and Viva-voce.

X. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)		
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	3	3	2	1	1	-	-	1	2
CO2	3	3	3	2	1	1	3	-	2	3
CO3	3	3	3	2	1	1	3	-	2	3
CO4	3	3	3	2	1	1	3	-	2	3
CO5	3	3	3	2	1	1	3	-	2	3
CO6	3	3	3	-	1	1	3	-	2	3
Summary	**3**	**3**	**3**	**2**	**1**	**1**	**3**	**-**	**2**	**3**
Legends:- High:03, Medium:02, Low:01, No Mapping: - *PSOs are to be formulated at the institute level										

XI. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No.	AUTHOR	TITLE	PUBLISHER
1	Lipschultz	Data Structures Schaum Outline Series	McGraw Hill Education, New Delhi.2013, ISBN-13: 978-0070701984
2	ISRD Group	Data Structures Using 'C'	McGraw Hill Education, New Delhi.2013,ISBN-13:978-12590006401
3	S K Shriwastva	Data Structures through C in Depth	BPB Publications ISBN:-13: 978-81-7656-741-1

XII. LEARNING WEBSITES & PORTALS

Sr. No.	Link/Portal	Description
1	https://www.w3schools.in/data-structures-tutorial	All practicals
2	https://www.geeksforgeeks.org/data-structures/	All practicals
3	https://www.tutorialspoint.com/data_structures_algorithms/index.htm	All practicals

Name & Signature: **Mrs. S R Hande** Lecturer in Information Technology **(Course Experts)**	
Name & Signature: **Dr.D N Rewadkar** (Programme Head)	Name & Signature: **Shri. S.B. Kulkarni** (CDC In-charge)

GOVERNMENT POLYTECHNIC, PUNE

'120 – NEP' SCHEME

PROGRAMME	DIPLOMA IN IT
PROGRAMME CODE	07
COURSE TITLE	CLIENT-SIDE SCRIPTING USING JAVASCRIPT
COURSE CODE	IT41203
PREREQUISITE COURSE CODE & TITLE	NA
CLASS DECLARATION	NO

I. LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Course Type	Learning Scheme					Credits	Assessment Scheme											
			Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
														Practical						
			CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
										Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
IT41203	CLIENT-SIDE SCRIPTING USING JAVASCRIPT	DSC	1	--	4	1	6	3	--	--	--	--	--	50	20	25@	10	25	10	100

Total IKS Hrs for Term: 0 Hrs

Abbreviations: CL-Classroom Learning, TL-Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS – Indian Knowledge System, SLA- Self Learning Assessment

Legends: @-Internal Assessment, # - External Assessment,*# - Online Examination,@$ - Internal Online Examination

Note:

FA-TH represents an average of two class tests of 30 marks each conducted during the semester.

1. If a candidate is not securing minimum passing marks in **FA-PR** (Formative Assessment - Practical) of any course, then the candidate shall be declared as **'Detained'** in that course.
2. If a candidate does not secure minimum passing marks in SLA (Self Learning Assessment) of any course, then the candidate shall be declared as **'fail'** and will have to repeat and resubmit SLA work.
3. **Notional learning hours** for the semester are **(CL + LL + TL + SL) hrs. * 15 Weeks**
4. **1 credit** is equivalent to **30 Notional hours.**
5. * Self-learning hours shall not be reflected in the Timetable.
6. * Self-learning includes micro-projects/assignments/other activities.

II. RATIONALE:

Client-side scripting includes faster response times, a more interactive application, and less overhead on the web server. As web applications become larger and more complex, combined with the increasing popularity of mobile applications that run on smartphones and other mobile devices, the need for client-side scripting, JavaScript will continue to grow.

III. COURSE-LEVEL LEARNING OUTCOMES (CO's)

Students will be able to achieve & demonstrate the following CO's on completion of course-based learning

- CO1 Write JavaScript using basic syntactical constructs
- CO2 Create forms and Control browser window features through Scripts
- CO3 Write and Execute JavaScript for handling cookies and regular expressions for validations
- CO4 Create Web pages with Rollovers, Status Bar, Banners and Slideshow
- CO5 Create web page application using Angular JS

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr. No.	Theory Learning Outcomes(TLO's) aligned to CO's.	Learning content mappedwith TLO's	Suggested Learning Pedagogies	Relevant COs
	UNIT 1: BASICS OF JAVASCRIPT PROGRAMMING (CL Hrs. -02, Marks - Nil)			
1	**TLO 1.1** Create an object to solve a given problem. **TLO 1.2** Develop JavaScript to implement programs using different operators and expressions. **TLO 1.3** Develop a JavaScript page using various control and looping structures.	1.1 Features of JavaScript 1.2 Object Name, Property, Method, Dot Syntax 1.3 Values and Variables 1.4 Operators and Expressions: Primary Expressions, Object and Array initializers, Function definition expression 1.5 If Statement, if…else, if...else if, nested if statement 1.6 Switch…case Statement 1.7 Loop Statement- for loop, for...in loop, while loop, do...while loop, continue statement.	Hands-on Demonstration Presentations, Chalk, Board	CO1
	UNIT 2: ARRAYS, FUNCTIONS AND STRING(CL Hrs. -04, Marks - Nil)			
2	**TLO 2.1** Write a JavaScript usingarray and Function. **TLO 2.2** Perform specified string manipulation operation on a given string	2.1 Array: Declaring an Array, Initializing an Array, defining an array element, Looping an Array, adding an array Element, sorting an array Element, Combining Array Elements into a String, Changing Elements of the Array, Objects as an associative array. 2.2 Function: Defining a function, Adding an argument, the scope of variables and arguments. 2.3 Calling a function- calling a function with or without argument, function Calling Another Function, Returning Values from a Function. 2.4 String: Joining Strings, Dividing Text, Converting Numbers and Strings, Changing the Case of the Strings, Strings and Unicode.	Hands-on Demonstration Presentations, Chalk, Board	CO2
	UNIT 3: FORMS AND EVENT HANDLING, COOKIES AND BROWSER WINDOWS (CL Hrs-04, Marks - Nil)			
3	**TLO 3.1** Develop JavaScript to handle given events. **TLO 3.2** Develop JavaScript to dynamically assign specified attribute values to the given	3.1 Building Block of a Form, Properties and methods of forms, Button, Text, Text area, Checkbox, Radio button, Select element. 3.2 Form Events: Mouse event, key event.	Hands-on Demonstration Presentations, Chalk, Board	CO3

	form control. TLO 3.3 Write JavaScript to handle forms using intrinsic function. TLO 3.4 Manage cookies using JavaScript in a given manner.	3.3 Form Objects and Elements, Changing Attribute Values Dynamically, Changing Option List Dynamically, Evaluating Check Box Selections, Manipulating Elements Before the Form, Disabling Elements, Read-Only Elements, Using Intrinsic JavaScript Functions, Changing Labels Dynamically 3.4 Cookie Basics, Creating, Reading, Setting the Expiration Date, Deleting Personalizing and Experience Using a Cookie. 3.5 Opening a New Window Focus, placing a Window into Position on the Screen, Changing the Contents of a Window, Closing the Window, scrolling a Web Page, Opening Multiple Windows at Once, Creating a Web Page in a New Window		
UNIT 4: REGULAR EXPRESSIONS, FRAMES AND ROLLOVERS (CL Hrs-03, Marks - Nil)				
4	TLO 4.1 Validate form using regularexpressions. TLO 4.2 Implement banners slideshow and rollovers to makete website come alive.	4.1 Regular Expression: The Language of a Regular Expression, Return the Matched Characters, Matching punctuations and symbols, matching words, replacing the text using a Regular Expression. 4.2 Aa Frames: Create a frame, invisible borders of frame, Calling a Child Windows JavaScript Function, Changing the Content of a Child Window, Changing the Focus of a Child Window, writing to a Child Window from a JavaScript, Accessing Elements of Another Child Window. 4.3 Rollovers: Creating a Rollover, Text Rollovers, Multiple Actions for a Rollover, More Efficient Rollovers, 4.4 Making Magic Using the Status Bar, Banner Advertisements, and creating a slideshow.	Hands-on Demonstration Presentations, Chalk, Board	CO4

UNIT V: INTRODUCTION TO ANGULAR JS (CL Hrs-02, Marks-Nil)				
	TLO 5.1 Develop a sample web pageusing Angular JS	5.1 Introduction of Angular JS, Core features of Angular JSAngular JS as MVC Architecture. 5.2 Angular JS components: directives, expressions, controls,functions, filters 5.3 Creating and executing basic applications using Angular JSAngular JS with tables and forms.	Hands-on Demonstration Presentations, Chalk, Board	CO5

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL/ TUTORIAL EXPERIENCES.

Sr. No.	Practical/Tutorial/LaboratoryLearning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	Number of Hrs.	Relevant COs
1	LLO 1.1 Write simple JavaScript with HTML for arithmetic expression evaluation and message printing.	Implement simple JavaScript with HTML for arithmetic expression evaluation.	2	1
2	LLO2.1 Develop JavaScript based on decision-making statement.	*Develop JavaScript based on decision-making statements.	2	1
3	LLO3.1 Develop JavaScript based on the looping statement.	Implement JavaScript based on the looping statement.	2	1
4	LLO 4.1 Develop JavaScript to implement array functionalities.	Implement JavaScript to implement array functionalities.	2	2
5	LLO 5.1 Develop JavaScript to implement functions.	*Implement JavaScript to implement functions.	2	2
6	LLO 6.1 Develop JavaScript to implement strings operations.	*Implement JavaScript to implement string operations.	2	2
7	LLO 7.1 Create a web page using different form objects.	Implement web pages using form objects and form elements.	2	3
8	LLO 8.1 Create a web page using Form Events.	*Implement web page using different Form Events.	2	3
9	LLO 9.1 Develop web page using Intrinsic Java Functions.	Implement web page using Intrinsic Java Functions.	2	3
10	LLO 10.1 Develop a web page for creating session and persistent cookies.	*Implement a web page for creating session and persistent cookies.	2	3
11	LLO 11.1 Create a web page for placing the Window on the screen and working with the child Window.	Implement a web page for placing the Window on the screen and working with the child Window.	2	3

Sr. No.	Practical/Tutorial/LaboratoryLearning Outcome (LLO)	Laboratory Experiment/Practical Titles/Tutorial Titles	Number of Hrs.	Relevant COs
12	LLO 12.1 Develop a web page for implementing the status bar and Banner.	*Implement web page for implementing status bar and Banner.	2	4
13	LLO 13.1 Create a web page for implementing Rollovers.	*Implement a web page for implementing Rollovers.	2	4
14	LLO 14.1 Create a basic application for demonstrating Angular JS expressions and directives (Any 2).	Write and implement basic applications for demonstrating Angular JS expressions and directives (Any 2).	2	5
15	LLO 15.1 Develop Simple applications using Angular JS andForms (Any 2).	*Write and implement Simple applications using Angular JS and Forms (Any 2).	2	5

VI. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITIES FOR SPECIFIC LEARNING/SKILLS DEVELOPMENT (SELF-LEARNING)

Self-Learning

a. Prepare a journal based on practicals performed in the laboratory.
b. Follow Coding Standards.
c. Undertake micro-projects.
d. Develop a variety of programs to improve logical skills.
e. Develop Application-oriented real-world programs.

VII. Micro project:

1. Password pattern matching

Design a web page that accepts Username and Password. Provide appropriate validation to Username. Use regular expression only, to validate the password with the following pattern:

i. password must have at least 8 characters
ii. at least an upper-case letter,
iii. a lowercase letter,
iv. a number
v. and probably a symbol.If invalid display accordingly.

2. Control Window Locations

Create a basic page in HTML that includes a single image.
When the image is clicked, it should open 5 new windows in the following locations on the screen:

- one in the top left corner of the screenone in the top right corner
- one in the lower left corner one in the lower right corner one in the center of the screen

The URLs displayed for each window can be of your choosing.

3. Multiple Rollovers -

vi. Create a basic page in HTML that displays 3 unique images.
vii. Create a separate rollover for each of these images, i.e., onMouseOver displays a new, unique image, and onMouseOut returns it to the original image.
viii. Add a fourth image to your page.
ix. The fourth image when mouse over will not change. Instead, it will change the other three images on the page (these images do not have to be unique).
x. Then, onMouseOut of the fourth image, return the other 3 images to their original images.

a) Preload all necessary images.
b) Disable hyperlinks on the images if using the <a> tag to complete this.

VIII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWARE REQUIRED

Sr. No.	Equipment Name with Broad Specifications/Instrument Required	Experiment Sr. No.
1	Hardware: Personal computer Pentium IV,2 GHz minimum (i3-i5 preferable), RAM minimum 2 GB.	For all experiments
2	Notepad / Notepad++	

IX. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Unit	Unit Title	Aligned Cos	Learning Hours	R Level	U Level	A Level	Total marks
1	BASICS OF JAVASCRIPT PROGRAMMING	CO1	2	--	--	--	--
2	ARRAYS, FUNCTIONS AND STRING	CO2	4	--	--	--	--
3	FORMS AND EVENT HANDLING, COOKIES AND BROWSER WINDOWS	CO3	4	--	--	--	--
4	REGULAR EXPRESSIONS, FRAMES AND ROLLOVERS	CO4	3	--	--	--	--
5	INTRODUCTION TO ANGULAR JS	CO5	2	--	--	--	--

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment forLearning)	Summative Assessment (Assessment ofLearning)
Each Practical will be assessed considering 60% weightage to the process, and 40% weightage to the product.	End Semester Exam based on Practical performance and Viva-voce.

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5	INTRODUCTION TO ANGULAR JS	CO5	2	--	--	--	--

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XI. SUGGESTED COS- POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes *(PSOs)		
	PO-1 Basic and Discipline-Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	2	1	1	1	1	--	1	1	--	3
CO2	3	2	3	3	1	2	1	--	--	2
CO3	3	2	3	3	1	2	2	--	--	2
CO4	3	2	3	3	1	2	1	--	1	2
CO5	3	2	3	3	1	2	2	1	-	3
Legends:- High:03, Medium:02, Low:01, No Mapping: -- *PSOs are to be formulated at the institute level										

XII. SUGGESTED LEARNING MATERIALS/BOOKS

Sr. No.	AUTHOR	TITLE	PUBLISHER
1	Jim Keogh	JavaScript Demystified	Tata McGraw Hill, First Edition - June 2005, ISBN: 0072254548
2	Michael Moncur	JavaScript in 24 hours	Sam's Publishing; 7th edition – February 2019, ISBN-10: 0672338092 ISBN-13: 978-0672338090
3	Shyam Seshadri, Brad Green	AngularJS: Up and Running - Enhanced Productivity with Structured Web Apps	Shroff/O'Reilly; First edition - October 2014, ISBN-10: 9789351108016 ISBN-13: 978-9351108016

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://www.nptel.ac.in	All practicals
2	https://www.tutorialspoint.com/	All practicals

Name & Signature:

Mrs.S R Hande
Lecturer in Information Technology

Ms.P C Fafat
Lecturer in Information Technology

(Course Experts)

Name & Signature:

Dr.D N Rewadkar
(Programme Head)

Name & Signature:

Shri. S.B. Kulkarni
(CDC In-charge)