SHRI VILE PARLE KELAVANI MANDAL'S
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC

COMPUTER ENGINEERING DEPARTMENT

SEMESTER-III
SCHEME - 2023

Shri Vile Parle Kelavani Mandal's
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC

Learning and Assessment Scheme for Post S.S.C Diploma Programs

Program Name	: Diploma In Computer Engineering		
Programme Code	: CSE	With Effect From Academic Year	: 2023-24
Duration Of Programme	: 6 Semester	Duration	: 16 WEEKS
Semester	: III	Scheme	: 2023

Sr No	Course Title & Code	Course Category	IKS (Hrs)	Actual Contact Hrs./Week			Self-Learning (SL^) (Term Work + Assignment) (Hrs)	Notional Learning Hrs /Week	Credits	Paper Duration (Hrs.)	Theory (Marks)			Based on LL & TL Practical (Marks)			Based on Self Learning SLA (Marks)	Total Marks
				CL	TL	LL					FA-TH	SA-TH	Total	FA-PR	SA-PR	SA-OR		
1	Social & Life Skills (SLS238910)	VEC	-	-	-	-	02	02	01	-	-	-	-	-	-	-	25	25
2	Programming in JAVA (PRJ238913)	AEC	-	02	-	04	02	08	04	03	30	70	100	25	25	-	25	175
3	Data Structure (DST238914)	DSC	-	04	-	02	-	06	03	03	30	70	100	25	25	-	-	150
4	Event Driven & UI Programming (EUP230804)	DSC	-	02	-	04	02	08	04	-	-	-	-	50	50	-	25	125
5	Database Management System (DBS238915)	DSC	-	04	-	02	-	06	03	03	30	70	100	25	25	-	-	150
6	Fundamentals of Microprocessor (FMP230805)	AEC	-	04	-	02	-	06	03	03	30	70	100	25	25	-	-	150
7	Linux Lab (LXL230806)	DSC	-	-	-	02	02	04	02	-	-	-	-	25	-	25	25	75
	Total	-		16	-	16	08	40	20	Total Papers=04	120	280	400	175	150	25	100	850

Abbreviations : IKS - Indian Knowledge System ,CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA -Summative Assessment, SLA - Self Learning Assessment, TH-Theory, PR-Practical, OR-Oral   **Legends :** @ Online Examination-

Note :
1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+TL+LL+SL)Hrs. x 15 Weeks
5. 1 credit is equivalent to 30 Notional Hrs.
6. ^ Self learning hours shall not be reflected in the Time Table.
7. SA-PR,SA-OR: Assessed by Internal and External Examiners Jointly   FA-PR, SLA: Assessed by Internal Examiner Only
Course Category : Discipline Specific Course Core (DSC) : 4, Discipline Specific Elective (DSE) : 0, Value Education Course (VEC) : 1, Intern./Apprenti./Project./Community (INP) : 0, Ability Enhancement Course (AEC) : 2, Skill Enhancement Course (SEC) : 0, Generic Elective (GE) : 0

Head of Department   Controller of Examination   Secretary CDC   Principal

COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

Programme: CSE/IT	Semester: III
Course: Social & Life Skills	Course Category: VEC
Course Code: SLS238910	Duration:16 Weeks

2. LEARNING AND ASSESSMENT SCHEME

Learning Scheme					Assessment Scheme								
Actual Contact Hrs./Week			Self-Learning (SL^) (Term Work + Assignment) (Hrs.)	Credits	Paper Duration (Hrs.)	Theory (Marks)			Based on LL & TL			Based on Self Learning	Total Marks
									Practical (Marks)				
CL	TL	LL				FA-TH	SA-TH	Total	FA-PR	SA-PR	SA-OR	SLA (Marks)	
-	-	-	2	1	-	-	-	-	-	---	--	25	25

3. COURSE OBJECTIVE:

Life skills include social skills and interpersonal skills that help individual make informed decisions, solve problems, think critically and creatively, build healthy relationships, empathize with others, by managing one's life. Life skills are essentially those abilities that help to promote overall wellbeing with holistic approach to face the problems of real life. Students learn socio- life skills from parents, teachers and significant others individuals to translate knowledge, attitude and values into actual abilities.

Note: The course offers three different alternatives(modules) for achieving above outcomes. Students must complete any one module from the following given objective.

       a. MODULE-I : **Unnat Maharashtra Abhiyan (UMA)**

       b. MODULE-II : **National Service Scheme (NSS)**

       c. MODULE-III **: Financial Literacy (NABARD)**

The institute can choose to offer any one MODULE to the groups of the students by taking into consideration the resources required and resources available in the institute. Different group of students may be offered different MODULE based on their choices.

4. SKILL COMPETENCY/INDUSTRY/EMPLOYER EXPECTED OUTCOME

1. Decision making
2. Problem solving
3. Time management
4. Presentation and Grooming skills
5. Social Skills & Empathy
6. Emotional intelligence
7. Financial Literacy

5. COURSE OUTCOMES (COs): At the end of the semester student will be able to**: -**

CO No.	COURSE OUTCOME
CO1	Develop interpersonal skills and leadership skills for empowerment of self and others
CO2	Provide the opportunity to get social experience while working individually or in group for society.
CO3	Develop financial literacy skills for self & community development.
CO4	Communicate professionally for liaisoning between individual & group.

6. CO-PO, CO- PSO MAPPING TABLE

Course and Code	Course Outcomes	Programme Outcomes								
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Social & Life Skills (SLS238910)	CO 1	-	-	-	-	-	3	1	-	-
	CO 2	-	-	-	-	3	1	1	-	-
	CO 3	-	-	-	-	2	1	1	-	-
	CO 4	-	-	-	-	1	3	1	-	-
	CO Avg.	-	-	-	-	**2**	**2**	**1**	-	-

7. COURSE CONTENTS

UNIT NO	TOPIC/sub topic
I	**MODULE I: Activities Under Unnat Maharashtra Abhiyan (UMA)** **1.1** Introduction to Societal Needs and respective stakeholders: Regional societal issues that need engineering intervention **1.2** Multidisciplinary approach-linkages of academia, society and technology **1.3** Stakeholders' involvement **1.4** Introduction to Important secondary data sets available such as census, district economic surveys, cropping pattern, rainfall data, road network data etc **1.5** Problem Outline and stakeholders: Importance of activity and connection with Mapping of system components and stakeholders (engineering / societal) **1.6** Various instruments used for data collection - survey templates, simple measuring equipment. **1.7** Format for measurement of identified attributes/ survey form and piloting of the same **1.8** Fieldwork: Measurement and quantifications of local systems such as agriculture produce, rainfall, Road network, production in local industries, Produce /service which moves from A to B **1.9** Analysis and Report writing 1. Introduction of the topic 2. Data collected in various formats such as table, pie chart, bar graph etc 3. Observations of field visits and data collected.

II	**MODULE II : National Service Scheme (NSS)** **2.1** Contacting Village/Area Leaders **2.2** Primary socio -economic survey of few villages in the vicinity of the institute. **2.3** Selection of the village for adoption - conduct of activities **2.4** Comprehensive Socio Economic Survey of the Village/Area **2.5** Identification of Problem(s) **2.6** Dissemination of information about the latest developments in agriculture, watershed management, wastelands development, non-conventional energy, low cost housing, sanitation, nutrition and personal hygiene, schemes for skill development, income generation, government schemes, legal aid, consumer protection and allied fields. **2.7** A liaison between government and other development agencies for the implementation of various development schemes in the selected village / slum.
III	**MODULE-III : Financial Literacy** **3.1** Introduction - Life Goals and financial goals **3.2** Savings and Investments - Three pillars of investments, Popular asset classes, Government schemes, Mutual Funds, Securities markets (Shares and bonds), Gold, Real Estate, Do's and Don'ts of investments **3.3** Retirement planning **3.4** Cashless transactions **3.5** Income, expenditure and budgeting – Concepts and Importance **3.6** Inflation- Concept, effect on financial planning of an individual **3.7** Loans – Types, Management of loans, Tax benefits **3.8** Insurance – Types, Advantages, selection **3.9** Dos and Donts in Financial planning and Transactions

8. **List of activities for Self Learning:**

   Following list is an illustrative list of the type of activities that can be undertaken. Under this course it would be open to undertake one of these or many other activities which may seem suitable to local needs.

1) Plantation of trees, their preservation and upkeep

2) Construction & maintenance of village streets, drains.

(3) Cleaning of village ponds and wells.

(4) Popularization and construction of Gobar Gas Plants, use of non-   conventional Energy.

(5) Disposal of garbage & composting.

(6) Prevention of soil erosion and work for soil conservation.

(7) Watershed management and wasteland development.

(8) Preservation and upkeep of monuments, and creation of consciousness about the preservation of cultural heritage among the community.

(9) Health education, AIDS Awareness and preliminary health care.

(10) Working with cancer patients / orphans/ old age home/ welfare organizations of women with NGO.

(11) Empowering women by creating awareness among them and imparting training in sewing, embroidery, knitting and other skills wherever possible to make them financially independent.

(12) Organizing Blood donation/Eye check Up/Body donation camp.

(13) Popularization of small savings and assistance in procuring bank loans of government schemes, mutual funds and share market, financial planning.

(14) Organization of youth clubs, rural land indigenous sports in collaboration with Nehru Yuva Kendras;

(15) Assisting the authorities in distribution of rations, medicine, clothes, immunization, supply of medicine, relief and rescue operation; collection of clothes and other materials, and sending the same to the affected areas

9. IMPLEMENTATION STRATEGY (PLANNING)

1. Industry visit
2. Guest/Expert lectures
3. Demonstrations
4. Slides
5. Self-Learning Online Resources
6. Case Study
7. Role Play
8. Collaborative learning

10. SUGGESTED LEARNING RESOURCES

Sr.No.	Title of Book	Author	Publication
1	Compendium of Training Materials for the Capacity Building on 'IMPROVING THE PERFORMANCE OF RURAL WATER SUPPLY AND SANITATION SECTOR IN MAHARASHTRA' Districts Economic survey reports	IRAP, Hyderabad, CTARA, IIT Bombay and UNICEF, Mumbai	UNICEF
2	Manual on Water Supply and Treatment	Central Public Health and Environmental Engineering Organization	Ministry of Urban Development, New Delhi
3	Indian Standards (IS) Codes and Indian Roads Congress (IRC) Codes	Specifications And Standards Committee	Bureau of Indian Standards and The Indian Road Congress
4	Sample Case Studies on UMA website	Local college students, UMA staffs	IITB-UMA team

11 LEARNING WEBSITE & PORTALS

1. https://gr.maharashtra.gov.in/Site/Upload/Government
2. https://gr.maharashtra.gov.in/Site/
3. https://censusindia.gov.in/census.website/
4. https://gsda.maharashtra.gov.in/english/
5. https://mrsac.gov.in/MRSAC/map/map
6. https://ejalshakti.gov.in/jjmreport/JJMIndia.aspx
7. https://cpcb.nic.in/
8. http://www.mahapwd.com/#
9. http://tutorial.communitygis.net/
10. https://nss.gov.in/

12. ASSESMENT METHODOLOGIES/TOOLS

Formative Assessment (Assessment for Learning)

1. Self-Learning
2. Seminar/Presentation
3. Report and presentation of fieldwork activities
4. Assignment

13. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.		NAME	sign
1	Internal	Mr. Balaji M. Pande, Senior Lecturer in English	
2	Internal	Mrs. Keerti P. Bhave Lecturer (Selection Grade)	
3	Internal	Mr. Prasad S. Dhuri , Lecturer EXTC	

COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

Programme: CSE/IT	**Semester: III**
Course: Programming in Java	**Course Category: AEC**
Course Code: PRJ238913	**Duration:16 Weeks**

2. LEARNING AND ASSESSMENT SCHEME

Learning Scheme						Assessment Scheme							
Actual Contact Hrs./Week			Self-Learning (SL^) (Term Work + Assignment) (Hrs)	Credits	Paper Duration (Hrs.)	Theory (Marks)			Based on LL & TL			Based on Self Learning	Total Marks
									Practical (Marks)				
CL	TL	LL				FA-TH	SA-TH	Total	FA-PR	SA-PR	SA-OR	SLA (Marks)	
02	-	04	02	04	03	30	70	100	25	25	-	25	175

Total IKS Hrs for the course :00

3. COURSE OBJECTIVE

Java is one of the most powerful object-oriented programming languages. It supports development of secured, portable, concurrent, and distributed applications. From laptops to data centres, game consoles to scientific supercomputers, cell phones to the Internet, Java is everywhere! This course is designed to provide basics of Java Language.

4. SKILL COMPETENCY/INDUSTRY/EMPLOYER EXPECTED OUTCOME
- **Write Java programs using Inheritance, Exception Handling and Multithreading.**
- **Develop desktop GUI applications.**

5. COURSE OUTCOMES (COs): At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME
CO1	Write code for basic problems in Java
CO2	Use class & object to solve object-oriented problems
CO3	Implement programs based on Inheritance and packages
CO4	Demonstrate exception handling mechanism
CO5	Write multithreaded Java programs
CO6	Design GUI applications using AWT and SWING controls

6. CO-PO, CO- PSO MAPPING TABLE - Computer Engineering

Course and Code	Course Outcomes	Programme Outcomes							Programme Specific Outcomes	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Programming in Java (PRJ238913)	CO1	3	2	2	2	-	3	2	3	-
	CO2	3	2	2	2	-	3	3	3	-
	CO3	3	3	3	2	-	3	3	3	-
	CO4	3	1	2	2	-	3	2	3	-
	CO5	3	2	2	2	-	3	2	3	-
	CO6	3	1	1	1	--	3	2	3	-
	CO Avg.	**3**	**1.83**	**2**	**1.83**	**--**	**3**	**2.33**	**3**	**-**

CO-PO, CO- PSO MAPPING TABLE - Information Technology

Course and Code	Course Outcomes	Programme Outcomes							Programme Specific Outcomes	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Programming in Java (PRJ238913)	CO1	3	2	2	2	-	3	2	3	-
	CO2	3	2	2	2	-	3	3	3	-
	CO3	3	3	3	2	-	3	3	3	-
	CO4	3	1	2	2	-	3	2	3	-
	CO5	3	2	2	2	-	3	2	3	-
	CO6	3	1	1	1	--	3	2	3	-
	CO Avg.	**3**	**1.83**	**2**	**1.83**	**--**	**3**	**2.33**	**3**	**-**

7. COURSE CONTENTS

UNIT NO.	TOPIC/Sub-topic
I	**Introduction to object-oriented programming** 1.1 Creation of java, java byte code, java characteristics 1.2 Abstraction, OOP Principles. -Encapsulation, Inheritance and Polymorphism 1.3 Constant, Variables and Data Types, Type casting 1.4 Operator and Expression, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operator, Increment and Decrement Operator, Bit wise Operator, Special Operator 1.5 Decision making with simple if, if… else, else if ladder statements, The switch statement, The conditional operator 1.6 Decision Making with Loops i.e. while, do and for statement, Jumps in Loops, Labelled Loops
II	**Classes, Objects and Methods** 2.1 Class Fundamentals, The General Form of a Class, A Simple Class 2.2 Declaring Objects, A Closer Look at new, Assigning Object Reference Variables 2.3 Introducing Methods, adding a Method to the Class, returning a Value, adding a Method that takes parameters 2.4 Constructors, Parameterized Constructors 2.5 'this' Keyword 2.6 static data, method, and blocks 2.7 String class and its methods
III	**Inheritance, Interfaces and Packages** 3.1 Inheritance Basics, 3.2 Member Access and Inheritance, 3.3 A Superclass Variable Can Reference a Subclass Object 3.4 Use of super keyword 3.5 Creating a Multilevel Hierarchy, 3.6 Method Overriding, Dynamic Method Dispatch, Abstract classes 3.7 Defining an Interface, Implementing Interfaces, applying interfaces, Variables in Interfaces, 3.8 Implementing Multiple Inheritance (Multiple Inheritance), Interfaces Can Be Extended 3.9 Packages, defining a Package, Finding Packages and CLASSPATH, 3.10 Access Protection, Importing Packages
IV	**Exception Handling** 4.1 Exception-Handling Fundamentals, Exception class hierarchy 4.2 Uncaught Exceptions, try and catch, Multiple catch Clauses, nested try Statements, throw, throws, finally clauses 4.3 Java's Built-in Exceptions - Checked and Unchecked Exceptions 4.4 Creating Your Own Exception Subclasses using Exceptions

V	**Multithreading** 5.1 The Java Thread Model,The Thread Life Cycle, Thread class methods 5.2 The Thread Class and the Runnable Interface 5.3 The Main Thread, creating a Thread, Extending Thread, Implementing Runnable 5.4 Creating Multiple Threads, Using isAlive( ) and join( ) 5.5 Thread Priorities, Synchronization, Using Synchronized Methods, The synchronized Statement 5.6 Interthread Communication	
VI	**AWT and SWING Controls** 6.1 Abstract Window toolkit, AWT classes 6.2 Event handling, Delegation event model, Event model, Event classes, source of events, event listener interface, 6.3 windows fundamentals, creating a frame window, working with frame window, working with graphics 6.4 Introduction to AWT controls, inserting user interfaces like buttons, checkbox, list, scrollbar, text field and text areas, layout managers. 6.5 Introduction to SWING GUI Controls	

8. LIST OF PRACTICALS/ASSIGNMENTS/ TUTORIALS/DRAWINGS
Term Work consists of Journal containing minimum no of –12 Experiments/assignments/drawings.

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx. Hrs required	CO
1	To Install and Set up Jdk18 on Windows OS to write, compile, and execute a sample Program.	2	CO1
2	To test various data types and typecasting concept available in Java	2	CO1
3	To define a class having overloaded constructors and instantiating objects of the same class. (2 problems)	2	CO2
4	To implement the concept of array of objects in Java (2 problems)	4	CO2
5	To take user inputs through command line arguments. (2 problems)	2	CO2
6	To implement single and multi-level inheritance	6	CO3
7	To implement Dynamic Method Dispatch in Java.	2	CO3
8	To implement multiple Inheritance.	4	CO3
9	To create packages with access controls and importing them in appropriate classes.	4	CO3
10	To handle exceptions generated in Java	4	CO4
11	To create a user defined exception class.	4	CO4
12	To create user defined threads to achieve multitasking.	6	CO5
13	To achieve synchronization among multiple threads.	2	CO5
14	To develop GUI application using AWT controls and handling events.	8	CO6
15	To develop GUI application using SWING controls and handling events.	8	CO6
	TOTAL	**60**	

9. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITES FOR SPECIFIC LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

Assessment to be based on one of the following tools and rubrics for evaluation of SLA to be well defined by course teacher.

1.   **Micro project**
   a.   Bank Management System – Develop savings and fixed deposit modules
   b.   Quiz management system – Generate technical quiz for testing knowledge
   c.   Airline Reservation System – Books tickets for domestic/international flights
   d.   Healthcare System – Implement doctor, patient, and hospital modules
   e.   College Management System – Develop student admission, course management modules

   (Use OOPs principles to develop aforementioned Java applications)

2.   **Assignment**
   Practice problems on array of objects, inheritance, exception handling, multithreading, and desktop GUI

10. IMPLEMENTATION STRATEGY (PLANNING)
   1.   Teaching Plan
   2.   Minimum no of practical/assignments
   3.   Guest/Expert lectures
   4.   Slides
   5.   Self-Learning Online Resources

11. SUGGESTED LEARNING RESOURCES (minimum 3 to 5)

Sr.No.	Title of Book	Author	Publication
1	Java The Complete Reference	Herbert Schildt	Tata McGraw Hill
2	Core Java™ Volume I Fundamentals	Cay S. Horstmann ,Gary Cornel	Prantice Hall
3	Java How To Program	Paul Deitel, Harvey Deitel	Pearson
4	Effective Java	Joshua Bloch	Addison Wesley

12. LEARNING WEBSITE & PORTALS
   1. https://beginnersbook.com/java-tutorial-for-beginners-with-examples/
   2. https://www.javatpoint.com/java-tutorial
   3. https://www.guru99.com/java-tutorial.html
   4. http://tutorials.jenkov.com/java/index.html
   5. https://www.digitalocean.com/community/tutorials/core-java-tutorial

13. ASSESMENT METHODOLOGIES/TOOLS

Formative Assessment (Assessment for Learning)
   1.   Test
   2.   Rubrics for COs Assignment
   3.   Self-Learning

4. Term Work
5. Seminar/Presentation

Summative Assessment (Assessment of Learning)
1. End Term Exam
2. Micro-project

14. SUGGESTED WEIGHTAGE FOR LEARNING EFFORTS & ASSESMENT PURPOSE (Specification Table)

Unit No.	Unit Title	Aligned COs	Learning Hours	Distribution of Theory Marks			
				R Level	U Level	A Level	Total Marks
I	Introduction to object-oriented programming	CO1	04	02	04	-	06
II	Classes, Objects and Methods	CO2	05	03	03	06	12
III	Inheritance, Interfaces and Packages	CO3	08	04	08	08	20
IV	Exception Handling	CO4	04	02	04	04	10
V	Multithreading	CO5	04	02	04	04	10
VI	AWT and SWING Controls	CO6	05	02	04	06	12
GRAND TOTAL			30	15	27	28	70

R Remember, **U** Understand, **A** Apply and above, (Bloom's revised taxonomy levels)
NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

15. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.		NAME
1	Internal	Mr. Manish R Solanki
2	Internal	Mrs. Geetha S
3	External	Siddhesh Vaidya
		System Analyst, National Stock Exchange, Mumbai

COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

Programme: CSE/IT	**Semester: III**
Course: Data Structure	**Course Category: DSC**
Course Code: DST238914	**Duration:16 Weeks**

2. LEARNING AND ASSESSMENT SCHEME

Learning Scheme					Assessment Scheme								
Actual Contact Hrs./Week			Self-Learning (SL^) (Term Work + Assignment) (Hrs)	Credits	Paper Duration (Hrs.)	Theory (Marks)			Based on LL & TL			Based on Self Learning	Total Marks
									Practical (Marks)				
CL	TL	LL				FA-TH	SA-TH	Total	FA-PR	SA-PR	SA-OR	SLA (Marks)	
04	-	02	-	03	-	30	70	100	25	25	-	-	150

Total IKS Hrs for the course :00

3. COURSE OBJECTIVE

This subject intends to teach the students the core requisites of Computer programming which is storing and analysing data in various structures like stacks, queues, linked lists, trees, graphs etc.

4. SKILL COMPETENCY/INDUSTRY/EMPLOYER EXPECTED OUTCOME

- **Write and implement algorithms to store and manipulate data in various data structure**
- **To implement and compare various searching –sorting algorithms and analyse the complexities**

5. COURSE OUTCOMES (COs): At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME
CO1	Perform operations on an array and analyze an algorithm for its time and space complexity.
CO2	Implement searching and sorting techniques
CO3	Implement the static linear data structure
CO4	Apply the dynamic linear data structure
CO5	Describe non-linear data structure

6. CO-PO, CO- PSO MAPPING TABLE: Computer Engineering

Course and Code	Course Outcomes	Programme Outcomes							Programme Specific Outcomes	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Data Structure (DST238914)	CO1	3	2	2	1	-	-	2	3	-
	CO2	3	2	2	2	-	-	2	3	-
	CO3	2	1	2	1	-	-	2	3	-
	CO4	2	1	2	1	-	-	2	3	-
	CO5	1	-	1	1	-	-	2	3	-
	CO Avg.	**2.2**	**1.5**	**1.8**	**1.2**	**-**	**-**	**2**	**3**	**-**

CO-PO, CO- PSO MAPPING TABLE: Information Technology

Course and Code	Course Outcomes	Programme Outcomes							Programme Specific Outcomes	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Data Structure (DST228914)	CO1	3	2	2	1	-	-	2	3	-
	CO2	3	2	2	2	-	-	2	3	-
	CO3	2	1	2	1	-	-	2	3	-
	CO4	2	1	2	1	-	-	2	3	-
	CO5	1	-	1	1	-	-	2	3	-
	CO Avg.	**2.2**	**1.5**	**1.8**	**1.2**	**-**	**-**	**2**	**3**	**-**

7. COURSE CONTENTS

UNIT NO.	Topics/Sub-Topics
I	**Introduction to data structure** 1.1 Linear & Non linear 1.2 Algorithm Basic Concepts 1.3 Introduction to Time and Space complexity of algorithms, Big O Notation and theta notations 1.4 Definition, implementation and notation of Array- Numerical and character 1.5 Basic operation such as addition, deletion , String operations

II	**Sorting and Searching**
	2.1 Sorting Techniques
	     2.1.1 Selection sort
	     2.1.2 Bubble sort
	     2.1.3 Insertion sort
	     2.1.4 Quick sort
	     2.1.5 Heap Sort
	2.2 Searching
	     2.2.1 Linear search
	     2.2.2 Binary searching

III	**Static Linear Data Structure: Stacks and Queues**
	3.1 Introduction to Stacks
	3.2 Stacks as an Abstract Data Type
	3.3 Primitive operations of stacks
	3.4 Representation of Stacks through Arrays
	3.5 Application of Stack
	3.6 Stack and Recursion
	3.7 Introduction to Queues
	3.8 Queue as an abstract data type
	3.9 Representation of a Queue as an array
	3.10 Types of Queue
	     3.10.1 Circular Queue
	     3.10.2 Double Ended Queue
	     3.10.3 Priority Queue
	3.11 Applications of Queue

IV	**Dynamic Linear Data Structure: Linked List**
	4.1 Terminologies
	     4.1.1 Node
	     4.1.2 Address, Pointer
	     4.1.3 Information
	     4.1.4 Next, NULL Pointer
	     4.1.5 Empty list
	4.2 Representation of Linked list in memory
	4.3 Operations on a singly linked list (only algorithm)
	     4.3.1 Traversing a singly linked list
	     4.3.2 Searching a linked list

	4.3.3 Inserting a new node in a linked list 4.3.4 Deleting a node from a linked list 4.3.5 Header Linked list 4.4 Doubly linked list – Introduction, memory representation

V	**Non-Linear Data Structure**
	5.1 Trees Terminologies: Tree, Degree of a node, Degree of a tree, level of a node, leaf node, Depth / Height of a tree, In-degree & Out-Degree, Directed edge, Path Ancestor & descendant nodes
	5.2 Storage representation of binary tree
	5.3 Type of Trees
	    5.3.1 General tree
	    5.3.2 Binary tree
	    5.3.3 Binary search tree (BST): Searching, Inserting, Deleting
	5.4 Binary Tree Traversal Methods
	    5.4.1 In order traversal
	    5.4.2 Preorder traversal
	    5.4.3 Post order traversal
	5.5 Height Balanced, Weight Balanced Trees
	5.6 Graphs Terminologies: graph, node (Vertices), arcs (edge), directed graph, in-degree, out-degree, adjacent, successor, predecessor, relation, weight, path, length
	5.7 Representations of a graph
	    5.7.1 Sequential Representation (Adjacency Matrix, Path Matrix)
	    5.7.2 Linked Representation
	5.8 Graph Traversal: BFS, DFS

8. LIST OF PRACTICALS/ASSIGNMENTS/ TUTORIALS/DRAWINGS

Term Work consists of Journal containing minimum no of 10 Experiments

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx. Hrs required	CO
1	A program for inserting and deleting an element in an array.	2	CO1
2	A program for Linear Search	2	CO2
3	A program for Binary Search	2	CO2
4	A program for selection sort.	2	CO2
5	A program for quick sort.	2	CO2
6	A program for Insertion Sort	4	CO2
7	A program for pushing and popping an element into a STACK	2	CO3
8	A program for inserting and deleting an element in a circular queue.	2	CO3
9	A program for converting an infix expression to postfix using STACK	2	CO3
10	A program for creating and traversing a linked list.	4	CO4
11	A program for various operations on a linked list	2	CO4
12	A program to perform traversing of a binary tree.	4	CO5
	TOTAL	**30**	

9. IMPLEMENTATION STRATEGY (PLANNING)
1. Teaching Plan/Tutorials
2. Minimum 10 no. of practical/assignments etc.
3. Slides
4. Self-Learning Online Resources

10. SUGGESTED LEARNING RESOURCES

Sr. No.	Title Of Book	Author	Publication
1	Data Structures with C	Lipschutz	Schaum's series
2	Algorithms in C	Robert Sedgewick	Addison-Wesley
3	Data structures using C	Reema Thareja	Oxford Publication

11 LEARNING WEBSITE & PORTALS
1. www.csbdu.in/econtent/datastructures
2. www.nptel.iitm.ac.in/courses.php
3. www.gatesit.org/gitdownloads/c&ds.pdf
4. www.opendatastructure.org/ods-cpp.pdf

12. ASSESMENT METHODOLOGIES/TOOLS
Formative Assessment (Assessment for Learning)
1. Rubrics for Cos Assignment
2. Term work

Summative Assessment (Assessment of Learning)
1. End Term Exam

13. SUGGESTED WEIGHTAGE FOR LEARNING EFFORTS & ASSESMENT PURPOSE (Specification Table)

Unit No.	Unit Title	Aligned COs	Teaching Hours	Distribution of Theory Marks			
				R Level	U Level	A Level	Total Marks
I	Introduction to data structure and classification	CO1	08	4	6	-	10
II	Sorting and Searching	CO2	10	-	6	8	14
III	Static Linear Data Structure	CO3	16	4	6	8	18
IV	Dynamic Linear Data Structure	CO4	10	4	4	8	16
V	Non Linear Data Structure	CO5	16	4	4	4	12
	GRAND TOTAL		60	16	26	28	70

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)
NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

14. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.		NAME
1	Internal	Mrs. Radhika Patwardhan
2	Internal	Ms. Neha More
3	External	Mr. Prasad Wadkar
		Organization: Sr. Consultant, Infosys, Mumbai

COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

Programme: Computer Engineering	**Semester: III**
Course: Event Driven & UI Programming	**Group: DSC**
Course Code: EUP230804	**Duration:16 Weeks**

2. LEARNING AND ASSESSMENT SCHEME

Learning Scheme					Assessment Scheme								
Actual Contact Hrs./Week			Self-Learning (SL^) (Term Work + Assignment) (Hrs)	Credits	Paper Duration (Hrs.)	Theory (Marks)			Based on LL & TL			Based on Self Learning	Total Marks
									Practical (Marks)				
CL	TL	LL				FA-TH	SA-TH	Total	FA-PR	SA-PR	SA-OR	SLA (Marks)	
2	-	4	2	4	-	-	-	-	50	50	-	25	125

Total IKS Hrs for the course :00

3. COURSE OBJECTIVE

Event driven programming based on object oriented concepts can be used to develop GUI applications. These applications include various user friendly controls to accept and display data in a customized manner. This course will help the students attain in depth understanding of event driven programming and GUI applications development.

4. SKILL COMPETENCY/INDUSTRY/EMPLOYER EXPECTED OUTCOME
- **Design programs using visual development tools**
- **Develop user friendly graphical interfaces.**

5. COURSE OUTCOMES (COs): At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME
CO1	Demonstrate familiarity with Integrated development environment.
CO2	Design a user-friendly visual interface using windows forms
CO3	Develop GUI application using classic controls of windows form
CO4	Develop GUI application using custom controls of windows form
CO5	Apply database controls to establish database connectivity
CO6	Use data binding techniques for GUI application

6. CO-PO, CO- PSO MAPPING TABLE

Course and Code	Course Outcomes	Programme Outcomes							Programme Specific Outcomes	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Event Driven & UI Programming (EUP230804)	CO1	3	2	2	2	-	-	2	2	-
	CO2	2	2	3	3	-	-	3	2	-
	CO3	1	2	3	3	-	-	3	3	-
	CO4	1	2	3	3	-	-	3	3	-
	CO5	1	3	3	3	-	-	2	2	2
	CO6	1	2	3	3	-	-	2	2	2
	CO Avg.	**1.5**	**2.16**	**2.83**	**2.83**	**-**	**-**	**2.5**	**2.3**	**2**

7. COURSE CONTENTS

UNIT NO.	TOPIC/Sub-topic	CO	Teaching hours
I	**Overview of GUI Programming** 1.1 Introduction to .Net Framework 1.2 Overview of .Net Framework 1.3 Common Language Runtime Program element in C# IDE (CLR). 1.4 Microsoft Intermediate Namespaces in C#.net application, MSIL. 1.5 Introduction to Event handlers and Events. 1.6 Just-In-Time Compiler. 1.7 Exploring C#.Net IDE 1.8 System Namespaces in C#.Net ,Events and Event handling	CO1	04
II	**Introduction to Windows Forms** 2.1 Windows Forms Class Hierarchy 2.2 Form Class, Form Class Methods, Building a Form, Application Class 2.3 Common Control Properties, Common control events 2.4 Resizable forms, splitting windows, shaped form contents, visual inheritance 2.5 Inheritance and form class, use enumerations and resource classes	CO2	05

III	**Classic Controls of Windows Forms** 3.1 Types of controls, Invisible, provider, ActiveX control, Labels, Link, Label, Button, Textbox, Rich Textbox, Checkbox, Radio button, Picture Box, List Controls, other Domain Controls 3.2 Date Controls, DateTimePicker, MonthCalender 3.3 Container Controls, Tab Control	CO3	06
IV	**Custom Controls of Windows Forms** 4.1Understanding user control, Progress user control, creating, testing the progress user control, user control design, automatic progress bar 4.2 The Bitmap Thumbnail viewer, Creating and testing bitmap thumbnail viewer 4.3 Understanding derived controls, Project tree control 4.4ToolStrip Basics, Status Strip and Menu Strip 4.5 Image List, List View, Tree View	CO4	06
V	**ADO.NET: Developing Database Applications** 5.1 A Brief History of Universal Data Access Providers 5.2. Architecture of ADO.Net. 5.3 Connecting to a SQL Server Database 5.4 Connecting to an OLE DB Data Source 5.5 Reading Data into a Dataset 5.6 Relations Between Data Tables in a Dataset 5.7 Binding a dataset to a Windows Forms Data Grid 5.8 Reading Data Using a Data Reader 5.9 Executing Stored Procedures Through a SQL Command Object	CO5	05
VI	**Data Binding and Data Grids** 6.1. Use Simple Data binding for setting Properties of the given form control at run time using text box, Check box, Label, Lists 6.2. Complex Data Binding using Combo box and List box. 6.3. Data Grids, Formatting Data Grids, Data exchange and data grids 6.4. Custom data sources, type descriptors, type conversion, list data sources	CO6	04
	TOTAL		**30**

8. LIST OF PRACTICALS/ASSIGNMENTS/ TUTORIALS/DRAWINGS

Term Work consists of Journal containing minimum no of –10 Experiments/assignments

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx. Hrs required	CO
1	Installation of Visual Studio IDE	2	CO1
2	Creating custom dialog box and Designing an MDI application with menu	6	CO2
3	Design and data validation of Login form	4	CO2
4	Implement programs based on OOPS concept using form controls	4	CO2
5	Design of windows forms using classic controls	6	CO3
6	Design of windows forms using custom controls	6	CO4
7	Design of windows forms using user controls	6	CO4
8	Design of windows forms using advanced controls	6	CO4
9	Implement a Program to establish a connection between dataset and forms using ADO.NET	6	CO5
10	Implement a Program to retrieve data from database using ADO.NET	6	CO5
11	Implement Data binding techniques using form controls	4	CO6
12	Implement properties of Data Grid Control	4	CO6
	TOTAL	**60**	

9. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITES FOR SPECIFIC LEARNING / SKILL DEVELOPMENT (SELF LEARNING):

Assessment to be based on one of the following tools and rubrics for evaluation of SLA to be well defined by course teacher.

1. **Micro project**

   Design a windows based application using classic and custom controls. Design a database using MySQL server. Establish a connection between windows form and database using ADO.Net.

2. **Assignment**

   Practice problems on GUI Programming, classic &custom controls, Database connectivity.

10. IMPLEMENTATION STRATEGY (PLANNING)

1. Teaching Plan
2. Minimum no of practical/assignments.
3. Guest/Expert lectures
4. Demonstrations
5. Slides
6. Self-Learning Online Resources

11. SUGGESTED LEARNING RESOURCES

Sr.No.	Title of Book	Author	Publication
1	Windows Forms Programming with C#	Erik E.Brown	Manning Publication
2	Windows Forms Programming in C#	Chris Sells	Addison Wesley Professional
3	Application development using C# & .Net	Robert J Oberg, Michael Stiefel	Prentice Hall Professional
4	A Programmer's Introduction to C#	Eric Gunnerson	Apress Publications

12. LEARNING WEBSITE & PORTALS

1. http://www.onlinewebtutorials.com
2. https://docs.microsoft.com/en-us/dotnet
3. https://visualstudio.microsoft.com/vs/features/net-development
4. https://learn.microsoft.com/en-us/visualstudio/ide
5. https://www.c-sharpcorner.com

13.ASSESMENT METHODOLOGIES/TOOLS

Formative Assessment (Assessment for Learning)

1. Rubrics for COs Assignment
2. Self-Learning
3. Term Work
4. Seminar/Presentation

Summative Assessment (Assessment of Learning)

1. End Term Exam

14. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.		NAME
1	Internal	Mrs.Rupali Pawar
2	Internal	Mrs.Geetha.S
3	External	Mr. Yogesh Salunkhe
		Organization: Ingram Micro SSC Pvt.Ltd,Mumbai

COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

Programme: CSE/IT	Semester: III/III
Course: Database Management System	Course Category: DSC
Course Code: DBS238915	Duration:16 Weeks

2. LEARNING AND ASSESSMENT SCHEME

Learning Scheme						Assessment Scheme							
Actual Contact Hrs./Week			Self-Learning (SL^) (Term Work + Assignment) (Hrs)	Credits	Paper Duration (Hrs.)	Theory (Marks)			Based on LL & TL			Based on Self Learning	Total Marks
									Practical (Marks)				
CL	TL	LL				FA-TH	SA-TH	Total	FA-PR	SA-PR	SA-OR	SLA (Marks)	
04	-	02	-	03	03	30	70	100	25	25	-	-	150

Total IKS Hrs for the course :00

3. COURSE OBJECTIVE
This subject will enable the students to comprehend the Database concepts at both practical and theoretical levels. The aim of this subject is to understand the use of Structured Query Language (SQL) and learn SQL syntax. The students will understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access.

4. SKILL COMPETENCY

- **Perform data modelling using ER diagram**
- **Apply database management concept using SQL to manipulate the data in database and to query the database.**

5. COURSE OUTCOMES (COs): At the end of the semester student will be able to**: -**

CO No.	COURSE OUTCOME
CO1	Describe core concepts of database models
CO2	Create and manage data tables using SQL commands.
CO3	Understand the architecture of NoSQL and distinguish the different types of NoSQL database
CO4	Apply concepts of normalization to relational database design
CO5	Conceptualize query processing and transaction management
CO6	Explain the importance of concurrency and recovery in database management system

6. CO-PO, CO- PSO MAPPING TABLE – Information Technology

Course and Code	Course Outcomes	Programme Outcomes							Programme Specific Outcomes	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Database Management System (DBS238915)	CO1	3	-	1	-	-	-	1	3	-
	CO2	3	2	2	2	-	-	2	3	-
	CO3	2	2	1	-	-	-	-	3	-
	CO4	2	3	2	-	-	-	2	3	-
	CO5	2	2	-	-	-	-	1	3	-
	CO6	2	-	-	-	-	-	1	3	-
	CO Avg.	2.33	2.25	1.5	2	-	-	1.4	3	-

CO-PO, CO- PSO MAPPING TABLE – Computer Engineering

Course and Code	Course Outcomes	Programme Outcomes							Programme Specific Outcomes	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Database Management System (DBS238915)	CO1	3	-	1	-	-	-	1	3	-
	CO2	3	2	2	2	-	-	2	3	-
	CO3	2	2	1	-	-	-	-	3	-
	CO4	2	3	2	-	-	-	2	3	-
	CO5	2	2	-	-	-	-	1	3	-
	CO6	2	-	-	-	-	-	1	3	-
	CO Avg.	2.33	2.25	1.5	2	-	-	1.4	3	-

7. COURSE CONTENTS

UNIT NO.	TOPIC/Sub-topic

I	**Introduction to DBMS**
	1.1 Introduction to database management system:
	    1.1.1 Concept of data, database and DBMS
	    1.1.2 Advantages of DBMS over file processing,
	    1.1.3 Data abstraction, data independence
	1.2 Data Models:
	    1.2.1 Entity Relationship model,
	    1.2.2 Relational Model,
	    1.2.3 Network Model
	    1.2.4 Hierarchical Model
	1.3 Database Users and Administrators
	1.4. Database system structure

II	**Overview of SQL**
	2.1. SQL Data Definition
	    2.1.1 Basics structure of SQL queries (DDL, DML, DCL, TCL)
	    2.1.2 Additional Basic Operations
	    2.1.3 Modification of the database (Update, Delete, Alter Drop)
	2.2 Integrity constraints –
	    key constraints, Domain Constraints, Referential integrity, check constraints
	2.3 SQL Clauses – group by clause, Having clause, order by clause
	2.4 Set Operations and Aggregate functions
	2.5 Date, Time and String Functions
	2.6 Sub Queries and Views
	2.7 JOINS
	    2.7.1 INNER JOIN
	    2.7.2 OUTER JOIN: left, right and outer join
	2.8 Introduction to PL/SQL

III	**NoSQL Databases**
	3.1 Overview of NoSQL
	    3.1.1 Features of NoSQL
	    3.1.2 Advantages and disadvantages of NoSQL
	    3.1.3 Difference between RDBMS and NoSQL databases
	    3.1.4 Types of NoSQL
	3.2 MongoDB:
	    3.2.1 Key features,
	    3.2.2 MongoDB Query Language: Data type,
	      create database Collections and Documents, Updating and querying
	      database, Querying through Indexes,
	3.3 Cassandra: Overview,
	    3.3.1 CQL: Shell commands,
	    3.3.2 Cassandra Data types
	    3.3.3 CRUD operations

IV	**Relational Database Design**
	4.1. Relational database design:
	    4.1.1 Functional Dependencies
	    4.1.2 Armstrong's Axioms in DBMS
	    4.1.2 Features of good relational database design
	4.2 Decomposition: properties of decomposition
	4.3 Normalization
	    4.3.1 Types of anomalies in database
	    4.3.2 First Normal Form, Second Normal Form, Third Normal Form and 3.5 Normal Form

V	**Query Processor and Optimizer, Transactions**
	5.1. Overview of query processing.
	    5.1.1 Relational algebra operations: Select, project, Union, Set difference, Cartesian product, rename
	5.2 Query optimization: Cost of query
	5.3 Transaction:
	    5.3.1 Concept of transaction,
	    5.3.2 Transaction Model
	    5.3.3 ACID Properties of transaction
	5.4 Serializability
	    5.4.1 Conflict Serializability
	    5.4.2 View Serializability
	    5.4.3 Recoverability of schedules

VI	**Concurrency Control and Recovery system**
	6.1. Lock-based protocols
	    6.1.1 Shared lock and exclusive lock
	    6.1.2 Compatibility function
	    6.1.3 Starvation
	6.2 Deadlock Handling
	6.3 Two-Phase locking protocol: Growing and Shrinking Phase
	6.4 Timestamp-Based protocols
	6.5 Validation-Based protocols
	6.6 Recovery System
	    6.6.1 Failure classification
	    6.6.2 Storage structure
	    6.6.3 Log-Based recovery shadow paging and checkpoints

8. LIST OF PRACTICALS/ASSIGNMENTS/ TUTORIALS/DRAWINGS

Term Work consists of Journal containing minimum no of –10 Experiments/assignments/drawings.

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx. Hrs required	CO
1.	Design an ER model for statement of problem	2	CO1
2.	Creation of table with constraints and insertion of data	4	CO2
3.	Running simple SQL queries	4	CO2
4.	Execution of Alter, Update, Delete and drop	2	CO2
5.	Implementation of aggregate and character functions	2	CO2
6.	Implementation of various clauses (Where, Group by and Having) in SQL.	2	CO2
7.	Execution of string, comparison and set operations	2	CO2
8.	Implementation of various types of joins	2	CO2
9.	Implementation of views.	2	CO2
10.	Perform CRUD operations in MongoDB	2	CO3
11.	Assignment 1: Normalization of a sample database – Show decomposition from 1NF,2NF and 3NF	2	CO4
12.	Using case study of a banking system – apply the concept of transaction processing and recovery to the system	2	CO5
13.	Assignment 2: Concurrency control	2	CO6
	Total	**30**	

9. IMPLEMENTATION STRATEGY (PLANNING)

1. Teaching Plan
2. Minimum no of practical/assignments.
3. Guest/Expert lectures
4. Demonstrations
5. Slides
6. Self-Learning Online Resources

10. SUGGESTED LEARNING RESOURCES

Sr. No.	Title Of Book	Author	Publication
1.	Database System Concepts	Silberschatz, Korth	McGraw hill, Sixth Edition
2.	Introduction to Database Management	Mark L. Gillenson Paulraj Ponniah	Wiley, India
3.	Database Management Systems	Ramakrishnan, Gehrke	McGraw hill, Third Edition
4.	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence	Pramod J. Sadalage, Martin Fowler	Addison-Wesley Professional

11. LEARNING WEBSITE & PORTALS

1. www.w3schools.com/sql
2. www.tutorialpoint.com/dbms
3. www.khanacademy.org/computing/computer-programming/sql
4. www.techonthenet.com/sql
5. www.beginnersbook.com

12. ASSESMENT METHODOLOGIES/TOOLS

Formative Assessment (Assessment for Learning)

1. Test
2. Rubrics for COs Assignment
3. Term Work
4. Seminar/Presentation

Summative Assessment (Assessment of Learning)

1. End Term Exam

13. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Aligned COs	Learning Hours	Distribution of Theory Marks			
				R Level	U Level	A Level	Total Marks
I	Introduction to DBMS	CO1	08	2	4	6	12
II	Overview of SQL	CO2	12	2	4	6	12
III	NoSQL Databases	CO3	10	4	4	4	12
IV	Relational Database Design	CO4	10	2	4	4	10
V	Query Processor and Optimizer, Transactions	CO5	10	4	8	-	12
VI	Concurrency Control and Recovery system	CO6	10	6	6	-	12
	GRAND TOTAL		60	20	30	20	70

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

14. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.		NAME
1	Internal	Mr. Pankaj Rathod
2	Internal	Mr. Siddhesh Masurkar
3	External	Dr. Chetashri Bhadane
		Organization: Assistant Professor, D. J. Sanghvi College of engineering

COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

Program: Computer Engineering	**Semester: III**
Course: Fundamentals of Microprocessor	**Course Category: AEC**
Course Code: FMP230805	**Duration:16 Weeks**

2. LEARNING AND ASSESSMENT SCHEME

Learning Scheme						Assessment Scheme							
Actual Contact Hrs./Week			Self-Learning (SL^) (Term Work + Assignment) (Hrs)	Credits	Paper Duration (Hrs.)	Theory (Marks)			Based on LL & TL			Based on Self Learning	Total Marks
									Practical (Marks)				
CL	TL	LL				FA-TH	SA-TH	Total	FA-PR	SA-PR	SA-OR	SLA (Marks)	
4	-	2	-	6	3	30	70	100	25	25	-	-	150

Total IKS Hrs for the course :00

3. COURSE OBJECTIVE

A microprocessor is an integrated circuit incorporating the core functions of a computer's central processing unit. This course provides exposure to the architecture and instruction set of the 8086 microprocessor. It introduces the programming and interfacing techniques of 8086 with other peripherals.

4. SKILL COMPETENCY

- **Assembly language programmer**

5. COURSE OUTCOMES (COs): At the end of the semester student will be able to: -

CO No.	COURSE OUTCOMES
CO1	Conceptualize the working of 8086 microprocessor.
CO2	Develop Assembly language programming skills.
CO3	Illustrate bus logic and interrupt structure of 8086.
CO4	Interpret AVR microcontroller architecture.
CO5	Write Assembly Language program / C program for AVR microcontroller.
CO6	Summarize the architecture and pipelining mechanism of Pentium processor.

6. CO-PO, CO- PSO MAPPING TABLE

Course and Code	Course Outcomes	Programme Outcomes							Programme Specific Outcomes	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Fundamentals of Microprocessor (FMP230805)	CO1	3	1	-	-	-	-	1	3	-
	CO2	3	3	3	2	1	1	3	3	1
	CO3	3	1	1	1	-	-	1	3	-
	CO4	3	2	-	1	1	1	2	3	-
	CO5	3	3	2	2	1	1	2	3	-
	CO6	3	1	-	-	1	1	1	3	1
	CO Avg.	**3**	**1.83**	**2**	**1.5**	**1**	**1**	**1.6**	**3**	**1**

7. COURSE CONTENTS

UNIT NO.	TOPIC/Sub-topic
I	**The 8086 microprocessor** 1.1 Introduction to Microprocessors 1.2 Features of 8086 1.3 Architecture of 8086 – BIU and EU 1.4 Pin diagram of 8086 1.5 Instruction Queue 1.6 Memory segmentation of 8086 1.7 Memory bank & memory accessing
II	**Instruction set of 8086** 2.1 Addressing modes of 8086 2.2 Instruction types – Data transfer group 2.3 Arithmetic group 2.4 Bit manipulation, program transfer instructions 2.5 String instructions 2.6 IO programming Instructions, Stack instruction 2.7 Process control instructions.

III	**8086 system bus & Interrupt Structure** 3.1 Signals for modes of 8086 3.2 Modes of 8086 – minimum and maximum 3.3 Timing diagram: T- state, Machine cycle, Instruction cycle 3.4 Multiprocessor system - Bus arbitration 3.5 Types of interrupts- H/W v/s S/W, maskable v/s non maskable , vectored v/s non vectored, internal v/s external 3.6 ISR (Interrupt Service Routine) & IVT (Interrupt Vector Table) 3.7 8086 interrupt structure, interrupt control instruction	
IV	**AVR Microcontroller Architecture** 4.1 Introduction to microcontroller, 4.2 Overview of AVR family, 4.3 AVR architectural overview 4.4 Introduction to ATmega 32 4.5 Memory organization	
V	**AVR Microcontroller Internal Hardware & Programming** 5.1 I/O port structure and programming 5.2 Interrupts 5.3 Timer/ Counter 5.4 Serial port	
VI	**Introduction to Intel Pentium Architecture** 6.1 Features of Pentium processor. 6.2 Pentium Superscalar architecture. 6.3 Pipelining. 6.4 Branch Prediction. 6.5 Instruction and Data cache.	

8. LIST OF PRACTICALS/ASSIGNMENTS/ TUTORIALS/DRAWINGS

  Term Work consists of Journal containing minimum no of –10 Experiments/assignments/drawings.

Sr. No.	Title of Experiments	Approx. Hrs. required	CO
1	To draw the architecture of 8086 and explain each block	02	CO1
2	To perform arithmetic operations on 8 bit and 16 bit data.	04	CO2
3.	To find 2's complement using logical instructions of 8086.	02	CO2
4	To calculate sum and average of an array.	04	CO2
5.	To search a number and its index from an array.	02	CO2
6	To sort an array in ascending/descending order.	02	CO2
7	To separate even and odd numbers from given array.	02	CO2
8	To perform string instruction of 8086.	04	CO2
9.	Draw the timing diagram of memory and IO read/write operation of 8086 minimum mode.	02	CO3

10.	Case study: Interrupts used in Windows X operating system	02	CO4
11.	To perform AVR I/O programming in C	04	CO4
12.	To perform AVR Timer programming in C	04	CO5
13.	To perform AVR Interrupt programming in C	04	CO5
14	To perform AVR serial port programing in C	04	CO5
15.	Compare Pentium processors with latest processors	02	CO6
	Total	**30**	

9. IMPLEMENTATION STRATEGY (PLANNING)
1. Teaching Plan
2. Minimum 10 no of practical/assignments.
3. Demonstrations
4. Slides
5. Self-Learning Online Resources

10. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1.	Microprocessor and Interfacing, Programming & Hardware	Douglas V Hall	Tata McGraw Hill
2.	8086 Microprocessor Programming and Interfacing the PC	Kenneth Ayala	West Publication
3.	Microcomputer Systems: 8086/8088 family Architecture, Programming and Design	Liu, Gibson	PHI Publication
4.	The 8088 and 8086 Microprocessors	Triebel, Walter A.,Singh, Avtar	Pearson Publications
5.	Pentium Processor System Architecture	Don Anderson, Tom Shanley	Addison-Wesley
6.	The INTEL Microprocessors, Architecture, Programming and Interfacing	Barry B. Brey	Pearson Publishers
7.	The 8051 Microcontroller And Embedded Systems	Muhammad Ali Mazidi	Pearson Publishers

11. WEB REFERENCES
1. www.intel.com
2. www.pcguide.com/ref/CPU
3. www.CPU-World.com/Arch/

12. ASSESMENT METHODOLOGIES/TOOLS
Formative Assessment (Assessment for Learning)
1. Test
2. Rubrics for Cos Assignment
3. Term work

Summative Assessment (Assessment of Learning)
1. End Term Exam

COMPUTER ENGINEERING DEPARTMENT

13. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Aligned COs	Learning Hours	Distribution of Theory Marks			
				R Level	U Level	A Level	Total Marks
I	The 8086 Microprocessors	CO1	10	6	6	-	12
II	Instruction set of 8086	CO2	12	-	6	6	12
III	8086 system bus & Interrupt Structure	CO3	10	6	6	-	12
IV	AVR Microcontroller Architecture	CO4	12	4	6	4	14
V	AVR Microcontroller Internal Hardware & Programming	CO5	10	2	4	6	12
VI	Introduction to Intel Pentium Architecture	CO6	6	4	4	-	8
GRAND TOTAL			60	22	32	16	70

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)
NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

14. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.		NAME
1	Internal	Ms. Sharyu Kadam
2	Internal	Mrs. Prachi Arora
3	External	Mr. Anil Gurav
		St. Xavier's College, Mumbai

COMPUTER ENGINEERING DEPARTMENT

1. COURSE DETAILS

Program : Computer Engineering	**Semester: III**
Course: Linux Lab	**Course Category: DSC**
Course Code: LXL230806	**Duration:16 Weeks**

2. LEARNING AND ASSESSMENT SCHEME

Learning Scheme					Assessment Scheme								
Actual Contact Hrs./Week			Self-Learning (SL^) (Term Work + Assignment) (Hrs)	Credits	Paper Duration (Hrs.)	Theory (Marks)			Based on LL & TL			Based on Self Learning	Total Marks
									Practical (Marks)				
CL	TL	LL				FA-TH	SA-TH	Total	FA-PR	SA-PR	SA-OR	SLA (Marks)	
-	-	2	2	2	-	-	-	-	25	-	25	25	75

Total IKS Hrs for the course :00

3. COURSE OBJECTIVE

Linux is the most widely used and best-known open-source operating system and can be found in embedded systems, smartphones, web servers, and supercomputers. Over the decades, Linux has become a key component in the infrastructure of nearly every major enterprise. Linux is also part of the backbone of the DevOps world, where it serves as both a development and distribution platform for many key tools.

4. SKILL COMPETENCY

- **Setting up and managing Linux Environment**

5. COURSE OUTCOMES (COs): At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME
CO1	Select and install Linux Distribution
CO2	Demonstrate the File system Hierarchy System and Linux commands
CO3	Configure TCP/IP in Linux
CO4	Write Linux shell scripts

6. CO-PO, CO- PSO MAPPING TABLE

Course and Code	Course Outcomes	Programe Outcomes							programme Specific Outcomes	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
Linux Lab (LXL230806)	CO1	2	-	-	3	-	-	3	3	-
	CO2	2	-	-	1	-	-	2	3	-
	CO3	2	-	-	2	-	-	2	2	-
	CO4	3	-	-	1	-	-	1	1	-
	CO Avg.	**2.25**	**-**	**-**	**2.25**	**-**	**-**	**2**	**2.25**	**-**

7. LIST OF PRACTICALS/ASSIGNMENTS/ TUTORIALS/DRAWINGS

Term Work consists of Journal containing minimum no of 12 experiments.

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx.Hrs required	CO
1	To Demonstrate the use of OS installer such Anaconda and Boot Loaders (Boot loaders , Boot options , File locations)	4	CO1
2	To Install Linux with partitioning and on Virtual Machine	4	CO1
3	To install, configure, and monitor kernel modules (lsmod , insmod,modprobe ,modinfo,dmesg,rmmod)	2	CO1
4	To demonstrate File Hierarchy System (FHS) in Linux	2	CO2
5	To create, modify, and redirect files and directories. Text editors, File readers ,Output redirection, Text processing and File and directory operations	2	CO2
6	To execute System and utility commands	4	CO2
7	To create and manage a root user	2	CO2
8	To configure TCP/IP in Linux	2	CO3
9	To Execute Networking Commands in Linux	2	CO3
10	Write a shell script to find factorial of a given number	2	CO4
11	Write a shell Script to Display a pattern using nested loop	2	CO4
12	Write a shell script to list all of the directory files in a directory	2	CO4
	Total	**30**	

8. SUGGESTED MICRO PROJECT/ASSIGNMENT/ACTIVITES FOR SPECIFIC LEARNING / SKILL DEVELOPMENT (SELF LEARNING):

Assessment to be based on one of the following tools and rubrics for evaluation of SLA to be well defined by course teacher.

1. Assignment - a) Practice problems on shell programming and Linux commands.

9. IMPLEMENTATION STRATEGY (PLANNING)

1. Minimum no of practical/assignments.
2. Hands on Practice on the laboratory

10. SUGGESTED LEARNING RESOURCES

Sr.No.	Title of Book	Author	Publication
1	Linux Administration Cookbook	Adam K. Dean	Packt Publishing
2	Linux Administration Best Practices	Scott Alan Miller	Packt Publishing
3	Linux System Administration	Tom Adelstein, Bill Lubanovic	O'Reilly Media

11. LEARNING WEBSITE & PORTALS

1. https://access.redhat.com/documentation
2 https://www.comptia.org
3. https://www.javatpoint.com/linux-commands
4. https://www.tutorialspoint.com/unix/shell_scripting.htm
5. https://linuxjourney.com/

12.ASSESMENT METHODOLOGIES/TOOLS

Formative Assessment (Assessment for Learning)

1. Rubrics for COs Assignment
2. Self-Learning
3. Term Work
4. Seminar/Presentation

Summative Assessment (Assessment of Learning)

1. End Term Exam

13. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.		NAME
1	Internal	Mr Janardan Kulkarni
2	Internal	Mr Pratik Shah
3	External	Ms Heena Sarvaiya Organization: Senior Information Technology Analyst CPP Investments,Mumbai