



**BANGLADESH TECHNICAL EDUCATION BOARD**

**Agargaon, Sher-E-Bangla Nagar**

**Dhaka-1207.**

**04-YEAR DIPLOMA IN ENGINEERING CURRICULUM  
COURSE STRUCTURE & SYLLABUS  
(PROBIDHAN-2022)**

**COMPUTER SCIENCE & TECHNOLOGY TECHNOLOGY**  
**TECHNOLOGY CODE: 85**

**6TH SEMESTER**  
**(Effective from 2022-2023 Academic Sessions)**

## DIPLOMA IN ENGINEERING CURRICULUM COURSE STRUCTURE

(PROBIDHAN-2022)

**TECHNOLOGY NAME: COMPUTER SCIENCE & TECHNOLOGY (85)**

(6th SEMESTER)

Sl. No.	Subject		Period Per Week		Credit	Marks Distribution						Grand Total
						Theory Assessment			Practical Assessment			
	Code	Name	Theory	Practical		Continuous	Final	Total	Continuous	Final	Total	
1	25851	Principles of Marketing	2		2	40	60	100	-	-	-	100
2	25852	Industrial Management	2	-	2	40	60	100	-	-	-	100
3	28561	Database Management System	2	3	3	40	60	100	25	25	50	150
4	28562	Computer Networking	2	3	3	40	60	100	25	25	50	150
5	28563	Sensor & IOT System	2	3	3	40	60	100	25	25	50	150
6	28564	Microcontroller Based System Design & Development	2	6	4	40	60	100	50	50	100	200
7	28565	Surveillance Security System	1	3	2	20	30	50	25	25	50	100
8	28566	Web Development Project	-	3	1	-	-	-	25	25	50	50
<b>Total</b>			<b>13</b>	<b>21</b>	<b>20</b>	<b>260</b>	<b>390</b>	<b>650</b>	<b>175</b>	<b>175</b>	<b>350</b>	<b>1000</b>

Subject Code	Subject Name	Period per Week		Credit
25851	Principles of Marketing	T	P	C
		2	0	2

<b>Rationale</b>	<p>This subject scrutinizes the business function of Marketing. Textile students need to learn identifying the proper target market and decide upon appropriate products, services, and programs to serve these markets. Moreover, students need to know how marketers deliver value in satisfying customer needs and wants. This subject will cover areas include fundamentals of marketing, branding, consumer behavior, marketing mixes, promotion, marketing channel, international marketing, online marketing and implementation of ethics will benefit the students to gain an elementary scenario of marketing knowledge.</p>
<b>Learning Outcome (Theoretical)</b>	<p>After undergoing the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe marketing and marketing function.</li> <li>2. Distinguish between sales and marketing</li> <li>3. Interpret significance of marketing in own filed.</li> <li>4. Explore opportunities of international marketing</li> <li>5. Analyze marketing theories and marketing mix elements for product promotion.</li> <li>6. Solve the complexity arises from market environment.</li> <li>7. State classification of products marketing</li> <li>8. State distribution channels</li> <li>9. Explain implementation procedure of market segmentation, targeting and positioning strategies in product marketing.</li> <li>10. Interpret pricing tactics to get competitive advantages.</li> <li>11. Analyze branding and branding elements</li> <li>12. Explain ethical marketing and its significance</li> </ol>

## Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	<b>INTRODUCTION TO MARKETING</b> 1.1 Define marketing 1.2 Explain functions of marketing 1.3 Differentiate between sales and marketing 1.4 Describe marketing prospects on the context of 4 <sup>th</sup> industrial revolution 1.5 Discuss marketing importance on apparel industry.	4	6
2	<b>MARKETING THEORIES AND STRATEGIES</b> 2.1. Explain core concept of marketing 2.2. Describe basic strategies and SWOT analysis of marketing 2.3. Define marketing mixes 2.4. Mention 7Ps of marketing 2.5. Compare between 4Cs and 4Ps of marketing	4	7
3	<b>MARKET ENVIRONMENT AND INTERNATIONAL MARKETING</b> 3.1 Describe market environment 3.2 Discuss micro environment and macro environment. 3.3 List the influential factors of market environment related with own industrial field 3.4 Define international marketing 3.5 Describe international market entry process 3.6 Classify international marketing	3	7
4	<b>PRODUCT AND SERVICE MARKETING</b> 4.1. Define product 4.2. Discuss good and service 4.2. Explain product life cycle 4.3. Classify product levels 4.5 Classify service marketing 4.6 Distinguish between goods and service	3	7
5	<b>DISTRIBUTION STRATEGIES</b> 5.1. Define distribution 5.2. State the necessity of distribution in marketing 5.3. Illustrate types of distribution channel	2	4
6	<b>SEGMENTATION, TARGETING AND POSITIONING METHODS</b> 6.1. Discuss market segmentation 6.2 Explain bases for consumer market segmentation	4	7

	6.3 Define market targeting 6.4 Describe strategies of targeting 6.5 Define positioning, repositioning and de-positioning		
7	<b>ESSENTIALS OF PROMOTION AND PRICING</b> 7.1 Define promotion 7.2 State fundamentals of promotion 7.3 Relate managing customer relationships 7.4 Define price 7.5 Outline new product pricing strategies 7.6 Compare price adjustments with competitors	4	7
8	<b>FUNDAMENTALS OF BRANDING</b> 8.1 Define branding 8.2 List branding elements 8.3 State necessity of branding 8.4 Mention the steps of brand making process	2	4
9	<b>CONSUMER BEHAVIOUR</b> 9.1 Define consumer behavior 9.2 Outline stages of the buying process 9.3 Illustrate importance of studying consumer behavior 9.4 Mention the scope of consumer behavior area	2	4
10	<b>ONLINE AND ETHICAL MARKETING</b> 10.1 Define marketing ethics 10.2 Mention policies of marketing ethics 10.3 State the practice of ethics on virtual market. 10.4 Describe significance of the ethical practices on social media 10.4 Discuss Corporate Social Responsibility (CSR) 10.5 Discuss the consequence of green marketing	4	7
	<b>Total</b>	<b>32</b>	<b>60</b>

### **Recommended Books:**

<b>SL</b>	<b>Book Name</b>	<b>Writer Name</b>	<b>Publisher Name &amp; Edition</b>
1.	Principles of Marketing	Gray Armstrong/ Philip Kotler	Prentice Hall, NJ,USA 17th Edition

2.	Marketing Management	Rajan Saxsena	Tata McGraw-Hill Education, 1 <sup>st</sup> Edition, 2005
----	----------------------	---------------	--

Subject Code	Subject Name	Period per Week		Credit
25852	INDUSTRIAL MANAGEMENT	T	P	C
		2	0	2

<b>Rationale</b>	<p>As mid-level manager, engineering diploma graduates are responsible for proper and most efficient interaction of 6 M'S: man, machine, material, money, method (SOP or process) and market with a focus that will depend on their position in the organization (production, planning, quality, maintenance, design, etc.).</p> <p>They first need to understand the type of management and organization they work in. As they work directly or indirectly with manufacturing, therefore they need to have knowledge, skills and attitudes on production, planning, productivity improvement, new systems such as lean manufacturing and understand how production integrates in the overall supply chain management.</p> <p>They deal with people either as a supervisor, assistant manager or by leading transversal projects, they should know their role concerning human resources management and development. In their daily work, they must use a suitable leadership style, assign and monitor work, solve problems, support motivation to change of their teams when they implement new methods and systems.</p>
<b>Learning Outcome (Theoretical)</b>	<p><b>After undergoing the subject, students will be able to:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> State the roles and responsibilities of a mid-level manager within the organization</li> <li><input type="checkbox"/> Differentiate various management systems and organizations</li> <li><input type="checkbox"/> Describe the manufacturing process ensuring productivity, quality, cost and safety</li> <li><input type="checkbox"/> State the types of production planning</li> <li><input type="checkbox"/> Explain productivity improvement factors while controlling cost</li> <li><input type="checkbox"/> Describe new trends of production management systems</li> <li><input type="checkbox"/> Identify mid-level manager roles in the human resources management and development</li> <li><input type="checkbox"/> Select the suitable leadership style depending on the situations and people</li> <li><input type="checkbox"/> Identify the steps of work assignment based on goals to achieve while supporting changes</li> <li><input type="checkbox"/> Describe the steps of problem solving and decision making</li> </ul>

## DETAIL DESCRIPTION (THEORY):

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	<p><b>FUNDAMENTALS OF ORGANIZATION</b></p> <p>1.1 Explain the purpose of an organization.            1.2 Define management organization.            1.3 Describe various types and features of organization structures.            1.4 Explain authority, responsibility, duties and delegation of authority.            1.5 Define span of supervision.</p>	2	4
2.	<p><b>FUNDAMENTALS OF MANAGEMENT</b></p> <p>2.1 Explain the functions of management.            2.2 Relate administration, organization and management.            2.3 Describe different types of management and in which context they apply.            2.4 Define the specificities of industrial management.</p>	2	4
3.	<p><b>PRODUCTION MANAGEMENT</b></p> <p>3.1 Define production management .            3.2 State functions of production management.            3.3 Describe “5p”.            3.4 Mention applications of “5p”.            3.5 Define cost control-methods.            3.6 Define inventory &amp; inventory control.            3.7 Describe the fundamentals of maintenance management.            3.8 Explain the importance of quality system.            3.9 Explain the components of quality system</p>	5	8
4	<p><b>PRODUCTIVITY IMPROVEMENT</b></p> <p>4.1 Define Productivity.            4.2 List factors affecting industrial productivity.            4.3 Describe productivity improvement techniques.            4.4 Describe the lean manufacturing approach.            4.5 Explain the concept of Just in Time.</p>	3	6
5	<p><b>PLANNING</b></p> <p>5.1 Discuss importance of planning.            5.2 Explain the steps in planning.            5.3 Explain the factors affecting on planning.            5.4 State different types of production planning and control.            5.5 Describe the way to manage personal time.</p>	4	7
6	<p><b>SUPPLY CHAIN MANAGEMENT</b></p>	3	4



Unit	Topics with Contents	Class (1 Period)	Final Marks
	<p>6.1 Define supply chain management.</p> <p>6.2 Explain the components of supply chain management.</p> <p>6.3 Explain production integration into supply chain management.</p>		
7.	<p><b>HUMAN RESOURCES MANAGEMENT AND DEVELOPMENT (HRM-HRD)</b></p> <p>7.1 Describe the main functions in human resources management (HRM).</p> <p>7.2 Describe the main functions in human resources development (HRD).</p> <p>7.3 Explain the role of manager in the recruitment process.</p> <p>7.4 Explain the role of manager in the training process.</p> <p>7.5 Explain the role of manager in the performance management system.</p> <p>7.6 Mention the components of compensation and benefits system.</p>	3	6
8.	<p><b>LEADING A TEAM</b></p> <p>8.1 Define leadership.</p> <p>8.2 Identify personality traits impacting leadership style.</p> <p>8.3 Discuss the types of leadership.</p> <p>8.4 Define motivation and motivational cycle.</p> <p>8.5 State the importance of motivation.</p> <p>8.6 List motivation drivers based on Maslow, Herzberg adapted to various generations</p> <p>8.7 State concepts of Theory-X, Theory-Y and Theory-Z</p>	3	6
9.	<p><b>WORK ASSIGNMENT</b></p> <p>9.1 List different types of leadership styles.</p> <p>9.2 Describe the leadership style adapted to the work assignment and delegation.</p> <p>9.3 State SMART goal.</p> <p>9.4 Set SMART goals to support work assignment.</p> <p>9.5 Identify ways to reduce resistance to change during work assignment.</p>	4	8
10.	<p><b>PROBLEM SOLVING AND DECISION MAKING</b></p> <p>10.1 Mention the steps of problem solving.</p> <p>10.2 Explain tools used to analyze and solve problem addressing the 5M components.</p> <p>10.3 Define decision making.</p> <p>10.4 Discuss different types of decision-making process.</p> <p>10.5 Describe the steps in decision making.</p>	3	7
	<b>Total</b>	<b>32</b>	<b>60</b>

## Necessary Resources (Tools, equipment and Machinery):

SI	Item Name	Quantity (piece/s)
01	Case studies, examples, exercises related documents	One for each student
02	Project templates	One for each student

## Recommended Books:

SI	Book Name	Writer Name	Publisher Name & Edition
01.	Principles of Management	Dr. Md. Mainul Islam and Dr. Abdul Awal Dhan,	Bangladesh Open University.
02.	Personnel Management and Industrial Relation.	Mohammad Mohiuddin	NIDS Publication Co, Dhaka.
03.	Production Operations Management: The Handbook	Ronald P Bizzle Jr	Independently published (January 31, 2023)
04.	How To Implement Lean Manufacturing, Second Edition 2nd Edition	Lonnie Wilson	McGrawHill; 2nd edition (March 22, 2015)
05.	The Toyota Way, Second Edition: 14 Management Principles from the World's Greatest Manufacturer Hardcover	Jeffrey K Liker	McGrawHill; 2nd edition (December 1, 2020)
06.	Fast er, Bet ter, Cheaper i n the H st ory of Manuf act ur i ng 1st Edi ti on	Chr i st oph Roser	Product i vi ty Pr; 1st edi ti on (August 5, 2016)
07.	Suppl y Chai n Management , I nvent ory Cont rol , Human Resource Management , and Cust omer ser vi ce (Loui s Bevoc Ser i es of Educat i onal and I nf or mat i onal Books)	Loui s Bevoc	Creat eSpace I ndependent Publ i shi ng Plat f or m (Sept ember 4, 2016)
08.	Bul l et pr oof Pr obl em Sol vi ng: The One Ski ll That Changes Ever yth i ng	Char l es Conn	WI ey; 1st edi ti on (Mar ch 6, 2019)
09.	The Mini at ure Gui de to Cri ti cal Thi nki ng Concept s and Tool s	Ri char d Paul and Li nda El der	The Foundat i on for Cri ti cal Thi nki ng; Eigh t h edi ti on (Sept ember 20, 2019)
10.	Leadership and the One Minute Manager: Increasing Effectiveness Through Situational Leadership	Ken Blanchard, Patricia Zigarmi, Drea Zigarmi	William Morrow; Updated edition (October 15, 2013)
11.	Effective Delegation of Authority: A (Really) Short Book for New Managers	Hassan Osman	Independently published (May 7, 2019)
12.	The Human Element: Overcoming the Resistance That Awaits	Loran Nordgren, David Schonthal	Wiley; 1st edition (September 28, 2021)
13.	The 7 Habits of Highly Effective People	Stephen R. Covey	Free Press (1989)
14.	ব্যবস্থাপনা	মোহাম্মদ খালেবুজ্জামান	দি যমুনা পাবলিশার্স
16.	কলেজে আরও ভালো কীভাবে করা যায়	সম্পাদকমন্ডলী	নায়েম, ঢাকা

17.	শিল্প প্রতিষ্ঠান উৎকর্ষ অর্জন	সম্পাদকমন্ডলী	নায়েম, ঢাকা
-----	-------------------------------	---------------	--------------

### **Website References:**

SI	Web Link	Remarks
01.	<a href="http://www.coachinforleaders">www.coachinforleaders</a>	Podcast on leadership skills
02.	<a href="https://essentialcomm.com/">https://essentialcomm.com/</a>	Podcast on coaching
03.	<a href="https://www.manager-tools.com/">https://www.manager-tools.com/</a>	Podcast on management
04.	<a href="https://www.shrm.org/">https://www.shrm.org/</a>	Website of the most important HR association in USA
05.	<a href="https://www.makingchips.com/">https://www.makingchips.com/</a>	Podcast on manufacturing

Subject Code	Subject Name	Period per Week		Credit
28561	Database Management System	T	P	C
		2	3	3

<b>Rationale</b>	The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.
<b>Learning Outcome (Theoretical)</b>	<p><b>After Completing the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Illustrate Entity-Relationship model from a realistic problem specification.</li> <li>2. Describe schema of a database.</li> <li>3. Interpret formal design techniques to produce a database schema.</li> <li>4. Explain relational data model, relational database design, relational algebra and SQL.</li> <li>5. Interpret Integrity &amp; security.</li> <li>6. State the procedure to improve the database design by normalization.</li> </ol>
<b>Learning Outcome (Practical)</b>	<p><b>After undergoing the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Create relational database systems with design.</li> <li>2. Execute various advanced database queries.</li> <li>3. Design and build ER Diagrams, Flow chart for related database systems using various software.</li> <li>4. Design and implement database applications.</li> </ol>

## Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
<b>1</b>	<p><b>Basic concept of database system</b></p> <p>1.1 Define database and database management system.            1.2 Explain the purposes of database management system.            1.3 Differentiate between conventional file system and database management system.            1.4 Mention the advantages and disadvantages of database management system.            1.5 State Relational data base management system-RDBMS.            1.6 Define data abstraction, instances and schemas.            1.7 Describe schema.</p>	<b>2</b>	<b>6</b>
<b>2</b>	<p><b>Database languages, users, manager and administrator</b></p> <p>2.1 Describe the database query languages.            2.2 Explain the basic operation of DDL, DML, DCL and TCL.            2.3 Describe the different types of database system users.            2.4 State various tasks performed by a database manager.            2.5 Describe the responsibilities of a database administrator.            2.6 Explain the functional components of a database system.</p>	<b>2</b>	<b>6</b>
<b>3</b>	<p><b>Data models</b></p> <p>3.1 Define entity, entity set and data model.            3.2 Explain E-R diagram symbols.            3.3 Describe the E-R diagram for different mapping constrains.            3.4 List different types of attributes used in E-R diagrams.            3.5 Explain conversion technic of E-R diagram to table.            3.6 Describe the different types of data models with examples.            3.7 Illustrate mapping, cardinalities and existences constraints in entity-relationship with diagrams.            3.8 List different types of keys in RDBMS.            3.9 Define Primary key, Foreign key, Super key and Candidate key.            3.10 Distinguish between strong and weak entity sets.</p>	<b>4</b>	<b>10</b>
<b>4</b>	<p><b>Relational Database Query Language</b></p> <p>4.1 Define query language.            4.2 Differentiate among SQL, QBE and datalog.            4.3 List fundamental operations of relational algebra.            4.4 Describe select, project, union, set difference, Cartesian product, rename, set intersection, natural joint, division and assignments.</p>	<b>3</b>	<b>6</b>

<p><b>5</b></p>	<p><b>SQL and PL/SQL</b></p> <p>5.1 Define SQL and PL/SQL.  5.2 Mention several parts of SQL and PL/SQL.  5.3 List different clauses of SQL statement.  5.4 Explain SELECT, FROM, WHERE, ORDER BY, GROUP BY and HAVING statement.  5.5 Describe the usage of SQL set operators.  5.6 State the usage of SQL Scalar functions.  5.7 Describe the usage of SQL aggregate functions.  5.8 Explain the usage of joining.  5.9 Interpret the techniques to add, change and remove data from a table.</p>	<p><b>4</b></p>	<p><b>8</b></p>
<p><b>6</b></p>	<p><b>Integrity and security</b></p> <p>6.1 Define integrity constraints.  6.2 Describe the referential integrity in SQL.  6.3 State the assertions in RDBMS.  6.4 Define the triggers in RDBMS.  6.5 State the necessity of triggers in RDBMS.  6.6 Define the security in RDBMS.  6.7 Define encryption and authentication in database.  6.8 Mention various encryption techniques.</p>	<p><b>4</b></p>	<p><b>6</b></p>
<p><b>7</b></p>	<p><b>Relational database design</b></p> <p>7.1 Define normalization.  7.2 Explain the necessity for normalization.  7.3 Describe redundancy in RDBMS.  7.4 Explain the three stages/rules of normalization in a database management system.  7.5 State the overall database design.</p>	<p><b>3</b></p>	<p><b>4</b></p>
<p><b>8</b></p>	<p><b>Data Storage Media</b></p> <p>8.1 List physical storage media.  8.2 Describe the storage device hierarchy used for database storage.  8.3 Define RAID.  8.4 Describe the various levels of RAID.  8.5 Explain the considerations for choosing RAID levels.</p>	<p><b>3</b></p>	<p><b>4</b></p>
<p><b>9</b></p>	<p><b>Transactions and concurrency controls</b></p> <p>9.1 Define transaction and concurrent execution in DBMS.  9.2 List the properties of a transaction.  9.3 Explain the transaction state with diagram.  9.4 Define concurrency.  9.5 Discuss the reasons for allowing concurrency.  9.6 Define locking.  9.7 Explain various locking techniques.</p>	<p><b>3</b></p>	<p><b>4</b></p>

<b>10</b>	<b>Database System Architecture.</b> 10.1 Define centralized, parallel and distributed database systems. 10.2 Interpret homogeneous and heterogeneous databases. 10.3 Explain the structure of centralized and client server, Parallel and distributed database architecture. 10.4 Describe the advantages and disadvantages of server, parallel and distributed database system architecture.	<b>4</b>	<b>6</b>
	<b>TOTAL</b>	<b>32</b>	<b>60</b>

### DETAILED SYLLABUS (PRACTICAL)

<b>SL.</b>	<b>EXPERIMENT NAME WITH WORKING PROCEDURE</b>	<b>Class (3 Period)</b>	<b>Marks (Continuous)</b>
1.	<b>Install MS-Access</b> 1.1 Collect necessary hardware and operating system requirements for installing MS-Access. 1.2 Install MS-Access on the computer. 1.3 Observe and document the Installation process. 1.4 Maintain a record of performed task.	<b>1</b>	<b>2</b>
2.	<b>Create a new database</b> 2.1 Open MS-Access. 2.2 Create a new database. 2.3 Save the database. 2.3 Rename the database as needed. 2.4 Maintain a record of the tasks performed during creation.	<b>1</b>	<b>2</b>
3.	<b>Create Tables</b> 3.1 Create a new user/database and assign permissions. 3.2 Create a table space for organized data storage. 3.3 Create new tables with appropriate data types for Student, Department, Subject, Year, and Mark information. 3.4 Identify Primary key, foreign key, and candidate key with different constraints. 3.5 Perform dropping Primary key and foreign key. 3.6 Save the table structures. 3.7 Edit a table structure if needed. 3.8 Perform operations such as inserting a record, updating a record, and deleting a row. 3.9 Alter a field with Field Name, Data type, and Length. 3.10 Change or remove a key field. 3.11 Maintain a record of the tasks performed during table creation and modification.	<b>2</b>	<b>3</b>

4.	<b>Create Data Entry Forms</b> 4.1 Query linked tables using join clauses for relational data. 4.2 Create data entry forms for Student Information, Department Information, Subject Information, Year Information, and Mark Information tables. 4.3 Create a total query to find the GPA of each student for a specific year. 4.4 Maintain a record of the tasks performed during	2	2
5.	<b>Use Report Wizard to Visualize the Final Output</b> 5.1 Use Auto Report to generate reports for the result process. 5.2 Utilize the report wizard to create grade sheets, mark sheets, transcripts, merit lists, and tabulation sheets. 5.3 Customize reports with grouping and sorting for better presentation. 5.4 Maintain a record of the tasks performed during report creation.	2	2
6.	<b>Install Oracle and SQL Server</b> 6.1 Collect necessary hardware and operating system requirements for installing Oracle and SQL Server database. 6.2 Install Oracle database on the computer. 6.3 Install SQL Server database on the computer. 6.4 Observe and document the installation process. 6.5 Maintain a record of the tasks performed during installation.	2	2
7.	<b>Retrieve Data using SQL</b> 7.1 Retrieve data from the database using SELECT clause. 7.2 Use WHERE to restrict the amount of rows in the result set. 7.3 Use ORDER BY to sort retrieved data. 7.4 Use GROUP BY to aggregate data. 7.5 Maintain a record of the tasks performed during data retrieval.	1	2
8.	<b>Use Functions of SQL</b> 8.1 Utilize various scalar functions, including LOWER (), UPPER (), INITCAP (). 8.2 Apply various aggregate functions, including COUNT (), SUM (), AVG () etc. 8.3 Maintain a record of the tasks performed using SQL functions.	1	2
9.	<b>Manipulate Data</b> 9.1 Perform Data Manipulation Language (DML) operations on the Database. 9.2 Execute the ALTER operation to modify the structure of a table. 9.3 Maintain a record of the tasks performed during data manipulation.	1	2



<b>10.</b>	<b>JOIN Tables</b> 10.1 Perform Inner Join on tables. 10.2 Execute Outer Join on tables. 10.3 Perform Full Outer Join on tables. 10.4 Maintain a record of the tasks performed during table joins.	<b>1</b>	<b>2</b>
<b>11.</b>	<b>Work with Index and Constraints in SQL</b> 11.1 Create Index on tables. 11.2 Utilize 'DUAL' and SYSDATE for system-related information. 11.3 Implement different types of constraints in SQL.	<b>1</b>	<b>2</b>
<b>12.</b>	<b>Work with Roles and Privileges</b> 12.1 Grant privileges on database users. 12.2 Revoke privileges from database users. 12.3 Create roles for organized access control. 12.4 Assign privileges to roles for efficient management. 12.5 Assign roles to users for streamlined access control. 12.6 Maintain a record of the tasks performed in managing roles and privileges.	<b>1</b>	<b>2</b>
	Total	<b>16</b>	<b>25</b>

**RECOMMENDED BOOKS:**

SL	Book Name	Writer Name	Publisher Name & Edition
01.	Database System Concepts	Abraham Silberschatz, Henry F. Korth, and S. Sudarshan	McGraw-Hill
02.	Successful ICT Projects in Access	P.M Heathcote	Payne-Gallway Publishers
03.	Oracle PL/SQL Programming	Steven Feuerstein, Bill Pribyl, Chip Dawes	O'Reilly Media
04.	Oracle Database 12c The Complete Reference (Oracle Press)	Bob Bryla, Kevin Loney	McGraw-Hill

**WEBSITE REFERENCES:**

SL	Web Link
1	<a href="https://www.w3schools.com/sql/">https://www.w3schools.com/sql/</a>
2	<a href="http://www.java2s.com/Tutorial/Oracle/CatalogOracle.htm">www.java2s.com/Tutorial/Oracle/CatalogOracle.htm</a>
3	<a href="https://www.splunk.com/en_us/blog/learn/dbms-database-management-systems.html">https://www.splunk.com/en_us/blog/learn/dbms-database-management-systems.html</a>
4	<a href="http://www.docs.oracle.com">www.docs.oracle.com</a>

---

Engr. Abdul Wadud  
Chief Instructor (Tech.)  
Cumilla Polytechnic  
Institute  
01720-875155  
engwaducse@gmail.com

Engr. Mohammad Abdus  
Salam Chowdhury.  
Chief Instructor (Tech.)  
Chattogram Mohila  
Polytechnic Institute  
01816-624262  
engrsalamchy07@gmail.com

Santosh Kumar Karmaker  
Chief Instructor(Tech)  
Tangail Polytechnic Institute  
01714518188  
santoshkarmaker33@gmail.com

Mohammad Saidur  
Rahman Akanda  
Database Administrator  
Techlite IT Institute  
01794-252731  
dbasaidur@gmail.com

Subject Code	Subject Name	Period per Week		Credit
28562	Computer Networking	T	P	C
		2	3	3

<b>Rationale</b>	Computer Networking is the most significant area of diploma in Computer Science & Technology. To work with Computer Networking should have the knowledge, skills and attitude of Computer Network fundamentals, Topologies and protocols. The OSI reference model. Functions of the Physical layer and Data Link layer, Network layer and Transport layer Network Interface Cards (NIC), Hubs, Repeaters, Bridges and Switches, LAN and provide services of Network, Network Addressing and Client Server Network.
<b>Learning Outcome (Theoretical)</b>	<p><b>After Completing the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. State Computer network basics.</li> <li>2. Explain Network topologies.</li> <li>3. Describe OSI model.</li> <li>4. Interpret communication and network protocols</li> <li>5. Explain Physical layer and Data Link layer</li> <li>6. Describe Network layer and Transport layer</li> <li>7. Interpret Presentation layer and Session Layer</li> <li>8. Discuss Network devices.</li> <li>9. Illustrate Sub-netting, VLSMs, and Summarization.</li> <li>10. Analyze the Features of Client Server Network.</li> </ol>
<b>Learning Outcome (Practical)</b>	<p><b>After undergoing the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Identify different types of connectors.</li> <li>2. Identify Network hardware's</li> <li>3. Prepare network cables</li> <li>4. Establish a Peer to Peer/Workgroup LAN</li> <li>5. Perform the task to Work with a Peer/Workgroup LAN</li> <li>6. Perform Installation and configuration of windows server</li> <li>7. Connect internet to the existing Lan.</li> <li>8. Configure windows firewall, defender and ping.</li> <li>9. Manage cloud network (google/yahoo drive).</li> <li>10. Establish a client–Server Local Area Network.</li> </ol>

### Detailed Syllabus (Theory)

<b>Unit</b>	<b>Topics with contents</b>	<b>Class (1 Period)</b>	<b>Final Marks</b>
<b>1</b>	<b>Computer network</b> 1.1 Define Computer Network. 1.2. State the concept of computer Network. 1.3 Mention elements of computer network. 1.4 Describe the advantages of Computer network. 1.5 State the application of computer network. 1.6 Describe client / server and peer-to-peer network. 1.7 State LAN, MANs and WANs. 1.7 Describe the general features of LAN, MANs and WANs.	<b>2</b>	<b>4</b>
<b>2</b>	<b>Network topologies</b> 2.1 Define topology. 2.2 Difference between physical and logical topology. 2.3 Define point-to-point and multi point connections. 2.4 List different types of topologies. 2.4 Describe the physical connection of bus, ring, star and hybrid topologies. 2.5 Mention the advantages and disadvantages of bus, ring, star and hybrid topologies. 2.6 Describe the factors to select a particular topology. 2.7 Describe the logical topologies of a token ring network.	<b>3</b>	<b>8</b>
<b>3</b>	<b>OSI model</b> 3.1 Define communication standards. 3.2 Define OSI Model & DoD model. 3.3 Differentiate between DoD model and the OSI reference model. 3.4 List the global forum and regulatory authority of communication and computer Network sector. 3.5 State the function of IEEE in the communication and computer Network sector. 3.6 State International Standard organization-ISO. 3.7 Describe the necessity to develop OSI Model. 3.7 Describe the functions of each layer of the OSI reference model.	<b>3</b>	<b>8</b>

<p><b>4</b></p>	<p><b>Communication and network protocols</b></p> <p>4.1 Define network protocol.  4.2 Describe the main elements of protocol.  4.3 Describe the characteristics of different types of protocol.  4.4 Describe the functions of protocol.  4.5 List different types of network protocols.  4.6 State TCP/IP.  4.7 State the advantages and disadvantages of OSI and TCP/IP.  4.8 Describe the functions of TCP/IP.</p>	<p><b>4</b></p>	<p><b>8</b></p>
<p><b>5</b></p>	<p><b>Physical layer and Data Link layer of the OSI Reference Model</b></p> <p>5.1 Draw the position diagram of Physical layer in the Internet model.  5.2 Describe the functions and services of Physical layer.  5.3 Draw the position diagram of Data link layer in the Internet model.  5.4 Describe the duties and responsibilities of Data link layer.  5.5 State the functions of LLC and MAC sub layer.  5.6 Describe the function of network connectivity devices used in Physical and Data link layers (Repeater, modems, Hub/ Switch and bridge)</p>	<p><b>3</b></p>	<p><b>4</b></p>
<p><b>6</b></p>	<p><b>Network layer and Transport layer of the OSI reference model.</b></p> <p>6.1 Draw the position diagram of Network layer and Transport layer.  6.2 Describe the functions of Network layer and Transport layer.  6.3 Describe Transmission control protocol- TCP and user datagram Protocol -UDP.  6.4 Describe IP, RIP, OSPF, and EIGRP.  6.5 Describe the responsibilities of Network layer and Transport layer.  6.6 Describe the function of Router and Switch.</p>	<p><b>3</b></p>	<p><b>8</b></p>
<p><b>7</b></p>	<p><b>Presentation layer, Session Layer and Application layer of the OSI reference model</b></p> <p>7.1 Draw the position diagram of Presentation layer, Session Layer and Application layer.  7.2 Describe presentation layer protocol.  7.3 Describe Session layer protocol.  7.4 Describe Application layer protocol  7.5 State Telnet, SMTP, NFS, and FTP.  7.6 Describe the functions and services of Presentation layer, Session Layer and Application layer.</p>	<p><b>3</b></p>	<p><b>4</b></p>
<p><b>8</b></p>	<p><b>Hubs, Repeaters, Bridges, Switches and Routers</b></p> <p>8.1 List the different network device.</p>	<p><b>4</b></p>	<p><b>8</b></p>

	<p>8.2 Mention the layer of different network device.</p> <p>8.3 Describe the functions of Hubs, Repeaters, Bridges Switches and Routers.</p> <p>8.4 Mention the types of Hubs/ Switches.</p> <p>8.5 Describe the important features of passive, active and intelligent Hubs/ Switches.</p> <p>8.6 Describe the important features of Repeaters, Bridges, Switches and Routers.</p> <p>8.7 Differentiate among Bridges, Repeaters, Switches and Routers.</p>		
<b>9</b>	<p><b>Sub-netting, VLSMs, and Summarization</b></p> <p>9.1. Define Sub-netting.</p> <p>9.2. State Classless inter domain routing (CIDR).</p> <p>9.3. Define Variable length subnet mask (VLSMs)</p> <p>9.4. Describe VLSM design.</p> <p>9.5 State the procedure to implement VLSM Network</p> <p>9.6. Define Summarization.</p>	<b>4</b>	<b>4</b>
<b>10</b>	<p><b>Operation and features of Client Server Network.</b></p> <p>10.1 Define Client Server Network.</p> <p>10.2 Describe role of Client Server Network.</p> <p>List different type of server.</p> <p>10.3 Describe DNS Server, Web Server, Mail Server, Proxy server, File Server and DHCP Server.</p> <p>10.4 State the Advantages &amp; Disadvantages of Client Server Network.</p>	<b>3</b>	<b>4</b>
	<b>TOTAL</b>	<b>32</b>	<b>60</b>

### **DETAILED SYLLABUS (PRACTICAL)**

<b>SL.</b>	<b>EXPERIMENT NAME</b>	<b>Class (3 Period)</b>	<b>Marks (Continuous)</b>
<b>1</b>	<p><b>Identify Network Media</b></p> <p>1.1 Collect the cables and computer networking Tools.</p> <p>1.2 Identify RJ45, BNC and MT-RJ connectors.</p> <p>1.3 Identify the cables</p> <p>1.4 Identify Network Interface Cards/LAN cards/ Network Adaptor.</p> <p>1.5 Identify Modems, Hubs, Repeaters, Switches &amp; Routers.</p> <p>1.6 Find out the ports of the above devices.</p> <p>1.7 Check the specifications of the devices.</p>	<b>2</b>	<b>3</b>
<b>2</b>	<p><b>Work with network cables and Connectors.</b></p> <p>2.1 Connect RJ45 Connector with UTP Cable</p> <p>2.2 Make a straight through cable.</p> <p>2.3 Make a Cross over cable.</p> <p>2.4 Check the cable-by-cable tester.</p> <p>2.5 Connect Patch Cord and SFP Module.</p>	<b>2</b>	<b>2</b>

<b>3</b>	<b>Establish a wired Peer to Peer/Workgroup LAN</b> 3.1 Collect network cable, connector, network switch / Router and tools. 3.2 Install Network Interface Card (NIC) into the PC. 3.3 Connect cable with connector and network port. 3.4 Check the MAC address of the Network Interface Card (NIC). 3.5 Configure the TCP/IP in each PC 3.6 Test the connectivity among PCs using Ping Command.	<b>2</b>	<b>3</b>
<b>4</b>	<b>Establish a wireless (Wi-Fi) Peer to Peer/Workgroup LAN</b> 4.1 Collect Wi-Fi network devices. 4.2 Install Wireless Lan Card into the PC. 4.3 Connect multiple Pcs with Wireless LAN. 4.4 Test the connectivity among PCs using Ping Command.	<b>1</b>	<b>2</b>
<b>5</b>	<b>Perform the task to Work with a Peer/Workgroup LAN environment for simple data communication.</b> 5.1 Share the Files, folders, Pen drive and Secondary memory. 5.2 Install Network Printer. 5.3 Print documents from Network Printer. 5.4 Share DVD Drive and other resources.	<b>2</b>	<b>3</b>
<b>6</b>	<b>Install and configure windows server</b> 6.1. Install Windows server 2012/2019/2022 into a PC. 6.2. Perform the task to configure the Active Directory. 6.3. Configure TCP/IP to server and client PCs. 6.4. Maintain the record of performed task.	<b>2</b>	<b>3</b>
<b>7</b>	<b>Connect internet to the existing Lan.</b> 7.1. Prepare the equipment list. 7.2. Install and configure a Router with a PC of LAN. 7.3. Configure subnet for the LAN. 7.4. Ensure and Browse Internet from different PCs. 7.5. Maintain the record of performed task.	<b>1</b>	<b>2</b>
<b>8</b>	<b>Configure windows firewall, defender and ping.</b> 8.1. Prepare the equipment list. 8.2. Configure <b>windows</b> Firewall, Defender of a PC to the LAN. 8.3. Perform Ping command for the PCs of LAN. 8.4. Maintain the record of performed task.	<b>1</b>	<b>3</b>
<b>9</b>	<b>Manage cloud network (google/yahoo drive).</b> 9.1. Prepare the equipment list. 9.2. Create a google/yahoo account. 9.3. Access the google/yahoo drive. 9.4. Share and manage google/yahoo drive. 9.5. Maintain the record of performed task.	<b>1</b>	<b>2</b>
<b>10</b>	<b>Establish a Client–Server Local Area Network</b> 10.1 Install Windows server 2012 into a server PC 10.2 Configure TCP/IP to server and client PCs 10.3 Perform the task to configure the Active Directory 10.4 Perform the task to configure the DNS.	<b>2</b>	<b>2</b>
	<b>Total</b>	<b>16</b>	<b>25</b>

**NECESSARY RESOURCES (TOOLS, EQUIPMENT AND MACHINERY):**

SL	Item Name	Quantity
1	Network tool box	10 nos
2	Cat6 and Fiber Optic cable	5 box
3	RJ 45 connector	300 nos
4	Patch Cord and SFP Module	10 nos
5	Splicer Machine	5 nos
6	Crimping tool	10 nos
7	Cable tester	10 nos
8	Hub	05 nos
9	Repeater	10 nos
10	Network Switch-8 Ports	5 nos
11	Network Switch- 24 Ports	5 nos
12	Network Switch-48 Ports	5 nos
13	Router (Wireless)	10 nos
14	Cisco Router	05 nos
15	Mikrotik Router (5P, 8P, 16P)	10 nos
16	Brouter	5 nos
17	Desktop PC	20 nos
18	Laser Printer	5 nos
19	Internet connection	At least 20Mbps
20	Windows server 2012/2019/2022 DVD(Licensed)	10 nos

**RECOMMENDED BOOKS:**

SL	Book Name	Writer Name	Publisher Name & Edition
01.	Data Communications and Networking	Behrouz A. Forouzan	McGraw Hill 5 <sup>th</sup> Edition
02.	Computer Networks	Andrew S.Tanenbaum	PRENTICE HALL 5th Edition
03.	DATA COMMUNICATION & NETWORKING	YEKINI N. ASAFE ADEBARI F. ADEBAYO BELLO OLALEKAN	Computer Engineering Department Yaba College of Technology Lagos Nigeria
04.	Official Certificate Guide	Wendell Odom	Cisco press
05.	Cisco Certificate Network Associate study Guide	Todd Lammler	Sybex.

**WEBSITE REFERENCES:**

SL	Web Link	Remarks
1	(a) Website: <a href="https://en.wikipedia.org/wiki/Data_communication">https://en.wikipedia.org/wiki/Data_communication</a> (b) Website: <a href="https://en.wikipedia.org/wiki/Computer_network">https://en.wikipedia.org/wiki/Computer_network</a> (c) Website: <a href="https://en.wikipedia.org/wiki/Windows_Server">https://en.wikipedia.org/wiki/Windows_Server</a> (d) Website: <a href="https://en.wikipedia.org/wiki/Cloud_storage">https://en.wikipedia.org/wiki/Cloud_storage</a> (e) Website: <a href="https://en.wikipedia.org/wiki/Cloud_computing">https://en.wikipedia.org/wiki/Cloud_computing</a>	Search here with given link
2	<a href="http://www.youtube.com">www.youtube.com</a>	Search here with topics
3	<a href="http://www.google.com">www.google.com</a>	Search here with topics



Subject Code	Subject Name	Period per Week		Credit
28563	Sensor & IoT System	T	P	C
		2	3	3

<b>Rationale</b>	Sensor & IoT System is the most significant area of diploma in Computer Science & Technology. To work with Sensor & IoT System should have the knowledge, skills and attitude of Sensor and IoT, IoT Architecture, Raspberry pi and Arduino, IoT Architecture, IoT devices, Connectivity in IoT, Security in IoT , Data analytics in IoT, IIoT in agriculture, IoT standards and interoperability, Regulatory and ethical considerations, Future trends in IoT and IIoT.
<b>Learning Outcome (Theoretical)</b>	<p>After Completing the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Interpret Sensor and IoT</li> <li>2. Illustrate IoT Architecture</li> <li>3. Interpret Raspberry pi and Arduino.</li> <li>4. Explain IoT Architecture</li> <li>5. Explain IoT devices and sensors</li> <li>6. Describe connectivity in IoT</li> <li>7. Illustrate security in IoT</li> <li>8. Describe data analytics in IoT</li> <li>9. Explain IIoT in agriculture</li> <li>10. Explain IoT standards and interoperability</li> <li>11. Explain regulatory and ethical considerations</li> <li>12. Describe future trends in IoT and IIoT</li> </ol>
<b>Learning Outcome (Practical)</b>	<p>After undergoing the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Assemble a basic IoT sensor node using Arduino.</li> <li>2. Assemble a basic IoT sensor node using raspberry pi.</li> <li>3. Establish a simple wireless IoT network using Wi-Fi or Bluetooth.</li> <li>4. Use Python or other tools to analyze sensor data.</li> <li>5. Integrate IoT devices with cloud platforms.</li> <li>6. Design a basic IIoT solution using a Raspberry Pi as the edge device and the Google Cloud IoT platform for cloud integration.</li> <li>7. Develop a system to control and monitor home appliances remotely using IoT technology.</li> <li>8. Construct a weather station to collect and shares real-time weather data using IoT sensors, providing local weather information.</li> <li>9. Implement an IoT-based solution to monitor soil moisture, temperature, and other environmental factors for optimizing agricultural practices.</li> <li>10. Design a smart parking solution to uses IoT sensors to detect and relay information about available parking spaces in real-time.</li> <li>11. Implement a system to optimize traffic flow by monitoring and controlling traffic signals based on real-time data.</li> <li>12. Create a quality control system in manufacturing that utilizes IIoT sensors to ensure product consistency and reliability.</li> </ol>

## Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
<b>1</b>	<b>INTRODUCTION to IoT &amp; IoT ARCHITECTURE</b> 1.1 Define IoT. 1.2 State the Application of IoT. 1.3 State the Layers of the IoT architecture. 1.4 Explain components and technologies involved in Sensor and IoT. 1.5 Describe Edge computing and cloud computing in IoT 1.6 List different Communication protocols in IoT. 1.7 Explain MQTT and CoAP.	<b>3</b>	<b>6</b>
<b>2</b>	<b>. IoT DEVICES AND SENSORS</b> 2.1 Interpret different type of IoT devices & sensors. 2.2 State the Sensor technologies for data collection methods. 2.3 Describe the role of actuators in IoT systems. 2.4 List Innovative IoT devices. 2.5 Mention the applications of various types of sensor.	<b>3</b>	<b>6</b>
<b>3</b>	<b>RASPBERRY PI AND ARDUINO</b> 3.1 Interpret Arduino and Rasbrry pi . 3.2 State the Architecture of Arduino and Rasbrry pi . 3.3 Describe general purpose input/output(GPIO) pins of Raspberry pi and Arduino 3.4 Explain Digital and Analog I/O interfacing with Arduino . 3.5 State Digital and Analog I/O interfacing with Rasbrry pi 3.6 Describe Sensor interfacing with raspberry pi and arduino 3.7 State Serial communication raspberry pi and arduino 3.8 Explain Arduino programming language 3.9 Interpret Rasbrry pi programming language	<b>4</b>	<b>6</b>
<b>4</b>	<b>IIoT IN MANUFACTURING</b> 4.1 Define IIoT. 4.2 State the application of IIoT. 4.3 Explain Smart factories and Industry 4.0. 4.4 Describe the role of IoT to optimize the production process. 4.5 Distinguish between consumer IoT and industrial IoT. 4.6 State the Challenges and opportunity of IIoT. 4.7 Describe Regulatory landscape for IoT and IIoT.	<b>3</b>	<b>6</b>
<b>5</b>	<b>IoT IN AGRICULTURE</b> 5.1 Interpret Precision farming and smart agriculture. 5.2 Describe applications of IoT for crop management. 5.3 Explain Automation in agricultural processes. 5.4 Explain Challenges and opportunities to implement IoT in agriculture industry. 5.5 Mention the best practices of IoT in in agriculture industry	<b>3</b>	<b>6</b>
<b>6</b>	<b>CONNECTIVITY IN IoT</b> 6.1 List different Communication technologies In IoT. 6.2 Explain 5G and LPWAN. 6.3 Interpret Wireless and wired connectivity options. 6.4 State IoT protocols for efficient data transfer. 6.5 Describe Scalability and reliability considerations for connectivity in IoT.	<b>3</b>	<b>6</b>
<b>7</b>	<b>SECURITY IN IoT</b>	<b>4</b>	<b>6</b>

	<p>7.1 Describe the Threats and vulnerabilities in IoT systems.</p> <p>7.2 State Encryption and authentication in IoT.</p> <p>7.3 Discuss Best practices and Security considerations in IoT architecture.</p> <p>7.4 Explain Privacy concerns in the age of connected devices.</p> <p>7.5 Explain Privacy and data protection regulations for IoT and IIoT.</p> <p>7.6 Describe the necessity of ethics to implement the IoT in Industry.</p> <p>7.7 State the Ethical considerations in the development and deployment of IoT technologies</p>		
<b>8</b>	<p><b>DATA ANALYTICS IN IoT</b></p> <p>8.1 Define Data Analytics.</p> <p>8.2 State the Importance of data analytics in IoT.</p> <p>8.3 Explain Big data and machine learning for IoT applications.</p> <p>8.4 State the role of IoT for Predictive maintenance and anomaly detection.</p> <p>8.5 Mention the process to Predictive maintenance and anomaly detection using IoT.</p>	<b>3</b>	<b>6</b>
<b>9</b>	<p><b>IoT STANDARDS AND INTEROPERABILITY</b></p> <p>9.1 State IoT standards and protocols.</p> <p>9.2 Describe Importance of interoperability in IoT ecosystems.</p> <p>9.3 State Initiatives and organizations promoting IoT Standardization.</p> <p>9.4 List successful interoperable IoT solutions.</p>	<b>3</b>	<b>5</b>
<b>10</b>	<p><b>FUTURE TRENDS IN IOT AND IIoT</b></p> <p>10.1 Describe the evolution of IoT and IIoT.</p> <p>10.2 State the Emerging technologies shaping the future of IoT.</p> <p>10.3 Define AI, Block chain, IoE, Big data analytics, Cloud computing, augmented reality, Virtual reality, simulation and additive manufacturing.</p> <p>10.4 State the Impact of AI and block chain in IoT applications.</p> <p>10.5 Describe the Challenges and opportunities to implement the AI.</p> <p>10.6 State the Predictions for the evolution of IoT and IIoT in the future.</p> <p>10.7 List the promising IoT practices industry in Bangladesh.</p>	<b>3</b>	<b>6</b>
	<b>TOTAL</b>	<b>32</b>	<b>60</b>

### **DETAILED SYLLABUS (PRACTICAL)**

<b>SL.</b>	<b>EXPERIMENT NAME</b>	<b>Class (3 Period)</b>	<b>Marks (Continuous)</b>
<b>1</b>	<p><b>ASSEMBLE A BASIC IoT SENSOR NODE USING ARDUINO</b></p> <p>1.1 Connect DHT11 Sensor to Arduino.</p> <p>1.2 Connect ESP8266 Wi-Fi Module.</p> <p>1.3 Install Libraries.</p> <p>1.4 Write Arduino Code to blink a LED.</p> <p>1.5 Upload Code to Arduino.</p> <p>1.6 Monitor Serial Output.</p>	<b>1</b>	<b>2</b>
<b>2</b>	<p><b>ASSEMBLE A BASIC IoT SENSOR NODE USING RASPBERRY PI.</b></p> <p>2.1 Connect DHT11 Sensor to Raspberry Pi.</p> <p>2.2 Configure Raspberry Pi.</p> <p>2.3 Install Necessary Libraries.</p> <p>2.4 Write Python Script.</p> <p>2.5 Run the Script.</p>	<b>1</b>	<b>2</b>

3	<b>ESTABLISH A SIMPLE WIRELESS IoT NETWORK USING WI-FI OR BLUETOOTH.</b> 3.1 Set Up Raspberry Pi as IoT Sensor Node. 3.2 Set Up Computer as IoT Gateway. 3.3 Run the IoT System.	1	2
4	<b>APPLY PYTHON OR OTHER TOOLS TO ANALYZE SENSOR DATA.</b> 4.1 Modify <code>iot_gateway.py</code> to Store Data. 4.2 Write Python Script to store data. 4.3 Run the Scripts.	1	2
5	<b>INTEGRATE IOT DEVICES WITH CLOUD PLATFORMS LIKE AWS, AZURE, OR GOOGLE CLOUD.</b> 5.1 Set Up Google Cloud IoT Core Project. 5.2 Set Up Cloud IoT Core. 5.3 Install Necessary Libraries on Raspberry Pi. 5.4 Write Python Script and save as <code>iot_google_cloud.py</code> . 5.5 Run the Python Script on Raspberry Pi.	2	2
6	<b>DEVELOP A SYSTEM THAT ALLOWS USERS TO CONTROL AND MONITOR HOME APPLIANCES REMOTELY USING IOT TECHNOLOGY.</b> 6.1 Set Up Google Cloud IoT Core Project. 6.2 Set Up Cloud IoT Core. 6.3 Install Necessary Libraries on Raspberry Pi. 6.4 Write Python Script to control a light. 6.5 Run the System.	1	2
7	<b>IMPLEMENT AN IoT-BASED SOLUTION TO MONITOR SOIL MOISTURE, TEMPERATURE, AND OTHER ENVIRONMENTAL FACTORS FOR OPTIMIZING AGRICULTURAL PRACTICES.</b> 7.1 Set Up Raspberry Pi. 7.2 Create a Firestore Database. 7.3 Set Up Cloud IoT Core. 7.4 Write Python Script and save as <code>agricultural_monitor.py</code> 7.5 Run the System. 7.6 Verify Data in Firestore.	1	2
8	<b>DESIGN A SMART PARKING SOLUTION THAT USES IoT SENSORS TO DETECT AND RELAY INFORMATION ABOUT AVAILABLE PARKING SPACES IN REAL-TIME.</b> 8.1 Set Up Raspberry Pi. 8.2 Create a Firestore Database. 8.3 Set Up Cloud IoT Core. 8.4 Write Python Script and save as <code>smart_parking.py</code> 8.5 Run the System. 8.6 Verify Data in Firestore.	1	2
9	<b>IMPLEMENT A SYSTEM THAT OPTIMIZES TRAFFIC FLOW BY MONITORING AND CONTROLLING TRAFFIC SIGNALS BASED ON REAL-TIME DATA.</b> 9.1 Set Up Raspberry Pi. 9.2 Create a Firestore Database. 9.3 Set Up Cloud IoT Core. 9.4 Set Up Pub/Sub Topic. 9.5 Write Python Script and save as <code>traffic_control.py</code> . 9.6 Create a Cloud Function to Control Traffic Lights. 9.7 Run the System. 9.8 Verify Data in Firestore.	2	2

	<b>Total</b>	<b>16</b>	<b>25</b>
--	--------------	-----------	-----------

### **NECESSARY RESOURCES (TOOLS, EQUIPMENT AND MACHINERY):**

SL	Item Name	Quantity
1	<b>Arduino Boards:</b> <ul style="list-style-type: none"> <li>• Arduino Uno or Arduino Nano,</li> <li>• Arduino MKR or ESP8266/ESP32 for IoT-specific projects</li> </ul>	
2	<b>Raspberry Pi</b> (Raspberry Pi 3 or Raspberry Pi 4)	
3	<b>Sensors</b> <ul style="list-style-type: none"> <li>• Temperature and humidity sensors (DHT11/DHT22).</li> <li>• Light sensors (LDRs or digital light sensors).</li> <li>• Motion sensors (PIR sensors).</li> <li>• Ultrasonic distance sensors.</li> <li>• Gas sensors.</li> <li>• Accelerometers and gyroscopes.</li> </ul>	
4	<b>Actuators:</b> <ul style="list-style-type: none"> <li>▪ LEDs (various colors).</li> <li>▪ Servo motors.</li> <li>▪ Stepper motors.</li> <li>▪ DC motors</li> </ul>	
5	<b>Communication Modules:</b> <ul style="list-style-type: none"> <li>•WiFi modules (ESP8266 or ESP32).</li> <li>•Bluetooth modules.</li> <li>•RFID/NFC modules.</li> <li>•GSM/GPRS modules.</li> </ul>	
6	<b>Power Supplies:</b> <ul style="list-style-type: none"> <li>•Power banks or batteries for mobile projects.</li> <li>•USB power adapters.</li> </ul>	
7	<b>Software and Development Tools:</b> <ul style="list-style-type: none"> <li>• Arduino IDE,</li> <li>• Raspberry Pi OS,</li> <li>• Python,</li> <li>• IoT Platforms,</li> <li>• Integrated Development Environments (IDEs)</li> </ul>	
8	<b>Additional Components:</b> <ul style="list-style-type: none"> <li>• Breadboards and Jumper Wires:</li> <li>• Resistors and Capacitors</li> <li>• Power Supply Components</li> <li>• USB Cables</li> <li>• Storage</li> <li>• Cases and Enclosures</li> </ul>	
9	<b>Optional Tools:</b> <ul style="list-style-type: none"> <li>• Sensors and Actuators Kits</li> <li>• Robotics Kits</li> <li>• IoT Development Boards</li> </ul>	

### **RECOMMENDED BOOKS:**

SL	Book Name	Writer Name	Publisher Name & Edition
01.	Introduction to Sensors in IoT and Cloud Computing Applications	Ambika Nagaraj	
02.	Internet of Things (IoT)	Dr Kamlesh Lakhwani (Author), Dr Hemant Kumar Gianey (Author), Joseph Kofi Wireko (Author)	

03.	Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) 1st Edition, Kindle Edition by Cuno Pfister (Author) Format: Kindle Edition	<a href="#">Cuno Pfister</a>	<b>Make Community, LLC</b>
	IoT based Projects: Realization with Raspberry Pi, NodeMCU and Arduino	<a href="#">Rajesh Singh</a>	

**WEBSITE REFERENCES:**

SL	Web Link	Remarks
1	<a href="https://mrcet.com/downloads/digital_notes/EEE/IoT%20&amp;%20Applications%20Digital%20Notes.pdf">https://mrcet.com/downloads/digital_notes/EEE/IoT%20&amp;%20Applications%20Digital%20Notes.pdf</a>	
2	<a href="https://nibmehub.com/opac-service/pdf/read/IoT%20Fundamentals.pdf">https://nibmehub.com/opac-service/pdf/read/IoT%20Fundamentals.pdf</a>	
3	<a href="https://bridgera.com/wp-content/uploads/2018/10/IoTeBook3.pdf">https://bridgera.com/wp-content/uploads/2018/10/IoTeBook3.pdf</a>	
4	<a href="https://www.psgrkcw.ac.in/wp-content/uploads/2021/08/IoT-Applications-Lab-Manual-IT.pdf">https://www.psgrkcw.ac.in/wp-content/uploads/2021/08/IoT-Applications-Lab-Manual-IT.pdf</a>	
5	<a href="https://copyprogramming.com/howto/internet-of-things-a-hands-on-approach-pdf">https://copyprogramming.com/howto/internet-of-things-a-hands-on-approach-pdf</a>	
6	<a href="https://www.spiceworks.com/tech/iot/articles/what-is-iiot/#_002">https://www.spiceworks.com/tech/iot/articles/what-is-iiot/#_002</a>	
7	<a href="https://www.techtarget.com/iotagenda/definition/Industrial-Internet-of-Things-IloT#:~:text=The%20industrial%20internet%20of%20things%20(IIoT)%20is%20the%20use%20of,enhance%20manufacturing%20and%20industrial%20processes.">https://www.techtarget.com/iotagenda/definition/Industrial-Internet-of-Things-IloT#:~:text=The%20industrial%20internet%20of%20things%20(IIoT)%20is%20the%20use%20of,enhance%20manufacturing%20and%20industrial%20processes.</a>	
8	<a href="https://iopscience.iop.org/book/mono/978-0-7503-3663-5/chapter/bk978-0-7503-3663-5ch1.pdf">https://iopscience.iop.org/book/mono/978-0-7503-3663-5/chapter/bk978-0-7503-3663-5ch1.pdf</a>	
9	<a href="https://www.machinemetrics.com/blog/industrial-internet-of-things-iiot">https://www.machinemetrics.com/blog/industrial-internet-of-things-iiot</a>	

Subject Code	Subject Name	Period per Week		Credit
28564	MICROCONTROLLER BASED SYSTEM DESIGN & DEVELOPMENT	T	P	C
		2	6	4

<b>Rationale</b>	As electronic devices continue to play a vital role in our daily lives, the need for understanding Microcontroller and Embedded Systems becomes imperative. This course aims to equip Diploma in Engineering Level students with knowledge and skills related to Microcontroller Architecture, Programming, Interfacing within Embedded Systems, and practical applications in real-world projects.
<b>Learning Outcome (Theoretical)</b>	<p><b>After completing the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Interpret Microcontroller Architecture.</li> <li>2. Write Program Microcontrollers using suitable IDEs.</li> <li>3. State procedure to Interface the Microcontrollers with various sensors and actuators.</li> <li>4. Comprehend communication protocols in Embedded Systems.</li> <li>5. Explain Analog-to-Digital Conversion and PWM.</li> <li>6. Develop and troubleshoot projects involving Microcontrollers and Embedded Systems.</li> <li>7. Explain procedure of Interface with real world devices.</li> <li>8. Illustrate mini development kit.</li> </ol>
<b>Learning Outcome (Practical)</b>	<p><b>After undergoing the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Operate Microcontroller-based projects.</li> <li>2. Demonstrate effective debugging and troubleshooting skills.</li> <li>3. Interface Microcontrollers with sensors and actuators.</li> <li>4. Develop practical solutions using Microcontroller programming.</li> <li>5. Evaluate projects for functionality and reliability.</li> <li>6. Apply safety precautions in the development and testing of Microcontroller-based systems.</li> <li>7. Apply detailed procedure of microcontroller-based system development.</li> <li>8. Develop application in assembly &amp; C language.</li> <li>9. Originate and test a program for LEDs, 7-Segment display, LCD.</li> <li>10. Drive any AC load (light, fan etc.), DC motor.</li> <li>11. Design and test a program for using built-in timer with any MCU.</li> <li>12. Configure serial port communication by using any MCU.</li> <li>13. Interface temperature, light, sound, touch, infrared sensor by using any MCU.</li> </ol>

## Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
1	<b>Introduction to Microcontroller</b> 1.1 Define Microcontroller. 1.2 State the importance of Microcontroller. 1.3 Mention the types of Microcontrollers. 1.4 Define Embedded system. 1.5 Sketch the basic building blocks of a microcontroller. 1.6 Compare between Microprocessor and Microcontroller. 1.7 Distinguish between computer and embedded system. 1.8 List the applications of microcontroller. 1.9 Mention the criteria to choose a microcontroller. 1.10 List commonly used microcontrollers' series with targeted application.	2	3
2	<b>PIC Series Microcontroller</b> 2.1 Define PIC MCU. 2.2 State the features of PIC microcontroller. 2.3 Mention the purposes of different family/series of PIC MCU. 2.4 Describe basic functional blocks of PIC mid-range MCU. 2.5 State the types of Reset used in MCU. 2.6 Define Power Up Timer -PWRT and Oscillator Start Up Timer –OST. 2.7 Discuss the function of different interrupt sources. 2.8 Describe the operation of Watchdog Timer. 2.9 State the function of Power down/low power Mode (Sleep and Wake up from sleep).	2	3
3	<b>Microcontroller Programming and Interfacing</b> 3.1 Describe the development life cycle of embedded system. 3.2 List different types of software development tools for microcontroller programming. 3.3 Discuss the uses of IDE, linker, compiler, editor and assembler. 3.4 Mention commonly used IDE for microcontroller programming 3.5 Interpret MPLAB, MPLAB X and MikroC. 3.6 List different types of hardware development tools. 3.7 State the uses of flasher, debugger and emulator. 3.8 Mention commonly used debugger and flashing tools. 3.9 State the procedure to build embedded software. 3.10 Write a program for accessing GPIO port.	3	6
4	<b>Timer/counter Programming</b> 4.1 Define Timer in microcontroller. 4.2 List the functions of a timer in microcontroller. 4.3 Discuss the mode of operation of a timer in microcontroller. 4.4 Write a program to create delay for certain amount of time using Timer. 4.5 Describe the Timer as an even counter. 4.6 Develop program for generating square wave and PWM.	3	6



5	<p><b>Interrupts of Microcontroller</b></p> <p>5.1 List the interrupts of the mid-range PIC MCU.</p> <p>5.2 State the interrupt priority and vector locations.</p> <p>5.3 State the procedure of enabling and disabling interrupts.</p> <p>5.4 Mention the steps to execute an interrupt service routine.</p> <p>5.5 Describe External Hardware, Timer, and Serial communication Interrupt.</p> <p>5.6 Write a program for interrupts of Microcontroller.</p>	3	5
6	<p><b>Assembly Language Programming of PIC Mid-range Microcontroller</b></p> <p>6.1 Describe Assembly language.</p> <p>6.2 Define Instruction and Instruction set.</p> <p>6.3 Classify instructions.</p> <p>6.4 Mention the fields of assembly language instruction.</p> <p>6.5 Describe the function of assembly language instruction.</p> <p>6.6 State CPU Instruction &amp; Assembler directives.</p> <p>6.7 Describe the commonly used Assembler directives.</p> <p>6.8 Mention steps to create and execute assembly language program.</p> <p>6.9 Develop a program in assembly language to send data to the output port.</p>	3	6
7	<p><b>Interfacing Sensors and Actuators</b></p> <p>7.1 Define sensors and actuators.</p> <p>7.2 Differentiate between Sensors and Actuators.</p> <p>7.3 State the types of actuators with application.</p> <p>7.4 Describe the interfacing process of sensors and actuators in an embedded system.</p> <p>7.5 Write a program for Controlling motors and LEDs using microcontrollers.</p> <p>7.6 Write a program to get temperature, humidity and light using MCU.</p> <p>7.7 Develop an embedded system block diagram that uses different sensors and actuators.</p>	4	8
8	<p><b>Communication Protocols in Embedded Systems</b></p> <p>8.1 Define Communication protocol.</p> <p>8.2 State the uses of UART, I2C and SPI communication protocols.</p> <p>8.3 Define wireless communication.</p> <p>8.4 Discuss the process of Bluetooth and RF modules.</p> <p>8.5 Mention the interfacing process of multiple microcontrollers.</p> <p>8.6 Write a program for serial communication.</p> <p>8.7 Develop an embedded system block diagram that uses different communication systems</p>	3	6
9	<p><b>Arduino</b></p> <p>9.1 State Arduino, Arduino board and Arduino shield.</p> <p>9.2 State the features of different Arduino boards.</p> <p>9.3 State different Arduino Shields.</p> <p>9.4 Describe the uses of Arduino Board and Sensor.</p> <p>9.5 Explain the basic block diagram of Arduino board.</p> <p>9.6 Describe the Interfacing with Arduino components.</p> <p>9.7 Develop program for any Arduino device with basic operation.</p> <p>9.8 Write a program for temperature sensor data or light sensor data using Arduino.</p> <p>9.9 Develop a program to read analog signal from a sensor.</p> <p>9.10 Develop a program to communicate with computer system with using any communication protocol.</p>	2	3

10	<b>IoT device, Raspberry Pi and other development kit</b> 10.1 Mention the uses of ARM architecture. 10.2 Discuss the basic building blocks of an IoT devices 10.3 State the uses of GSM module like device to connect the internet. 10.4 State the uses of Wi-Fi module to connect the internet. 10.5 Develop an embedded system block diagram for internet connectivity module. 10.6 State the features and uses of Raspberry Pi board. 10.7 List commonly used mini development kit based on MCU. 10.8 Outline commonly used robotics development board.	3	6
	<b>TOTAL</b>	<b>32</b>	<b>60</b>

### Detailed Syllabus (Practical)

**NB:**

- i. For the experiments of microcontroller (MCU) students can use any MCU i.e., PIC, AVR, 8051 core, Fujitsu, Lapis, Renesas and ST etc.
- ii. For developing programs, students can use any development tools i.e., MPLAB X, Atmel studio etc.

SL. No.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	<b>Design Schematic Diagram for LED blinking system.</b> 1.1 Select a simple PIC series mid-range MCU for LED flashing project. 1.2 Identify required input-output devices for building LED blinking system. 1.3 Interpret operation procedure of selected I/O devices. 1.4 Interpret the interface system of selected I/O devices with selected MCU. 1.5 Interpret the interface of different signals and pin of the selected MCU. 1.6 Sketch the connection diagram of the power pins of MCU with power supply in schematic design 1.7 Sketch the connection diagram of the crystal with clock signal related pin in schematic design. Internal clock source can be used as well. 1.8 Sketch the connection diagram of other system pin of MCU, for example, like reset etc. with necessary components or power supply if necessary. 1.9 Sketch the connection diagram of the I/O device and other parts, if necessary, with MCU to complete the schematic design.	<b>1</b>	<b>1</b>
2	<b>Develop a program for LED blinking system using MCU/Arduino.</b> 2.1 Design the circuit diagram. 2.2 Draw the process flow chart. 2.3 Write the code. 2.4 Compile/build the program. 2.5 Simulate the program and the circuit if necessary. 2.6 Flash/Download the Hex file/program to the MCU using flashing device.	<b>1</b>	<b>1</b>

	<p>2.7 Construct the circuit.</p> <p>2.8 Power the circuit and observe the output.</p> <p>2.9 Debug program/system using debugger device if necessary.</p> <p>2.10 Test the program.</p> <p>2.11 Prepare a report.</p> <p>2.12 Maintain the record of performed task.</p>		
3	<p><b>Develop a program for Multiple LED blinking system using MCU/Arduino.</b></p> <p>3.1 Design the circuit diagram.</p> <p>3.2 Draw the process flow chart.</p> <p>3.3 Write the code.</p> <p>3.4 Compile/build the program.</p> <p>3.5 Simulate the program and the circuit if necessary.</p> <p>3.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>3.7 Construct the circuit.</p> <p>3.8 Power the circuit and observe the output.</p> <p>3.9 Debug program/system using debugger device if necessary.</p> <p>3.10 Test the program.</p> <p>3.11 Prepare a report.</p> <p>3.12 Maintain the record of performed task.</p>	<b>1</b>	<b>1</b>
4	<p><b>Develop a program for LED Control by Switch using MCU/Arduino.</b></p> <p>4.1 Design the circuit diagram.</p> <p>4.2 Draw the process flow chart.</p> <p>4.3 Write the code.</p> <p>4.4 Compile/build the program.</p> <p>4.5 Simulate the program and the circuit if necessary.</p> <p>4.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>4.7 Construct the circuit.</p> <p>4.8 Power the circuit and observe the output.</p> <p>4.9 Debug program/system using debugger device if necessary.</p> <p>4.10 Test the program.</p> <p>4.11 Prepare a report.</p> <p>4.12 Maintain the record of performed task.</p>	<b>1</b>	<b>1</b>
5	<p><b>Develop a program for LED Brightness Control using MCU/Arduino.</b></p> <p>5.1 Design the circuit diagram.</p> <p>5.2 Draw the process flow chart.</p> <p>5.3 Write the code.</p> <p>5.4 Compile/build the program.</p> <p>5.5 Simulate the program and the circuit if necessary.</p> <p>5.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>5.7 Construct the circuit.</p> <p>5.8 Power the circuit and observe the output.</p> <p>5.9 Debug program/system using debugger device if necessary.</p> <p>5.10 Test the program.</p> <p>5.11 Prepare a report.</p> <p>5.12 Maintain the record of performed task.</p>	<b>2</b>	<b>1</b>

6	<p><b>Develop a program for Buzzer On/Off using MCU/Arduino.</b></p> <p>6.1 Design the circuit diagram.          6.2 Draw the process flow chart.          6.3 Write the code.          6.4 Compile/build the program.          6.5 Simulate the program and the circuit if necessary.          6.6 Flash/Download the Hex file/program to the MCU using flashing device.          6.7 Construct the circuit.          6.8 Power the circuit and observe the output.          6.9 Debug program/system using debugger device if necessary.          6.10 Test the program.          6.11 Prepare a report.          6.12 Maintain the record of performed task.</p>	1	1
7	<p><b>Develop a program for Buzzer Melody using MCU/Arduino.</b></p> <p>7.1 Design the circuit diagram.          7.2 Draw the process flow chart.          7.3 Write the code.          7.4 Compile/build the program.          7.5 Simulate the program and the circuit if necessary.          7.6 Flash/Download the Hex file/program to the MCU using flashing device.          7.7 Construct the circuit.          7.8 Power the circuit and observe the output.          7.9 Debug program/system using debugger device if necessary.          7.10 Test the program.          7.11 Prepare a report.          7.12 Maintain the record of performed task.</p>	2	1
8	<p><b>Develop a program for displaying decimal digit(0 to 9) or hexadecimal digit on 7- Segment display by using MCU/Arduino.</b></p> <p>8.1 Design the circuit diagram.          8.2 Draw the process flow chart.          8.3 Write the code.          8.4 Compile/build the program.          8.5 Simulate the program and the circuit if necessary.          8.6 Flash/Download the Hex file/program to the MCU using flashing device.          8.7 Construct the circuit.          8.8 Power the circuit and observe the output.          8.9 Debug program/system using debugger device if necessary.          8.10 Test the program.          8.11 Prepare a report.          8.12 Maintain the record of performed task.</p>	1	1
9	<p><b>Develop a program for Interfacing LCD by using any MCU.</b></p> <p>9.1 Design the circuit diagram.          9.2 Draw the process flow chart.          9.3 Write the code.          9.4 Compile/build the program.          9.5 Simulate the program and the circuit if necessary.          9.6 Flash/Download the Hex file/program to the MCU using flashing device.          9.7 Construct the circuit.          9.8 Power the circuit and observe the output.          9.9 Debug program/system using debugger device if necessary.</p>	2	1

	<p>9.10 Test the program.</p> <p>9.11 Prepare a report.</p> <p>9.12 Maintain the record of performed task.</p>		
10	<p><b>Perform the construction of a MCU based timing pulse generation system by using built-in timer.</b></p> <p>10.1 Design the circuit diagram.</p> <p>10.2 Draw the process flow chart.</p> <p>10.3 Write the code.</p> <p>10.4 Compile/build the program.</p> <p>10.5 Simulate the program and the circuit if necessary.</p> <p>10.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>10.7 Construct the circuit.</p> <p>10.8 Power the circuit and observe the output.</p> <p>10.9 Debug program/system using debugger device if necessary.</p> <p>10.10 Test the program.</p> <p>10.11 Prepare a report.</p> <p>10.12 Maintain the record of performed task.</p>	<b>1</b>	<b>1</b>
11	<p><b>Perform the construction of a MCU based system to count pulses.</b></p> <p>11.1 Design the circuit diagram.</p> <p>11.2 Draw the process flow chart.</p> <p>11.3 Write the code.</p> <p>11.4 Compile/build the program.</p> <p>11.5 Simulate the program and the circuit if necessary.</p> <p>11.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>11.7 Construct the circuit.</p> <p>11.8 Power the circuit and observe the output.</p> <p>11.9 Debug program/system using debugger device if necessary.</p> <p>11.10 Test the program.</p> <p>11.11 Prepare a report.</p> <p>11.12 Maintain the record of performed task.</p>	<b>1</b>	<b>1</b>
12	<p><b>Perform the construction of a MCU based ADC (Analog to digital converter) interface System.</b></p> <p>12.1 Design the circuit diagram.</p> <p>12.2 Draw the process flow chart.</p> <p>12.3 Write the code.</p> <p>12.4 Compile/build the program.</p> <p>12.5 Simulate the program and the circuit if necessary.</p> <p>12.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>12.7 Construct the circuit.</p> <p>12.8 Power the circuit and observe the output.</p> <p>12.9 Debug program/system using debugger device if necessary.</p> <p>12.10 Test the program.</p> <p>12.11 Prepare a report.</p> <p>12.12 Maintain the record of performed task.</p>	<b>2</b>	<b>1</b>

13	<p><b>Develop a program for Interfacing Keyboard using MCU/Arduino.</b></p> <p>13.1 Design the circuit diagram.</p> <p>13.2 Draw the process flow chart.</p> <p>13.3 Write the code.</p> <p>13.4 Compile/build the program.</p> <p>13.5 Simulate the program and the circuit if necessary.</p> <p>13.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>13.7 Construct the circuit.</p> <p>13.8 Power the circuit and observe the output.</p> <p>13.9 Debug program/system using debugger device if necessary.</p> <p>13.10 Test the program.</p> <p>13.11 Prepare a report.</p> <p>13.12 Maintain the record of performed task.</p>	<b>1</b>	<b>1</b>
14	<p><b>Develop a program for Interfacing 8×8 LED Dot Matrix using MCU/Arduino.</b></p> <p>14.1 Design the circuit diagram.</p> <p>14.2 Draw the process flow chart.</p> <p>14.3 Write the code.</p> <p>14.4 Compile/build the program.</p> <p>14.5 Simulate the program and the circuit if necessary.</p> <p>14.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>14.7 Construct the circuit.</p> <p>14.8 Power the circuit and observe the output.</p> <p>14.9 Debug program/system using debugger device if necessary.</p> <p>14.10 Test the program.</p> <p>14.11 Prepare a report.</p> <p>14.12 Maintain the record of performed task.</p>	<b>1</b>	<b>1</b>
15	<p><b>Perform the construction of a MCU based LDR (Light dependent resistor) interface system.</b></p> <p>15.1 Design the circuit diagram.</p> <p>15.2 Draw the process flow chart.</p> <p>15.3 Write the code.</p> <p>15.4 Compile/build the program.</p> <p>15.5 Simulate the program and the circuit if necessary.</p> <p>15.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>15.7 Construct the circuit.</p> <p>15.8 Power the circuit and observe the output.</p> <p>15.9 Debug program/system using debugger device if necessary.</p> <p>15.10 Test the program.</p> <p>15.11 Prepare a report.</p> <p>15.12 Maintain the record of performed task.</p>	<b>2</b>	<b>2</b>
16	<p><b>Develop a program for Interfacing DC motor by using any MCU/Arduino.</b></p> <p>16.1 Design the circuit diagram.</p> <p>16.2 Draw the process flow chart.</p> <p>16.3 Write the code.</p> <p>16.4 Compile/build the program.</p>	<b>2</b>	<b>1</b>

	<p>16.5 Simulate the program and the circuit if necessary.</p> <p>16.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>16.7 Construct the circuit.</p> <p>16.8 Power the circuit and observe the output.</p> <p>16.9 Debug program/system using debugger device if necessary.</p> <p>16.10 Test the program.</p> <p>16.11 Prepare a report.</p> <p>16.12 Maintain the record of performed task.</p>		
17	<p><b>Develop program for Interfacing a Bluetooth Module by using any MCU/Arduino.</b></p> <p>17.1 Design the circuit diagram.</p> <p>17.2 Draw the process flow chart.</p> <p>17.3 Write the code.</p> <p>17.4 Compile/build the program.</p> <p>17.5 Simulate the program and the circuit if necessary.</p> <p>17.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>17.7 Construct the circuit.</p> <p>17.8 Power the circuit and observe the output.</p> <p>17.9 Debug program/system using debugger device if necessary.</p> <p>17.10 Test the program.</p> <p>17.11 Prepare a report.</p> <p>17.12 Maintain the record of performed task.</p>	<b>2</b>	<b>1</b>
18	<p><b>Develop a program for Interfacing a Wi-Fi Module by using any MCU/Arduino.</b></p> <p>18.1 Design the circuit diagram.</p> <p>18.2 Draw the process flow chart.</p> <p>18.3 Write the code.</p> <p>18.4 Compile/build the program.</p> <p>18.5 Simulate the program and the circuit if necessary.</p> <p>18.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>18.7 Construct the circuit.</p> <p>18.8 Power the circuit and observe the output.</p> <p>18.9 Debug program/system using debugger device if necessary.</p> <p>18.10 Test the program.</p> <p>18.11 Prepare a report.</p> <p>18.12 Maintain the record of performed task.</p>	<b>2</b>	<b>1</b>
19	<p><b>Develop a program for interfacing Temperature Sensor by using Arduino.</b></p> <p>19.1 Design the circuit diagram.</p> <p>19.2 Draw the process flow chart.</p> <p>19.3 Write the code.</p> <p>19.4 Compile/build the program.</p> <p>19.5 Simulate the program and the circuit if necessary.</p> <p>19.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>19.7 Construct the circuit.</p> <p>19.8 Power the circuit and observe the output.</p> <p>19.9 Debug program/system using debugger device if necessary.</p>	<b>1</b>	<b>1</b>

	<p>19.10 Test the program.</p> <p>19.11 Prepare a report.</p> <p>19.12 Maintain the record of performed task.</p>		
20	<p><b>Develop a program for interfacing Light Sensor by using Arduino.</b></p> <p>20.1 Design the circuit diagram.</p> <p>20.2 Draw the process flow chart.</p> <p>20.3 Write the code.</p> <p>20.4 Compile/build the program.</p> <p>20.5 Simulate the program and the circuit if necessary.</p> <p>20.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>20.7 Construct the circuit.</p> <p>20.8 Power the circuit and observe the output.</p> <p>20.9 Debug program/system using debugger device if necessary.</p> <p>20.10 Test the program.</p> <p>20.11 Prepare a report.</p> <p>20.12 Maintain the record of performed task.</p>	<b>1</b>	<b>1</b>
21	<p><b>Develop a program for interfacing Sound Sensor by using Arduino.</b></p>	<b>1</b>	<b>1</b>
22	<p><b>Develop a program for interfacing Touch Sensor by using Arduino.</b></p> <p>22.1 Design the circuit diagram.</p> <p>22.2 Draw the process flow chart.</p>	<b>1</b>	<b>1</b>
23	<p><b>Develop a program for interfacing Infrared Sensor by using Arduino.</b></p> <p>23.1 Design the circuit diagram.</p> <p>23.2 Draw the process flow chart.</p> <p>23.3 Write the code.</p> <p>23.4 Compile/build the program.</p> <p>23.5 Simulate the program and the circuit if necessary.</p> <p>23.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>23.7 Construct the circuit.</p> <p>23.8 Power the circuit and observe the output.</p> <p>23.9 Debug program/system using debugger device if necessary.</p> <p>23.10 Test the program.</p> <p>23.11 Prepare a report.</p> <p>23.12 Maintain the record of performed task.</p>	<b>1</b>	<b>1</b>
24	<p><b>Develop a program for driving a Relay by using Arduino kit with any wireless shield.</b></p> <p>24.1 Design the circuit diagram.</p> <p>24.2 Draw the process flow chart.</p> <p>24.3 Write the code.</p> <p>24.4 Compile/build the program.</p> <p>24.5 Simulate the program and the circuit if necessary.</p> <p>24.6 Flash/Download the Hex file/program to the MCU using flashing device.</p> <p>24.7 Construct the circuit.</p> <p>24.8 Power the circuit and observe the output.</p>	<b>1</b>	<b>1</b>



	24.9 Debug program/system using debugger device if necessary. 24.10 Test the program. 24.11 Prepare a report. 24.12 Maintain the record of performed task.		
	<b>Total</b>	<b>32</b>	<b>50</b>

**Necessary Resources (Tools, Materials, equipment's and Machineries):**

SL.No.	Item Name	Quantity
01	MCU training kit	5
02	Program/software development tools for MCU	5
03	Computer	5
04	Arduino board, shield with sensor set	5

SL.No.	Book Name	Writer Name	Publisher Name & Edition
01	PIC Microcontroller and Embedded system	Muhammad Ali Mazidi	Pearson
02	C Programming for the PIC Microcontroller	Hubert Henry Ward	Apress

**Website References:**

SL. No.	Web Link	Remarks
01	<a href="http://www.microchip.com">www.microchip.com</a>	
02	<a href="http://www.arduino.cc">www.arduino.cc</a>	
03	<a href="http://www.raspberrypi.org">www.raspberrypi.org</a>	

Subject Code	Subject Name	Period per Week		Credit
28565	<b>SURVEILLANCE SECURITY SYSTEM</b>	T	P	C
		1	3	2

<b>Rationale</b>	The surveillance security systems enhance students' knowledge, skills, and readiness for careers in industries where security is paramount. It also aligns with the growing demand for professionals capable of designing and managing modern surveillance solutions. Students can design a system to monitor, record, and analyze activities within a given area to enhance safety, prevent crime, and provide evidence in case of incidents. The system employs various sensors such as cameras, motion detectors, door/window sensors, and glass-break detectors, Types of Lens & their functions, DVR, NVR interface, Principles of remote access, networking basic.
<b>Learning Outcome (Theoretical)</b>	<p><b>After Completing the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Interpret surveillance security System.</li> <li>2. Explain Cameras, Lens and sensors.</li> <li>3. Illustrate DVR, NVR interface and Remote access.</li> <li>4. Analyze Video Signal and Control Signal Transmission</li> <li>5. Elucidate Computer Networking</li> <li>6. Illustrate installation of Surveillance system</li> <li>7. Design and develop a surveillance security System</li> </ol>
<b>Learning Outcome (Practical)</b>	<ol style="list-style-type: none"> <li>1. Identify Surveillance system requirements of a client aspect.</li> <li>2. Prepare an installation plan through visual inspection</li> <li>3. Identify proper components, equipment &amp; tools.</li> <li>4. Select Suitable cameras &amp; DVR/NVR to the customer's requirements</li> <li>5. Select an area to install necessary electrical &amp; data cable warnings.</li> <li>6. Install and Configure access control device and software.</li> <li>7. Maintain working environment.</li> </ol>

## Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
<b>1</b>	<b>Surveillance security System</b> 1.1 Define surveillance system. 1.2 State different types of surveillance. 1.3 Describe problems & constrains of surveillance. 1.4 State the uses of access control in Surveillance systems.	<b>2</b>	<b>5</b>
<b>2</b>	<b>Video surveillance</b> 2.1 Define video surveillance. 2.2 Illustrate the Construction procedure of a video surveillance system. 2.3 State the function of video surveillance. 2.4 Explain the essential components of the CCTV camera system 2.5 Explain construction procedure of various nodes and blocks in CCTV surveillance system 2.6 Explain Security policy model.	<b>4</b>	<b>5</b>
<b>3</b>	<b>Cameras, Lens and sensors</b> 3.1 Define pixels, camera, Lens and Sensor. 3.2 Describe the function of different types of cameras. 3.3 List different types of lenses 3.4 State Fixed lenses, Zoom lenses, Varifocal lenses, Monofocal lenses, Wide Angle lenses with uses 3.5 State various types of CCTV drawing Symbols.	<b>2</b>	<b>5</b>
<b>4</b>	<b>DVR, NVR interface and Remote access</b> 4.1 Define DVR and NVR. 4.2 Describe the function of various blocks of DVR and NVR. 4.3 State the uses of physical storage and cloud storage. 4.4 Describe the recording format of a DVR and NVR. 4.5 Define remote access system. 4.6 Mention the Advantage and disadvantage of remote access system.	<b>4</b>	<b>8</b>
<b>5</b>	<b>Surveillance system installation</b> 5.1 List the necessary equipment of Surveillance system. 5.2 State the various type of cables uses in surveillance system 5.3 Describe the function and operation of Biometric device, Intercom, Door lock, Emergency Alarm 5.4 Illustrate the installation process of Biometric system. 5.5 Describe the maintenance procedure of Surveillance system.	<b>4</b>	<b>7</b>
	<b>TOTAL</b>	<b>16</b>	<b>30</b>

## Detailed Syllabus (Practical)

SL.	EXPERIMENT NAME	Class (3 Period)	Marks (Continuous)

<p><b>1.</b></p>	<p><b>Requirements, Quotation and approval.</b>  1.1 Collect requirements from Client.  1.2 Select products as per requirement.  1.3 Prepare Budget as per requirements.  1.4 Prepare design and diagram  1.5 Prepare a quotation as per requirements.  1.6 Approve quotation from client.  1.7 Maintain the record of performed task.</p>	<p><b>2</b></p>	<p><b>5</b></p>
<p><b>2.</b></p>	<p><b>Testing equipment's and set up.</b>  2.1 Follow Occupational safety and health (OSH) practices.  2.2 Collect the necessary equipment's and select BNC or Video balun, Power Adapter, Cable, Camera, DVR and NVR.  2.3 Connect and set up equipment's according to diagram.  2.4 Test the equipment's.  2.5 Identify and Isolate the faulty device.  2.6 Maintain the record of performed task.</p>	<p><b>1</b></p>	<p><b>5</b></p>
<p><b>3.</b></p>	<p><b>Perform Wiring of Power and Network Cable.</b>  3.1 Follow Occupational safety and health (OSH) practices.  3.2 Identify the power source.  3.3 Perform wiring as per required.  3.4 Install power equipment.  3.5 Connect cable according to diagram.  3.6 Connect different network equipment.  3.7 Maintain the record of performed task.</p>	<p><b>2</b></p>	<p><b>5</b></p>
<p><b>4.</b></p>	<p><b>Install the CCTV camera.</b>  4.1 Follow Occupational safety and health (OSH) practices.  4.2 Make survey and identify the location of the camera to be fixed.  4.3 Select the suitable camera depending on the coverage area required by the customer.  4.4 Connect power equipment of different CCTV Camera.  4.5 Select cable and connector (coaxial/twisted pair cable and BNC connectors/ Video Balun).  4.6 Connect all the cables and cameras as per procedure.  4.7 Ensure all cable and connectors are connected properly.  4.8 After complete all procedure connect AC/DC Power Adapter with CCTV Camera.  4.9 Maintain the record of performed task.</p>	<p><b>2</b></p>	<p><b>5</b></p>
<p><b>5.</b></p>	<p><b>Install the IP (and PTZ) camera</b>  5.1 Follow Occupational safety and health (OSH) practices.  5.2 Follow installation procedures as per manuals.  5.3 Mount the IP cameras such as pan, tilt, zoom.  5.4 Connect power equipment/ Use POE switch of IP Cameras.  5.5 Assign IP address.  5.6 Maintain the record of performed task.</p>	<p><b>1</b></p>	<p><b>5</b></p>
<p><b>6.</b></p>	<p><b>Install and configure DVR/NVR Machine.</b>  6.1 Follow Occupational safety and health (OSH) practices.  6.2 Set up DVR/NVR as per diagram.  6.3 Install Hard disk in DVR/NVR.  6.4 Ensure that all cables and connectors are connect Properly.  6.5 Assign IP Address to connect DVR/NVR.  6.6 Install the appropriate software for remote monitoring.  6.7 Configure the DVR/NVR as per procedure.  6.8 Maintain the record of performed task.</p>	<p><b>1</b></p>	<p><b>5</b></p>

<b>7.</b>	<b>Configure the camera</b> 7.1 Follow Occupational safety and health (OSH) practices. 7.2 Perform control and configure/settings of camera such rotation, speed of movement in pan/tilt camera 7.3 Use stable mounting structure and ensure that is not disturbance any circumstance. 7.4 Ensure that cameras are protected from light while installing in outdoor. 7.5 Maintain the record of performed task.	<b>2</b>	<b>5</b>
<b>8.</b>	<b>Backup data from DVR/NVR</b> 8.1 Follow Occupational safety and health (OSH) practices. 8.2 Connect external storage device to the DVR/NVR. 8.3 Use Backup Option from the DVR/NVR as per manual. 8.4 Select particular camera for backup the footage. 8.5 Set time and date to find the footage for backup. 8.6 select video format for backup such as dav, mp4, PAL, NTSC. 8.7 Start or Click Backup option. 8.8 Maintain the record of performed task.	<b>1</b>	<b>5</b>
<b>9.</b>	<b>Install and Configure Biometric and software</b> 9.1 Follow Occupational safety and health (OSH) practices. 9.2 Install and configure Biometric device. 9.3 Install and connect Biometric Device Software. 9.4 Enroll employes data in Biometric device 9.5 Configure attendance time table for employee. 9.6 link employes data from devices to software. 9.7 Generate test Report and get output by software. 9.8 Maintain the record of performed task.	<b>2</b>	<b>5</b>
<b>10.</b>	<b>Wireless series camera setup and install</b> 10.1 Follow Occupational safety and health (OSH) practices. 10.2 Select a wireless series camera from a specific company. 10.3 Read and get knowledge the camera mechanism from operational manual 10.4 Select and install SD Card for appropriate place of camera 10.5 Mount the Device with appropriate place and position. 10.6 Connect the camera with a local Wi-Fi follow the instruction Manual. 10.7 Download the necessary software for remotely access. 10.8 Maintain the record of performed task.	<b>2</b>	<b>5</b>
	Total	<b>16</b>	<b>50</b>

**NECESSARY RESOURCES (TOOLS, EQUIPMENT AND MACHINERY):**

<b>SL</b>	<b>Item Name</b>	<b>Quantity</b>
1	CCTV Camera	04 nos
2	IP Camera	04 nos
3	Digital Video Recorder (DVR)	01 nos
4	Network Video Recorder (NVR)	01 nos
5	BNC/Video Balun	08 nos
6	CAT 5/CAT 6 and Co-axial Cable	04 pair
7	Electric wire	1 box (305M)
8	AC/DC Power adapter	04 nos
9	VGA/HDMI cable	02 nos
10	Network Switch-8 Ports	3/4 nos
11	Hard Disk	02 nos
12	RJ45 Connector	10 nos
13	Router (Wireless)	01 nos

14	Monitor (PC/TV)	01 nos
15	Drill Machine	01 nos
16	Wireless Series Camera	02 nos
17	Pin, Clip, Scraw, Tie, Tape and necessary items	-
18	Power connection	08 nos
19	Wired Mouse	02 nos
20	Internet connection	At least 10 Mbps
21	Time Attendance Access Point Device	01 nos
22	Computer	01 nos
23	Smart phone for remote access	01 nos
24	Safety glubs	40 pair
25	Remote Access Software from specific company (SMART PSS, IVMS, CLOUD SEE ETC)	-
26	Remote Access Application from specific company (DMSS,HIK-CONNECT,CLOUD SEE,V380,IMOU,EZVIZ ETC)	-
27	Others	-

**RECOMMENDED BOOKS:**

SL	Book Name	Writer Name	Publisher Name & Edition
01.	Digital Video Surveillance and Security	Anthony C. Caputo	Elseiver
02.	Security Engineering	Ross Anderson	Wiley
03.	Closed Circuit Television Third Edition	Joe Cieszynski	Elseiver
03	Digital CCTV	Emily Harwood	Elseiver

**WEBSITE REFERENCES:**

SL	Web Link	Remarks
1	<a href="https://www.dahuasecurity.com/support/training/eLearning">https://www.dahuasecurity.com/support/training/eLearning</a>	
2	<a href="https://en.wikipedia.org/wiki/Surveillance">https://en.wikipedia.org/wiki/Surveillance</a>	
3	<a href="https://en.wikipedia.org/wiki/Closed-circuit_television">https://en.wikipedia.org/wiki/Closed-circuit_television</a>	
4	<a href="https://en.wikipedia.org/wiki/Dynamic_Host_Configuration_Protocol">https://en.wikipedia.org/wiki/Dynamic_Host_Configuration_Protocol</a>	
5	<a href="https://www.google.com/">https://www.google.com/</a>	
6	<a href="https://www.youtube.com/">https://www.youtube.com/</a>	

Subject Code	Subject Name	Period per Week		Credit
28566	Web Development Project	T	P	C
		0	3	1

<b>Rationale</b>	This is an occupational-specific subject in the curriculum for diploma in engineering courses required to enable the graduate to use and work with ICT competently. It includes web technology and industry requirements, UI/UX and markup language, Responsive website, and framework, Client-side scripting language and framework, server-side scripting language and framework, data manipulation language, Content Management System (CMS), E-commerce, domain and hosting, web security, and Search Engine Optimization(SEO). This will ensure the successful completion of intricate web development projects. Additionally, they will develop competencies in project management, collaborative teamwork, and problem-solving.
<b>Learning Outcome</b>	<p><b>After undergoing the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Prepare project proposal</li> <li>2. Plan projects</li> <li>3. Allocate resource of a project</li> <li>4. Prepare timeline of a project</li> <li>5. Develop a project</li> <li>6. Evaluate the project</li> <li>7. Perform collaboration and documentation of a project.</li> </ol>

### List of the projects:

At least one project should be chosen by a particular group (Not limited to):

- Library Management System
- Student Result Management System
- Institute Management System
- Ticket Booking System
- Hotel Management System
- E-commerce with Inventory Management System
- Hospital Management System
- Learning Management System
- Accounts Management System
- Content Management System
- Attendance Management System
- Any other online system that will provide solutions for practical situations.

## DETAILED SYLLABUS (PRACTICAL)

SL.	EXPERIMENT NAME	Class (3 Period)	Marks (Continuous)
1	<b>Prepare concept paper for the project</b> 1.1 Identify the projects. 1.2 Select the projects from list of the project. 1.3 Assess technical, operational, and economic feasibility. 1.4 Identify potential risks and mitigation strategies. 1.5 Interpret project concept paper 1.6 Prepare project concept paper	1	2
2	<b>Develop a plan of the project</b> 2.1 Conduct interviews, surveys, and research to gather user and system requirements. 2.2 Illustrate the scope and features of the Project. 2.3 Identify technologies, tools, and frameworks for development. 2.4 Develop a technical architecture and infrastructure plan. 2.5 Allocate human resources, including roles and responsibilities. 2.6 Prepare plans for hardware, software, and other resources. 2.7 Develop a detailed project schedule with major milestones. 2.8 Identify dependencies and potential risks. 2.9 Prepare estimates, project costs for development, testing, and deployment. 2.10 Develop a budget plan.	1	2
3	<b>Design the Project</b> 3.1 Create a detailed system design based on requirements. 3.2 Develop wireframes and mockups for user interfaces. 3.3 Prepare the Data Flow Diagram(DFD) of the proposed system. 3.4 Prepare Entity Relationship Diagram(ERD) of the Project. 3.5 Design the database schema and relationships. 3.6 Prepare plans for data storage and retrieval. 3.7 Interpret the overall system architecture. 3.8 Prepare plans for scalability and maintainability. 3.9 Develop the Graphical User Interface (GUI) elements.	2	3
4	<b>Write program code for the project</b> 4.1 Implement the user interfaces based on the design. Use HTML, CSS (Bootstrap), and JavaScript, possibly with a frontend framework (e.g., React or Vue). 4.2 Develop the server-side logic. e.g., Nodejs (Express.js), PHP (Laravel, CodeIgniter), Python(Django), CMS(WordPress). 4.3 Implement database interactions and server functionalities. 4.4 Apply SEO techniques to the project. 4.5 Integrate frontend and backend components. 4.6 Conduct testing during integration to identify and fix issues. 4.7 Setup version control system (Git, SVN) to manage code. 4.8 Apply project management tools like Jira, Asana, Trello etc.	3	6



SL.	EXPERIMENT NAME	Class (3 Period)	Marks (Continuous)
5	<p><b>Test and debug of the project</b></p> <p>5.1 Test individual components and functions. (PHPUnit, Mocha, Pytest, Selenium, Apache JMeter)</p> <p>5.2 Apply automated testing tools.</p> <p>5.3 Verify the interactions between different modules.</p> <p>5.4 Test data flow and system behavior.</p> <p>5.5 Conduct testing with actual users to ensure the system meets with expectations.</p> <p>5.6 Gather feedback for improvements.</p> <p>5.7 Identify and fix any issues during testing.</p>	2	2
6	<p><b>Deploy the project</b></p> <p>6.1 Select Domain and Perform Hosting.</p> <p>6.2 Configure the production server and database.</p> <p>6.3 Set up security measures.</p> <p>6.4 Migrate data from the development environment to the production environment.</p> <p>6.5 Conduct a final round of testing in the production environment.</p> <p>6.6 Ensure all functionalities work as expected.</p> <p>6.7 Deploy the Project to the live environment.</p> <p>6.8 Monitor for any issues during and after deployment.</p> <p>6.9 Provide support for users and address any issues that arise post-deployment.</p>	2	2
7	<p><b>Perform the maintenance and monitoring of the project</b></p> <p>7.1 Implement monitoring tools to track system performance.</p> <p>7.2 Optimize as needed for improved efficiency.</p> <p>7.3 Provide ongoing support for users.</p> <p>7.4 Identify bugs or issues that arise.</p> <p>7.5 Implement updates and enhancements based on user feedback and changing requirements.</p> <p>7.6 Plan for future iterations or releases.</p>	1	2
8	<p><b>Prepare project documentation</b></p> <p>8.1 Complete all documentation, including technical documentation and user manuals.</p> <p>8.2 Conduct a project review to evaluate successes, challenges, and lessons learned.</p> <p>8.3 Obtain client or user acceptance.</p> <p>8.4 Prepare a project closure report summarizing the entire project life cycle.</p> <p>8.5 Submit the project document</p> <p>8.6 Present the project with power point presentation</p> <p>8.7 Display the project outcome.</p> <p>8.8 Archive project documentation for future reference.</p>	2	2
9	<p><b>Review the project for future plan</b></p> <p>9.1 Review the project</p> <p>9.2 Identify the Limitation of the project</p> <p>9.3 Prepare further development plans if essential</p>	1	2

SL.	EXPERIMENT NAME	Class (3 Period)	Marks (Continuous)
10	<b>Prepare a project summary</b> 10.1 Check the output based on objectives 10.2 Demonstrate technical proficiency 10.3 Adhere to best practice 10.4 Develop team effort 10.5 Ready for deployment 10.6 Develop learning experience	1	2
	<b>Total</b>	<b>16</b>	<b>25</b>

**NECESSARY RESOURCES (TOOLS, MATERIALS, EQUIPMENTS AND MACHINERIES):**

SL	Item Name	Quantity
1	Computer	As per required
2	Software	As per required
3	Hardware tools	As per required
4	Internet Connection	As required

**WEBSITE REFERENCES:**

SL	Web Link	Remarks
1	<a href="https://figma.com">https://figma.com</a>	UI Design
2	<a href="https://www.google.com">https://www.google.com</a>	Search here with given link
3	<a href="https://www.youtube.com">https://www.youtube.com</a>	Search here with topics
4	<a href="https://www.smartdraw.com">https://www.smartdraw.com</a>	For DFD design
5	<a href="https://code.visualstudio.com">https://code.visualstudio.com</a>	Code Editor
6	<a href="https://www.apachefriends.org/download.html">https://www.apachefriends.org/download.html</a>	PHP, MySQL(MariaDB)
7	<a href="https://www.djangoproject.com">https://www.djangoproject.com</a>	For Python Stack
8	<a href="https://phpunit.de">https://phpunit.de</a>	PHP Unit
9	<a href="https://www.000webhost.com">https://www.000webhost.com</a>	Free Domain and Hosting

**RECOMMENDED BOOKS:**

SL	Book Name	Writer Name	Publisher Name & Edition
1	Beginning HTML, XHTML, CSS, and JavaScript	Jon Duckett	Wrox 1st Edition
2	Beginning PHP, Apache, MySQL Web Development	Michael K. Glass, Yann Le Scouarnec, Elizabeth Naramore, Gary Mailer, Jeremy Stolz, Jason Gerner	Wrox 1st Edition
3	Beginning JavaScript and CSS Development with jQuery	Richard York	Wrox 1st Edition
4	Web Engineering	Gerti Kappel, Birgit Proll, Siegfried Reich, Werner Retschitzegger	John Wiley & Sons