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: 66

5TH SEMESTER

(Effective from 2022-2023 Academic Sessions)

DIPLOMA IN ENGINEERING CURRICULUM
COURSE STRUCTURE
(PROBIDHAN-2022)
TECHNOLOGY NAME: COMPUTER SCIENCE & TECHNOLOGY (85)
(5th SEMESTER)

Sl. No.	Subject		Period Per Week		Credit	Marks Distribution						
						Theory Assessment			Practical Assessment			Grand Total
	Code	Name	Theory	Practical		Continuous	Final	Total	Continuous	Final	Total	
1	25841	Accounting	2	-	2	40	60	100	-	-	-	100
2	28551	Application Development Using Java	2	3	3	40	60	100	25	25	50	150
3	28552	Web Design & Development-II	1	6	3	20	30	50	50	50	100	150
4	28553	Computer Architecture & Microprocessor	3	3	4	60	90	150	25	25	50	200
5	28554	Data Communication	3	3	4	60	90	150	25	25	50	200
6	28555	Operating System	2	3	3	40	60	100	25	25	50	150
7	28556	Project Work-I	-	3	1	-	-	-	25	25	50	50
Total			**13**	**21**	**20**	**260**	**390**	**650**	**175**	**175**	**350**	**1000**

Subject code	Subject Name	Period per week		Credit
		T	P	C
25841	Accounting	2	0	2

Rationale	All diploma graduate will work in any insttution or organization or will be an employer this subject knowledgable skill and attitude will health the studies to make appropriate decision for their professional life. This subject will cover the topics like informationtechnology, Evaluation of an organization, journal entry system,cash book analysisand Income Tax.
Learning Outcome (Theoretical)	After undergoing the subject, student will be able to: ▪ Describe accounting concept ▪ Describe transaction analysis ▪ Describe accounting entry system. ▪ Explain the accounts of debit and credit ▪ Interpret the journal entry system. ▪ Evalute the balance of ledger. ▪ Describe the cash book analysis. ▪ Evaluate of trial balance ▪ Expain the financial statement ▪ Describe income tax assesment.

Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
1.	**CONCEPT OF ACCOUNTING** 1.1 Define accounting. 1.2 State the objectives of accounting. 1.3 State the advantages of accounting. 1.4 State the necessity and scope of accounting.	2	3
2.	**TRANSACTION ANALYSIS** 2.1 Define transaction. 2.2 Define business transaction. 2.3Describe the Characteristics of Transaction. 2.4Discuss the different types of Transaction.	2	3
3.	**ENTRY SYSTEM OF ACCOUNTING** 3.1 Define single and double entry system. 3.2 Discuss the principles of double entry system. 3.3 Justify whether double entry system is an improvement over the single-entry system. 3.4 Distinguish between single entry and double entry system of accounting	1	3
4.	**CONCEPT OF ACCOUNTS** 4.1 Define accounts. 4.2 State the objectives of accounts. 4.3 Illustrate different type of accounts. 4.4 State the golden rules of accounting. 4.5 State the rules for debit and credit in each class of accounts. 4.6 Define accounting cycle.	2	3
5.	**JOURNAL ENTRY SYSTEM** 5.1 Define journal. 5.2 State the objective of journal. 5.3 Mention the various names of journal. 5.4 Prepare the form of journal entry system. 5.5 Solve the problem related journal entry system.	4	10
6.	**LEDGER** 6.1 Define ledger 6.2 Interpret the form of ledger 6.3 Distinguish between journal and ledger 6.4 Explain “ledger is called the king of all books of accounts” 6.5 Prepare ledger from given transaction	2	3
7.	**CASH BOOK ANALYSIS** 7.1 Define cash book. 7.2 Classifycash book. 7.3 Explain cash book as both journal and ledger. 7.4 Explain the different types of discount. 7.5 Prepare different types of cash books from given transactions showing balances.	4	10
8.	**TRIAL BALANCE ANALYSIS** 8.1 Define trial balance. 8.2 State the objective of a trial balance. 8.3 Mentiion the reasonnon-agreement of trial balance. 8.4 Prepare trial balance from given balance.	3	3
9.	**FINAL ACCOUNTS**	10	20

	9.1 State the components of final accounts 9.2 Distinguish between trial balance and balance sheet 9.4 List the items to be posted in the trading account profit and loss account and the balance sheet 9.5 Prepare trading account profit and loss account and balance sheet from the given trial balance and other information		
10.	**INCOME TAX** 10.1 Define income tax. 10.2 State the objective of income tax. 10.3 Classify of assesses. 10.4 State the Taxable income of assesses. 10.5 Describe the Tax rebate. 10.6 Describe ther Income tax year, assessment year and National Board of Revenue (NBR).	**2**	**2**
	Total	**32**	**60**

REFERENCE BOOKS

SL	Book Name	Writer Name
1.	Book-Keeping & Accounting	Prof. Gazi Abdus Salam
2.	Principles of Accounting	Hafiz uddin
3.	Cost Accounting	Prof. Asimuddin Mondol
4.	হিসাবরক্ষন ও হিসাববিজ্ঞান	পরেশ মন্ডল
5.	উচ্চ মাধ্যমিক হিসাববিজ্ঞান	হক ও হোসাইন
6.	আয়কর	ওয়ালীউল্লাহ

Subject Code	Subject Name	Period per Week		Credit
28551	Application Development using Java	T	P	C
		2	3	3

Rationale	Java is a multi-platform, object-oriented, and network-centric language. It is a fast, secure, reliable programming language for coding everything from mobile apps and enterprise software to big data applications and server-side technologies. The aim of this course is to introduce advanced programming and practice on java components. After completion of the course, students will be able to develop well-organized and complex computer programs using java components. This course is essential for achieving practical knowledge on managing data on web, developing powerful GUI, user friendly interface, and developing various real life applications.
Learning Outcome (Theoretical)	After Completing the course, students will be able to: ▪ Interpret concept of Class, Object and Method ▪ Describe Object oriented programming pillars ▪ Explain String and Character ▪ Describe the exceptions handling in Java ▪ Explain database connectivity with Java Programs ▪ Describe event handling mechanisms ▪ Describe web application using Java Servlet and Java Server Pages technology.
Learning Outcome (Practical)	After undergoing the subject, students will be able to: ▪ Execute program using class, object and method ▪ Develop program using inheritance and polymorphism ▪ Execute program using string and characters ▪ Handle the exceptions of Java programming ▪ Connect database using Java programs through JDBC ▪ Use Swing Components ▪ Use servlet Components ▪ Develop Phonebook and basic calculator using java programming

Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
1.	**CLASS AND OBJECT** 1.1 Define Class, Object and Method 1.2 Describe the declaration (Syntax) of Class, Object and Method in Java 1.3 State the procedure to assign the object reference variable 1.4 Describe Creational Design Pattern in Java	**3**	**6**
2	**METHOD** 2.1 Mention the process of adding method to a Class 2.2 Describe method overloading in Java 2.3 Describe constructor method 2.4 Compare between overloaded method and overridden method 2.5 Explain instance variable hiding and garbage collection	**3**	**6**
3	**OOP in JAVA** 3.1 Describe the pillars of Object Oriented Programming (OOP) in Java 3.2 Explain different types of inheritance 3.3 Explain the implementation procedure of interface 3.4 Describe run time polymorphism 3.5 Mention the uses of abstract class and final keyword	**4**	**10**
4	**STRINGS AND CHARACTERS** 4.1 State character, character constant and string with example 4.2 Mention the string constructors used in Java 4.3 Mention the Java string methods with example 4.4 Differentiate between string and string buffer in Java 4.5 Explain Java string buffer class with constructors and capacity	**3**	**6**
5	**EXCEPTION HANDLING** 5.1 Define error, exception and exception handling with example 5.2 Mention the advantages of Java exception handling 5.3 State hierarchy of Java exception classes 5.4 State different types of Java exception 5.5 Discuss the Keywords used in Java exception handling 5.6 Mention the common scenarios of Java exception 5.7 Describe exception handling approaches with example	**3**	**6**
6	**JAVA DATABASE CONNECTIVITY**	**4**	**6**

	6.1 State Java Database Connectivity (JDBC) 6.2 Mention the importance of JDBC 6.3 Discuss the common JDBC Components 6.4 Mention the types of JDBC Drivers 6.5 Discuss the steps of java program and database connectivity 6.6 Explain JDBC Statements		
7	**SWING** 7.1 Define Java Swing with example 7.2 State the main features of Java Swing 7.3 Discuss the Swing Components with example 7.4 Discuss Swing Packages in Java 7.5 Mention the hierarchy of Java Swing Classes	**4**	**6**
8	**SERVLET** 8.1 Define Servlet with example 8.2 Mention the application of Servlet 8.3 Discuss the Components of Servlet Architecture 8.4 Describe the life cycle of a Servlet 8.5 Discuss the different method of Servlet 8.6 Describe session management and cookies in Servlet	**4**	**6**
9	**EVENT HANDLING** 9.1 Explain event handling with example 9.2 Mention the types of event handling in Java 9.3 Discuss the ways of event handling in Java 9.4 State delegation event model 9.5 Describe event sources and event listeners of delegation model 9.6 Discuss the event handling classes 9.7 Define annotation with example 9.8 Discuss the uses of different types of annotations	**4**	**8**
10	**TOTAL**	**32**	**60**

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	**EXECUTE JAVA PROGRAMS USING CLASS, OBJECT AND METHOD** 1.1 Write a program using class, object and method	1	2

	1.2 Compile and debug the program 1.3 Execute the program 1.4 Observe the result 1.5 Maintain the record of Performed Job.		
2	**EXECUTE JAVA PROGRAMS USING INHERITANCE** 2.1 Write a program using inheritance 2.2 Compile and debug the program 2.3 Execute the program 2.4 Observe the result 2.5 Maintain the record of Performed Job.	**1**	2
3	**EXECUTE JAVA PROGRAMS USING INTERFACE** 3.1 Write a program using interface 3.2 Compile and debug the program 3.3 Execute the program 3.4 Observe the result 3.5 Maintain the record of Performed Job.	1	2
4	**DESIGN A FORM USING JAVA PROGRAMMING** 4.1 Write code to design a form using components textbox, text field, checkbox, buttons, list and handle various events related to each component 4.2 Compile and debug the program 4.3 Execute the program 4.4 Observe the result 4.5 Maintain the record of Performed Job.	2	2
5	**PERFORM JAVA PROGRAMS FOR DATA VALIDATION** 5.1 Write code for data validation on different field 5.2 Compile and debug the program 5.3 Execute the program 5.4 Observe the result 5.5 Maintain the record of Performed Job.	1	1

6	**PERFORM JAVA PROGRAMS FOR DATA PERSIST TO DATABASE** 6.1 Write code for data persist to database 6.2 Compile and debug the program 6.3 Execute the program 6.4 Observe the result 6.5 Maintain the record of Performed Job.	1	2
7	**DEVELOP LOGIN SYSTEM OF AN APPLICATION USING JAVA** 7.1 Write code for login system 7.2 Compile and debug the program 7.3 Execute the program 7.4 Observe the result 7.5 Maintain the record of Performed Job.	1	2
8	**ACESSS DATA FROM DATABASE AND DISPLAY ON APPLICATION USING JAVA** 8.1 Write code to get data from database and display on application 8.2 Compile and debug the program 8.3 Execute the program 8.4 Observe the result 8.5 Maintain the record of Performed Job.	1	2
9	**UPDATE AND PERSIST INFORMATION IN DATABASE USING JAVA** 9.1 Write code for update and persist information in database 9.2 Compile and debug the program 9.3 Execute the program 9.4 Observe the result 9.5 Maintain the record of Performed Job.	1	1

10	**DELETE INFORMATION FROM DATABASE USING JAVA** 10.1 Write code for deleting information from database 10.2 Compile debug the program 10.3 Execute the program 10.4 Observe the result 10.5 Maintain the record of Performed Job.	1	1
11	**SEARCH AND DISPLAY INFORMATION IN APPLICATION** 11.1 Write code for searching and displaying information in application 11.2 Compile and debug the program 11.3 Execute the program 11.4 Maintain the record of Performed Job.	1	2
12	**DEVELOP A PHONEBOOK** 12.1 Write code to design a form of phonebook 12.2 Compile, debug and execute the code of designed form 12.3 Write code for different options of phonebook 12.4 Compile, debug and execute the code for different options of phonebook 12.5 Maintain the record of Performed Job.	2	3
13	**DEVELOP BASIC CALCULATOR** 13.1 Write code to design a form of basic calculator 13.2 Compile, debug and execute the code of designed form 13.3 Write code for different options of basic calculator 13.4 Compile, debug and execute the code for different options of basic calculator 13.5 Maintain the record of Performed Job.	2	3
	Total	**16**	**25**

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

Sl.	Item Name	Quantity
01	Computer with JDK 1.8 or above, any IDE for Java Programming such as NetBeans, Eclipse, JCreator	Each item 25 no's
02	Databases like Oracle, mySQl, Access or any other	Each item 25 no's

Reference Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
01	The Complete Reference of Java	Herbert Schildt	McGraw Hill, 7th Edition
02	JAVA How to Program	P.J. Deitel and H.M. Deitel	Pearson College Div, 9th Edition
03	Core Java	Cay S. Horstmann and Gary Cornell	Pearson, Publication, 3rd Edition
04	Effective Java	Joshua Bloch	Addison-Wesley Professional
05	অ্যাডভান্সড জাভা প্রোগ্রামিং	আ ন ম বজলুর রহমান	দ্বিমিক প্রকাশনী
06	জাভা প্রোগ্রামিং এ টু জেড	ড. মোক্তার হোসেন	সিসটেক পাবলিকেশন্স

Website References:

Sl.	Web Link	Remarks
01	https://www.w3schools.com/java/	
02	https://www.javatpoint.com/java-tutorial	
03	https://www.programiz.com/java-programming	

Subject Code	Subject Name	Period per Week		Credit
28552	Web Design and Development -II	T	P	C
		1	6	3

Rationale	This is an occupation specific subject for diploma in Engineering courses required to enable the graduates to use and work with ICT competently. It includes client-side scripting language framework, dynamic website and framework, Content Management System (CMS), E-Commerce, domain and hosting, web security and Search Engine Optimization(SEO). This course also enables a graduate to adopt further study in upper level courses using IT and other sectors. This course is designed emphasizing on teaching and learning practical aspect rather than theory.
Learning Outcome (Theoretical)	**After undergoing the subject, students will be able to:** ▪ Describe dynamic website and framework. ▪ Explain Content Management System (CMS). ▪ Interpret e-Commerce. ▪ Explain domain and hosting. ▪ Illustrate client-side scripting language framework. ▪ Interpret web security and Search Engine Optimization (SEO).
Learning Outcome (Practical)	After undergoing the subject, students will be able to: ▪ Prepare dynamic website using framework. ▪ Construct dynamic website using CMS. ▪ Construct e-commerce website using e-commerce solution. ▪ Deploy website. ▪ Prepare website using client-side scripting language framework. ▪ Maintain web security. ▪ Perform web analytics. ▪ Maintain website.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	**Client Side Scripting Language Framework** 1.1 State Document Object Model (DOM). 1.2 Describe the manipulation of DOM. 1.3 State Client-Side framework. 1.4 Describe different client-side framework. 1.5 Explain JavaScript runtime environments.	**2**	**6**
2	**DYNAMIC WEBSITE AND FRAMEWORK** 2.1 State dynamic website. 2.2 Mention the characteristics of dynamic website. 2.3 Differentiate between static website and dynamic website. 2.4 Define framework. 2.5 Describe different types of framework. 2.6 Explain DML and DDL for database.	**3**	**6**
3	**CONTENT MANAGEMENT SYSTEM (CMS)** 3.1 State Content Management System (CMS) 3.2 List the features of CMS 3.3 Mention the advantages and disadvantages of CMS 3.4 Define cPanel. 3.5 State cPanel components. 3.6 Define dashboard. 3.7 Describe dashboard components.	**3**	**4**
4	**E-Commerce** 4.1 Define E-Commerce . 4.2 State the features of E-Commerce . 4.3 Describe the structure of E-Commerce . 4.4 State E-Commerce payment systems. 4.5 State security standard for E-Commerce .	**2**	**4**
5	**Domain and Hosting** 5.1 Define domain, sub-domain and add-on domain. 5.2 Describe domain registration process. 5.3 Describe the functions of BTCL & BTRC. 5.4 Define web hosting. 5.5 Describe the web hosting process. 5.6 State the hosting server. 5.7 State HTTP, SSL, HTTPs, TLS and AV filtering.	**3**	**4**

6	**Web Security and Search Engine Optimization (SEO)** 6.1 State web security. 6.2 Describe security threats for web with reason. 6.3 Explain website security model. 6.4 State hacker with classification. 6.5 State Search Engine Optimization(SEO). 6.6 Explain different types of SEO techniques.	**3**	**6**
	Total	**16**	**30**

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	**Develop Website Using Client-Side Scripting Language Framework** 1.1. Plan dynamic features 1.1.1.***Run time environment*** is installed and configured. ***Run time environment***: Node.js, Express.js, React Js, Angular Js, Vue JS. 1.1.2.Purpose of website are identified. 1.1.3.Design requirements and constraints are identified. 1.1.4.A conceptual idea is developed. 1.1.5.Necessary software installed and checked according to requirement. 1.2. Develop web application using framework 1.2.1.***Framework*** is selected and installed. ***Framework***: Angular JS, React JS. 1.2.2.Project structure is prepared as per framework guideline. 1.2.3.Structure, element tags, necessary files are added to meet client requirements 1.2.4.Attributes are assigned according to client requirements 1.2.5.Content are added to site as per requirement. 1.2.6. Content are formatted in accordance with client requirements following legislation issues. 1.3. Test Web application 1.3.1.Project is tested according to testing criteria. 1.3.2.Project is opened in a variety of common browsers. 1.3.3.Accessibility, readability, legibility and appearance are checked in accordance with client requirements. 1.3.4.Project is evaluated for suitability as per client requirement	4	8
2	**DEVELOP DYNAMIC WEBSITE USING FRAMEWORK** 2.1 Follow OSH practices 2.1.1 Safe work practices are observed as according to workplace procedures. 2.1.2 OSH hazards and incidents are reported to	4	6

	appropriate personnel according to workplace procedures. 2.1.3 Turn on your PC properly. 2.2 Plan Project 2.2.1 Purpose of project are identified. 2.2.2 Design requirements and constraints are identified. 2.2.3 A conceptual design is developed. 2.2.4 Necessary software installed and checks all requirements. 2.3 Develop web application using framework 2.3.1 ***Framework*** is selected and installed as per project plan. **Framework :** Struts 2, Laravel, Symfony, Django, dotNetCore/ ASPNetCore, CakePHP 2.3.2 Project structure is prepared as per framework guideline. 2.3.3 ***Content*** are added to site. **Content:** Product information, Company information, Copyright and disclaimer notices, Site map, Frequently asked questions, Customer information, Instructions, Feedback mechanisms, Reference pages, GDPR, Ratings/ rankings/ testimonials/quotes from reviews. 2.3.4 Content is formatted in accordance with client requirements following ***legislation*** issues. ***Legislation***: Copyright Act, National Cyber Policy, Intellectual Property Rights law, GNU, GPL, CMS rules, Subsequent amendments 2.4 Perform test 2.4.1 Website is tested according to the testing criteria. 2.4.2 Website is opened in a variety of common browsers. 2.4.3 Accessibility, readability, legibility and appearance are checked in accordance with client requirements. 2.4.4 Website is evaluated for suitability as per client requirement.		
3	**DEVELOP DYNAMIC WEBSITE USING CMS** 3.1 Plan CMS project 3.1.1 Purpose of website are identified. 3.1.2 Design requirements and constraints are identified. 3.1.3 A conceptual ***design*** is developed. ***Design***: .psd, InDesign, image. 3.1.4 Necessary software is installed and checked as per requirement. 3.2 Develop CMS project 3.2.1 ***CMS (Content Management System)*** is selected and installed. ***CMS (Content Management System):*** Django CMS, WordPress, Joomla, Drupal, DotNetNuke, SiteCore 3.2.2 Project structure is prepared as per CMS guideline.	4	6

	3.2.3 Structure, element tags, necessary files are added to meet client requirements. 3.2.4 Attributes are assigned according to client requirements. 3.2.5 Content are added to site also formatted in accordance with client requirements and be aware of ***legislation.*** ***Legislation***: Copyright Act, National Cyber Policy, Intellectual Property Rights law, GNU, GPL, CMS rules, Subsequent amendments. 3.2.6 CMS plugin is installed and configured as per requirement. 3.3 Perform test 3.3.1 Website is tested according to the ***testing criteria.*** ***Testing criteria***: Compatibility, Functionality, Any errors, Log in. 3.3.2 Website is opened in a variety of common ***browsers.*** ***Browsers***: Google Chrome, Microsoft Edge, Opera, Safari, Mozilla Firefox. *3.3.3* Accessibility, readability, legibility and appearance are checked in accordance with client requirements. *3.3.4* Website is evaluated for ***suitability*** as per client requirement***.*** ***Suitability***: Purpose, Target audience, Specifications.		
4	**Develop E-Commerce Website Using E-Commerce Solution** 4.1 Plan E-Commerce features and payment method 4.1.1 Purpose and intended uses of shopping system are identified. 4.1.2 Payment methods are identified. 4.1.3 Demo purchased is demonstrated. 4.1.4 E-Commerce business model is developed to meet client requirement. 4.2 Integrate E-Commerce solution and payment method 4.2.1 ***E-Commerce solution*** is identified, evaluated and selected. ***E-Commerce solution***: WooCommerce, Drupal Commerce, J2store, BigCommerce, Shopify, Opencart, Magento. 4.2.2 e-Commerce solution is integrated as per selected solution. 4.2.3 ***Payment methods*** are implemented. ***Payment methods***: PayPal, Credit Card, Strip, SSLCommerz, Nagad, Bkash, Surjopay, , Ekpay, Echalan. Developer Sandbox(To free access different payment method) 4.2.4 Solution is developed as per online shopping, security standard. 4.3 Test shopping system	4	6

	4.3.1 Shopping cart is tested. 4.3.2 Website is tested according to the testing criteria. 4.3.3 Website is opened in a variety of common ***browsers.*** ***Browsers***: Google Chrome, Edge, Mozilla Firefox, Opera, Safari. 4.3.4 ***Accessibility*** readability, legibility and appearance are checked in accordance with client requirements. ***Accessibility:*** Cultural awareness, Physical impairments, Remote locations. 4.3.5 Website is evaluated for suitability as per client requirement.		
5	**Deploy Website** 5.1 Identify requirements for hosting server 5.1.1 Business, technical and security requirements of server are identified. 5.1.2 Version control is identified and verified. 5.2 Configure server and repository 5.2.1 Hosting space size, bandwidth and back-up options are selected in accordance with project requirements. 5.2.2 Appropriate web application server is chosen. 5.2.3 ***Security options*** are chosen in accordance with client requirements. ***Security options***: SSL, Trust client, AV filtering. 5.2.4 Name server is assigned properly with the domain name. 5.2.5 Virtual website or folder is created and mapped with domain. 5.2.6 The entire site is deployed into virtual folder. 5.2.7 Local work pushed to ***repository***. ***Repository***: Git, TFS, SVN. 5.3 Perform speed optimization 5.3.1 Test web speed using site ***testing tools*** and prepare plan according to the report. ***Testing tools***: GTmetrix, Google page speed insights, PINGDom tools. 5.3.2 HTTP (Hypertext Transfer Protocol) requests is minimized. 5.3.3 Files are minified and combined. 5.3.4 Asynchronous loading is used for CSS (Cascading Style Sheets) and JavaScript files. 5.3.5 JavaScript loading is deferred. 5.3.6 Server response time is reduced. 5.3.7 Right hosting option is selected as per project requirement. 5.4 Perform test 5.4.1 Website testing is performed at live. 5.4.2 Website is tested according to the testing criteria. 5.4.3 Website is opened in a variety of common browsers. 5.4.4 Accessibility, readability, legibility and appearance are	4	6

	checked in accordance with client requirements. 5.4.5 Website is evaluated for suitability as per client requirement		
6	**MAINTAIN WEB SECURITY** 6.1 Plan security requirements 6.1.1 Common and specific ***security threats*** are identified as per Open Web Application Security Project (OWSAP). ***Security threats:*** Injection, Broken authentication, Sensitive data exposure, XML External Entities (XXE), Broken access control, Security misconfigurations, Cross Site Scripting (XSS), Insecure deserialization, Using components with known vulnerabilities, Insufficient logging and monitoring. 6.1.2 Security measure to be added to a website is identified. 6.1.3 Security model is developed to meet standard requirements. 6.2 Implement security measure 6.2.1 Security model is implemented. 6.2.2 Database security is ensured as per model requirement. 6.2.3 Web security is ensured as per model requirement. 6.2.4 Hosting server is configured to ensure security of hosting server. 6.3 Monitor, report and fix security threat 6.3.1 Security logs are checked, and performance is monitored. 6.3.2 Security status is reported as per standard. 6.3.3 Based on security report solution is implemented. 6.3.4 Install and test a website by OWASP ZAP.	4	6
7	**PERFORM WEB ANALYTICS** 7.1 Plan SEO model 7.1.1 Purpose and intended uses of website are identified. 7.1.2 The common search engines are analyzed, and search patterns are identified. 7.1.3 SEO best practices are identified. 7.1.4 Target domain and verticals are identified. 7.1.5 SEO model is developed to meet client requirements. 7.2 Apply SEO techniques to website 7.2.1 SEO techniques are listed to maintaining standards meet client requirement. 7.2.2 SEO ***techniques*** are applied. ***Techniques:*** Standards typography, Robot.txt accessibility, Sitemap, Breadcrumb. 7.2.3 Analytical engine user is created and be aware of legislation. 7.3 Perform content optimization 7.3.1 Meta title, Meta description and keywords are	4	6

	identified and optimized. 7.3.2 SEO-Friendly URL is identified and optimized. 7.3.3 ***Heading tags*** are identified and optimized. ***Heading tags:*** H1,H2,H3, H4,H5,H6. 7.3.4 Page content is optimized. 7.3.5 ***Image SEO*** is performed. ***Image SEO:*** Image Alt attribute, Image file name, Image description, Image title, Image size, Image format, EXIF data. 7.3.6 Anchor text is identified. 7.3.7 Internal and external links are identified and optimized. 7.4 Select web traffic monitoring tools 7.4.1 Selected site analytic software is installed according to vendor requirements. 7.4.2 The required report options are identified with reference to organizational requirements and website architecture. 7.4.3 A traffic-monitoring plan is developed. 7.4.4 Necessary software installed and checked ***all requirements.*** ***All requirements:*** Fair speed internet connectivity, Google account. 7.5 Monitor and report web traffic. 7.5.1 ***Traffic monitoring tool*** is configured. ***Traffic monitoring tool:*** Uptime robot, Data doc, Site24X7. 7.5.2 Required traffic reports are specified according to information requirements. 7.5.3 Reports are analyzed to identify improvements to server/site performance. 7.5.4 Forecasting methodologies are applied to predict traffic peaks.		
8	**Maintain Website** 8.1 Perform troubleshooting's 8.1.1 Maintenance related ***security issues*** are identified and listed. ***Security issues***: SQL Injection, Broken authentication, Sensitive data exposure, XML External Entities (XXE), Broken access control, Security misconfigurations, Cross Site Scripting (XSS), Insecure deserialization, Using components with known vulnerabilities, Insufficient logging and monitoring, Version update. 8.1.2 Test is performed to make sure that site is work correctly. 8.1.3 ***Technical troubleshooting*** is carried out to pinpoint the root of the problem. ***Technical troubleshooting***: Version check, Latency check, User acceptance test, down time minimize.	4	6

	8.1.4 Site re-design is conducted as per organization requirement. 8.2 Perform administrative work 8.2.1 Site maintenance is performed as per schedule. 8.2.2 Site security is confirmed. 8.2.3 Liaising with ***other*** is ensured for appropriate product selection and performance. ***Other:*** Another department, Vendor. 8.2.4 Content strategy and updates is maintained 8.2.5 Work with content creators for optimized site. 8.2.6 Site is promoted through various advertising channel.		
	Total	**32**	**50**

Necessary Resources (Tools):

Sl	Name of the Tools
01	VS Code, Visual Studio, phpstrom, atom, Eclipse, Sublime Tex
02	XAMPP, WAMPP, MAMP, IIS
03	FileZilla
04	Git Bash, gitlab.com (for hosting source code), github.com (for hosting source code)
05	Node JS, Next JS (for react JS)
06	JIRA, Bit Bucket
07	DBeaver, MSSQL Server Management Studio, MySQL Workbench

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
01	Head First PHP and MysQL: ABrain Friendly Guide 1st Edition	Lynn Beighley and Michael Morrison	O'Reilly Media
02	Struts 2 in action	Donald Brown, Chad Michael Davis and Scott Stanlick	
03	Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites	Robin Nixon	O'Reilly Media
04	Laravel Documentation 5.8 Version Part-1	Robert Bruce	Independently Published
05	Web Design With HTML, CSS, JavaScript and jQuery Set 1st Edition	Jon Duckett.	Wiley
06	Eloquent JavaScript, 3rd Edition A Modern Introduction to Programming	Marijn Haverbeke	No Starch Press
07	PHP Objects, Patterns, and Practice	Matt ZandStra	Apress

Website References:

Sl	Web Link	Remarks
01	https://www.w3schools.com	
02	https://owasp.org/www-project-top-ten/	
03	https://www.codecademy.com	
04	https://www.freecodecamp.org	
05	https://www.ibm.com/topics/software-testing	
06	https://www.guru99.com/software-testing.html	
07	https://www.reactjs.org	
08	https://www.stackoverflow.com	
09	https://www.laravel.com	
10	https://www.wordpress.org	
11	https://www.vuejs.org	
12	https://www.angularjs.org	
13	https://www.php.net	

<table>
<tr><th>Subject Code</th><th>Subject Name</th><th colspan="2">Period Per Week</th><th>Credit</th></tr>
<tr><td rowspan="2">28553</td><td rowspan="2">Computer Architecture & Microprocessor</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>3</td><td>4</td></tr>
<tr><td>Rationale</td><td colspan="4">Diploma-in-Engineering students are required to acquire the knowledge and skill on the area of Computer Architecture and Microprocessor with Assembly Language Programming. Student must know about Computer Architecture to know how machines are designed, built, and operate. Knowing what's inside and how it works will help to design, develop, and implement applications better, faster, cheaper, more efficient, and easier to use. Student must know about Microprocessor to perform arithmetic and logic operations, provides temporary memory storage, and times and regulates all elements of the computer system.</td></tr>
<tr><td>Learning Outcome (Theoretical)</td><td colspan="4">After completing the subject, students will be able to:
- illustrate the architecture Simple As Possible computer (SAP-1)
- describe the basic structure of Computer Architecture
- interpret basic design of a 4-bit CPU
- memory organization and I/O system of a computer
- features & architecture of 8086 Microprocessor
- Write assembly language programming using 8086 processor code
- describe memory interfacing system of 8086 Microprocessor
- illustrate I/O interfacing system of 8086 Microprocessor
- interpret the features and specification of advanced microprocessor families.</td></tr>
<tr><td>Learning Outcome (Practical)</td><td colspan="4">After undergoing the subject, students will be able to:
- design and perform 4-bit 2’s complement adder/subtractor
- perform two functions Logic unit
- implement 4-bit two functions ALU
- develop and run 8086 assembly language programs for arithmetic, logical, branching and looping operation
- develop and run 8086 assembly language programs for data transfer operation
- develop and run 8086 assembly language programs for creating delay operation and 2’s complement operation</td></tr>
</table>

Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
1	**Architecture of Simple As Possible computer (SAP-1)** 1.1 Define computer architecture 1.2 Describe architecture of Simple As Possible computer (SAP-1) 1.3 Describe function of control bits of SAP-1 Controller/Sequencer 1.4 Describe function of each instruction of SAP-1 computer 1.5 Write basic programs using SAP-1 instruction	5	10
2	**Basics of Computer Architecture** 2.1 Describe organization of Stored-program Computer system 2.2 Describe basic instruction types 2.3 Explain Expanding and Huffman op-code Encoding techniques 2.4 Compare between RISC and CISC 2.5 State different techniques of Parallel processing 2.6 Describe architecture of General register, accumulator-based and Stack based processor	4	12
3	**Basics of CPU design** 3.1 Interpret basic function of ALU and Control unit 3.2 Describe a typical CPU model 3.3 Explain the design of 4-bit General Register and 4-bit Parallel Adder 3.4 Discuss simple organization of a 4-bit Arithmetic unit 3.5 Discuss simple organization of a two function Logic unit 3.6 Explain the design structure of a 4-bit ALU 3.7 Describe the instruction interpretation and instruction sequencing of control unit 3.8 Illustrate Hardwired & Microprogramming approach for control unit design 3.9 Describe the techniques of coprocessor interfacing	5	12
4	**Memory organization and I/O system** 4.1 Illustrate Centralized and Distributed memory organization 4.2 Design a 4K x 4 RAM using four 1K x 4 RAM chips 4.3 Describe the working principle of four platters Electro-mechanical memory device 4.4 Explain the memory organization of Cache memory 4.5 State basic concept of Programmed I/O, Interrupt I/O and DMA system	4	8
5	**Architecture of 8086 Microprocessor** 5.1 State evaluation up to 64 bit of microprocessor 5.2 Distinguish between microprocessor and microcontroller 5.3 Mention the general features of 8086 microprocessor 5.4 Describe the architecture of 8086 microprocessor 5.5 Describe the pin diagram with function of each pin of 8086 microprocessor 5.6 Illustrate maximum and minimum mode of 8086 microprocessor 5.7 Describe the register structure of 8086 microprocessor 5.8 Mention the general features of 8088 microprocessor 5.9 Distinguish between 8086 and 8088 microprocessor	5	8

6	**Programming using assembly code of 8086 Microprocessor** 6.1 State Instruction Set and Addressing mode 6.2 Describe the types of Instruction with function of 8086 microprocessor 6.3 Describe the types of addressing mode of 8086 microprocessor 6.4 Explain the instruction format of 8086 microprocessor 6.5 Interpret assembler, assembler pseudo instructions and assembler directives 6.6 List the assembler directives 6.7 State the uses of SEGMENT, ENDS, ASSUME and DUP directive 6.8 Write assembly language program using 8086 instruction set	4	12
7	**Memory interfacing system of 8086 Microprocessor** 7.1 Interpret Memory Interfacing 7.2 State the necessity of Memory Interfacing 7.3 Sketch the 8086 system memory interfacing diagram 7.4 Describe even & odd address boundaries 7.5 Describe the hardware organization of the memory address space of 8086 microprocessor 7.6 Describe the memory read and write bus cycle of 8086 microprocessor	4	9
8	**I/O interfacing system of 8086 Microprocessor** 8.1 Interpret I/O Interfacing 8.2 State the necessity of I/O Interfacing 8.3 Mention features of some important interfacing chips of 8086 microprocessor 8.4 Describe the interfacing system of PPI with block diagram 8.5 Illustrate 8086 microprocessor I/O interfacing system	3	6
9	**Interrupt interface of 8086 Microprocessor** 9.1 Define interrupt 9.2 List different types of interrupts 9.3 Describe the common features of different types of interrupts 9.4 Sketch the map of interrupt vector table 9.5 Describe the external hardware interrupt interface of 8086 Microprocessor	3	4
10	**Features of advanced microprocessors** 10.1 List the names of 80x86 processors with features and brief specification 10.2 List the names of Pentium family processors with features and brief specification 10.3 Distinguished between 80X86 family and Pentium family 10.4 List the names of Multi-core processors with features and brief specification 10.5 Compare between latest multi-core processor and previous multi-core family	6	9
	TOTAL	**48**	**90**

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	**Prepare a 4-bit parallel adder** 1.1 Draw the diagram of a 4-bit parallel adder 1.2 Identify necessary tools, equipment, chips and accessories 1.3 Collect the necessary tools, equipment, chips and accessories from respective store/person 1.4 Prepare a 4 bit parallel adder 1.5 Preserve the 4 bit parallel adder for next experiment.	2	2
2	**Prepare a 2's complement 4-bit adder/subtractor** 2.1 Draw the diagram of a 4-bit adder/subtractor 2.2 Identify necessary tools, equipment, chips and accessories 2.3 Collect the necessary tools, equipment, chips and accessories from respective store/person 2.4 Prepare 2's complement 4-bit adder/subtractor 2.5 Preserve 2's complement 4-bit adder/subtractor	1	2
3	**Perform a two function Logic Unit** 3.1 Draw the diagram of a two function Logic Unit 3.2 Identify necessary tools, equipment, chips and accessories 3.3 Collect the necessary tools, equipment, chips and accessories from respective store/person 3.4 Prepare a two function Logic Unit 3.5 Preserve two functions Logic Unit for next practical	1	2
4	**Perform a 4-bit two function ALU** 4.1 Draw the diagram of a 4-bit two function ALU 4.2 Identify necessary tools, equipment, chips and accessories 4.3 Collect the necessary tools, equipment, chips and accessories from respective store/person 4.4 Prepare a 4-bit two function ALU 4.5 Preserve 4-bit two function ALU for final exam	2	2
N.B.: 8086/8088 Training kit or MASM type software or simulator or any other equivalent application can be used in order to develop and execute programs for microprocessor related experiments (For Practical No. 5 to 11)			
5	**Execute an assembly language program for solving Arithmetic problems** 5.1 Write code for solving arithmetic problems 5.2 Compile the code and debug if required 5.3 Execute the compiled code 5.4 Maintain the Record of Performed Job	1	2
6	**Execute an assembly language program for solving logical problems** 6.1 Write code for solving logical problems 6.2 Compile the code and debug if required 6.3 Execute the compiled code 6.4 Maintain the Record of Performed Job	1	2
7	**Execute an assembly language program to compute 1's or 2's complement of binary number** 7.1 Write code for computing 1's or 2's complement of binary number 7.2 Compile the code and debug if required 7.3 Execute the compiled code 7.4 Maintain the Record of Performed Job	1	2

8	**Execute program to transmit data from a microprocessor to an I/O device** 8.1 Write code for transmitting data from a microprocessor to an I/O device 8.2 Compile the code and debug if required 8.3 Execute the compiled code 8.4 Maintain the Record of Performed Job.	1	2
9	**Execute program to receive data from an I/O to the microprocessor** 9.1 Write code for receiving data from an I/O device to the microprocessor 9.2 Compile the code and debug if required 9.3 Execute the compiled code 9.4 Maintain the Record of Performed Job	1	2
10	**Execute an assembly language program/ Subroutine to produce time delays of different durations** 10.1 Write code for producing time delays of different durations. 10.2 Compile the code and debug if required 10.3 Execute the compiled code 10.4 Maintain the Record of Performed Job	1	2
11	**Execute assembly language programs that implement the branching and looping structures.** 11.1 Write code for implementing the branching and looping structures 11.2 Compile the code and debug if required. 11.3 Execute the compiled code 11.4 Maintain the Record of Performed Job	1	2
12	**Build a prototype simple computer using 8086/8088 processor with memory, I/O interface and simple I/O devices.** 12.1 Draw the diagram of a prototype simple computer 12.2 Identify necessary tools, equipment, chips and accessories 12.3 Collect the necessary tools, equipment, chips and accessories from respective store/person 12.4 Prepare a prototype simple computer 12.5 Maintain the record of performed task	3	3
	Total	**16**	**25**

Necessary Resources (Tools, Materials, Equipment and Machinery):

Sl	Item Name	Quantity
01	8086/8088 microprocessor training kit/ simulator/MASM software	5
02	Computer	5

Sl	Book Name	Writer Name	Publisher Name & Edition
01	Modern Computer Architecture	Rafiquzzaman	West Publishing Company
02	Digital Computer Electronics, 3rd edition	Albert Malvino, Jerald Brown	McGraw Hill Education
03	Microprocessor and Microcomputer Based System Design	Mohamed Rafiquzzaman	CRC Press
04	The Intel Microprocessors	Brey , Barry B	Pearson Prentice Hall
05	Microprocessor and Interfacing	Douglas V. Hall	Pearson

Website References:

Sl	Web Link	Remarks
01	www.intel.com	
02	https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/	

Subject Code	Subject Name	Period per Week		Credit
28554	Data Communication	T	P	C
		3	3	4

Rationale	Data communication is the most significant area of diploma in Computer Science & Technology. To work with data communication and networking should have the knowledge, skills and attitude of Data Communication and Transmission Basics, Transmission Media, Analog and Digital Modulation, Multiplexing Techniques, Flow control, Error detection and correction, Network model and standard, Data link layer and switching technique, Communication Devices and Protocols, Network Addressing, Wireless Communication.
Learning Outcome (Theoretical)	After Completing the subject, students will be able to: ▪ Interpret Data Communication, Transmission and Media. ▪ Explain different Modulation Techniques. ▪ Describe different Multiplexing and Switching Techniques. ▪ State Flow control, Error detection and correction. ▪ Illustrate Communication Devices, Network Protocols and Models. ▪ Discuss Network Addressing. ▪ Describe wireless Communication.
Learning Outcome (Practical)	After undergoing the subject, students will be able to: ▪ Identify Analog and Digital signals. ▪ Perform the Pulse Code Modulation signal. ▪ Identify the Network equipment and tools. ▪ Prepare Co-axial and Ethernet Cable. ▪ Perform Fiber-Optic cable Connection. ▪ Perform One-to-one connection. ▪ Observe Network Protocols and Ports. ▪ Perform Wireless Connection. ▪ Perform Local and Internet Bandwidth Testing.

Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
1	**DATA COMMUNICATION BASICS** 1.1 Define Communication. 1.2 Describe Communication Terminology. 1.3 Mention the basic elements of a Communication System. 1.4 Describe Communication System with a simple block diagram. 1.5 Define Data and Signal. 1.6 Describe different types of data signal. 1.7 Define Data communication. 1.8 Discuss importance of Data communication.	3	6
2	**DATA TRANSMISSION CONCEPTS** 2.1 Discuss Components of Data Communication. 2.2 Describe the Typical Data Communication System. 2.3 State Frequency, Wavelength, Spectrum, Bandwidth, Throughput, Propagation Speed, Propagation Time, Noise and SNR. 2.4 Differentiate between bandwidth and data rate. 2.5 Mention the different Communication Models. 2.6 Describe Unicast, Multicast and Broadcast communication models. 2.7 Describe Simplex, Half-duplex and Full duplex modes of communication. 2.8 Describe Synchronous and Asynchronous communication techniques.	4	8
3	**TRANSMISSION MEDIA AND CONNECTORS** 3.1 Define Transmission Media. 3.2 Mention the categories of transmission media. 3.3 Describe the construction of STP, UTP, Co-axial and Fiber-optic cable. 3.4 State the characteristics of STP, UTP, Co-axial and Fiber-optic cable. 3.5 State the advantages and disadvantages of STP, UTP, Co-axial and Fiber-optic cable. 3.6 Define Connectors. 3.7 Discuss connectors for different types of media.	3	6
4	**ANALOG COMMUNICATION SYSTEMS** 4.1 Define Modulation and Demodulation. 4.2 State the necessity of Modulation. 4.3 Mention the types of Modulation. 4.4 Describe AM, FM and PM with necessary waveform. 4.5 State the advantages and disadvantages of ASK, FSK, PSK and BPSK.	3	6

5	**DIGITAL COMMUNICATION SYSTEMS** 5.1 Define Digital Modulation. 5.2 Describe PCM, DM and DPCM. 5.3 Define Line Coding and Block Coding. 5.4 Mention the Line Coding Schemes. 5.5 Differentiate between Analog and Digital Modulation.	**3**	**6**
6	**MULTIPLEXING TECHNIQUES** 6.1 Define Multiplexing and De-multiplexing. 6.2 Mention the categories of multiplexing. 6.3 Define FDM, WDM, TDM and CDM. 6.4 Describe Frequency Division Multiplexing and De-multiplexing technique with block diagram. 6.5 Describe Wave Division Multiplexing and De-multiplexing technique with block diagram. 6.6 Describe Time Division Multiplexing and De-multiplexing technique with block diagram. 6.7 Compare between baseband and broadband transmission.	**5**	**9**
7	**DATA FLOW CONTROL** 7.1 Define data flow control. 7.2 Discuss the necessity of flow control. 7.3 Describe the method of flow control. 7.4 Discuss Sliding Window protocol. 7.5 Discuss Stop and Wait protocol.	**3**	**6**
8	**ERROR DETECTION AND CORRECTION** 8.1 Define Error and Error Detection in data communication. 8.2 Describe types of errors in data communication. 8.3 Describe different types of error detection techniques. 8.4 Define Error Correction. 8.5 Describe different types of error correction techniques.	**4**	**8**
9	**NETWORK MODEL AND STANDARDS** 9.1 Define OSI and TCP/IP Model. 9.2 Describe the OSI Model. 9.3 List the network devices of OSI model layer. 9.4 Describe the TCP/IP Model. 9.5 Describe the interconnection model of OSI and TCP/IP model.	**3**	**7**
10	**DATA LINK LAYER AND SWITCHING TECHNIQUE** 10.1 Define Data Link Layer. 10.2 Describe the function of data link layer. 10.3 Discuss Data Link Control protocols. 10.4 Define Switching. 10.5 Mention the types of Switching. 10.6 Describe Circuit switching, Message switching and Packet switching. 10.7 Describe advantages and disadvantages of Circuit switching, Message switching and Packet switching.	**6**	**9**

11	**COMMUNICATION DEVICES AND PROTOCOLS** 11.1 Define Communication Devices. 11.2 Describe different types of Communication Devices. 11.3 Define Protocols and Ports. 11.4 List different types of Communication Protocols and Ports. 11.5 Describe TCP, UDP, SNMP, SMTP, FTP, SFTP, HTTP, MQTT, CoAP, I2C and ARP. 11.6 Define IoT and IoT Devices with example.	**4**	**7**
12	**NETWORK ADDRESSING** 12.1 Define Network Addressing and IP Addressing. 12.2 Define MAC Address. 12.3 Define IPv4 and IPv6. 12.4 Describe the IPv4 address format of Class A, B, C, D and E with example. 12.5 Discuss Public and Private IP address. 12.6 Describe Subnet and Subnet Mask. 12.7 Describe the Subnetting for IPv4.	**4**	**6**
13	**WIRELESS COMMUNICATION** 13.1 Define Wireless Communication. 13.2 Mention the types of Wireless Communication. 13.3 Discuss the necessity of wireless communication. 13.4 Describe Radio, Microwave, Satellite, Infrared and Mobile/Cellular communication systems. 13.5 Define WiFi and LiFi. 13.6 Define CDMA and GSM. 13.7 Describe 2G, 3G, 4G and 5G.	**3**	**6**
	TOTAL	**48**	**90**

DETAILED SYLLABUS (PRACTICAL)

SL.	EXPERIMENT NAME	Class (3 Period)	Marks (Continuous)
1	**IDENTIFY THE ANALOG AND DIGITAL SIGNALS** 1.1 Identify the equipment. 1.2 Observe analog signals using oscilloscope. 1.3 Observe digital signal using logic analyzer. 1.4 Identify and record characteristics of both types of signals, such as waveform shapes and amplitude. 1.5 Maintain the record of performed task.	**1**	**2**
2	**PERFORM MODULATION AND DEMODULATION** 2.1 Use a signal generator to produce modulated signals (e.g., AM, FM). 2.2 Use a demodulator to retrieve the original signal. 2.3 Maintain the record of performed task.	**1**	**2**
3	**PERFORM PULSE CODE MODULATION SIGNAL** 3.1 Prepare the equipment and trainer board list. 3.2 Connect the equipment according to diagram. 3.3 Observe the PCM signals. 3.4 Maintain the record of performed task.	**1**	**2**

4	**IDENTIFY THE NETWORK EQUIPMENTS AND TOOLS** 4.1 Prepare the equipment list. 4.2 Identify the equipment and tools. 4.3 Recognize the characteristics chart of each equipment. 4.4 Maintain the record of performed task.	**1**	**2**
5	**PREPARE STRAIGHT-THROUGH CABLE** 5.1 Collect the necessary equipment, including Ethernet cables, RJ-45 connectors, a cable crimper, a cable tester, and a wire stripper. 5.2 Follow the T-568B wiring standard for straight-through cables. 5.3 Follow the specific steps for crimping RJ-45 connectors onto Ethernet cables. 5.4 Practice crimping Ethernet cables. 5.5 Prepare straight through cable. 5.6 Test the crimped Ethernet cables for connectivity with Cable Tester.	**2**	**2**
6	**PREPARE CROSSOVER CABLE** 6.1 Collect the necessary equipment, including Ethernet cables, RJ-45 connectors, a cable crimper, a cable tester, and a wire stripper. 6.2 Follow the T-568A wiring standard for one end and T-568B for the other. 6.3 Follow the specific steps for crimping RJ-45 connectors onto Ethernet cables. 6.4 Test the crimped Ethernet cables for connectivity with Cable Tester. 6.5 Label the cables.	**1**	**2**
7	**PREPARE COAXIAL CABLE** 7.1 Collect necessary materials, including coaxial cables and connectors. 7.2 Apply the techniques for crimping BNC or F-Type connectors onto coaxial cables. 7.3 Apply the techniques through hands-on practice. 7.4 Test the crimped cables for connectivity with "Cable Continuity Tester" or "Coaxial Cable Tester".	**1**	**2**
8	**PERFORM FIBER OPTIC CABLE CONNECTION** 8.1 Collect equipment, including fiber optic connectors, a fusion splicer, and cleaver. 8.2 Clean Fiber and free from contaminants. 8.3 Strip the protective coating from the fiber ends using a precision stripping tool. 8.4 Use a cleaver to create a flat and clean end face for each fiber. 8.5 Perform positioning the cleaved fibers in a fusion splicer and align them precisely. 8.6 Activate the fusion splicer to melt and fuse the fibers together. 8.7 Inspect the fused fiber connection for quality and cleanliness. 8.8 Check the connectivity of the fiber optic cable by transmitting a light signal through it.	**2**	**3**

9	**PERFORM ONE-TO-ONE CONNECTION** 9.1 Collect Equipment. 9.2 Identify Ethernet Ports. 9.3 Prepare Ethernet Cables. 9.4 Connect Computers with the cable. 9.5 Configure Network Settings. 9.6 Test Connectivity.	**1**	**2**
10	**OBSERVE NETWORK PROTOCOLS AND PORTS** 10.1 Use network diagnostic tools to inspect network traffic. 10.2 Identify and analyze packets transmitted using Wireshark. 10.3 Identify different application layer protocols with associated ports (e.g., TCP, UDP).	**1**	**2**
11	**CONFIGURE WIRELESS NETWORK CONNECTION** 11.1 Configure a basic wireless router with default configuration. 11.2 Connect devices (e.g., laptops, smartphones) to the wireless network. 11.3 Protect wireless network by encryption and passwords. 11.4 Test wireless connectivity and signal strength.	**1**	**2**
12	**TEST THE LOCAL AND INTERNET BANDWIDTH** 12.1 Connect computers to the local network (LAN). 12.2 Use Local Bandwidth Testing Software. 12.3 Run the local bandwidth test using the software to measure the speed of data transfer within the local network. 12.4 Connect computers to the Internet. 12.5 Identify Online Bandwidth Testing Tool. 12.6 Run the Internet Bandwidth Test. 12.7 Observe local and internet bandwidth results. 12.8 Identify affecting factors of LAN and WAN bandwidth 12.9 Observe different bandwidth testing for local network (e.g., file transfers) and on the internet (e.g., streaming, online gaming).	**1**	**2**
	Total	**16**	**25**

NECESSARY RESOURCES (TOOLS, EQUIPMENT AND MACHINERY):

SL	Item Name	Quantity
1	Oscilloscope	05 Nos
2	Function Signal Generator	05 Nos
3	Network tool box	10 Nos
4	Ethernet Cable	01 box (305 m)
5	RJ 45 connector	300 Nos
6	Wire Stripper	10 Nos
7	Screwdriver (if needed to open computer cases)	10 Nos
8	Crimping tool	10 Nos
9	Cable tester	10 Nos
10	Router (Wireless)	05 Nos
11	Network Switch	05 Nos
12	Desktop PC	25 Nos
13	Internet connection	
14	LAN Connection	
15	Web Browser	
16	Network speed testing software (e.g., Speed test, LAN Speed Test)	
17	Wireshark /Packet Tracer Software	

RECOMMENDED BOOKS:

SL	Book Name	Writer Name	Publisher Name & Edition
01.	Data Communications and Networking	Behrouz A. Forouzan	McGraw Hill 5th Edition
02.	DATA COMMUNICATION & NETWORKING	YEKINI N. ASAFE ADEBARI F. ADEBAYO BELLO OLALEKAN	Computer Engineering Department Yaba College of Technology Lagos Nigeria
03.	Data and Computer Communications	William Stallings	10th Edition

WEBSITE REFERENCES:

SL	Web Link	Remarks
1	**General Data Communication:** - [Wikipedia:](https://en.wikipedia.org/wiki/Data_communication) - [GeeksforGeeks:](https://www.geeksforgeeks.org/data-communication-computer-networks/) -[Tutorials Point:] (https://www.tutorialspoint.com/data_communication_computer_network/index.htm) - [Cisco:](https://www.cisco.com/c/en/us/solutions/enterprise-networks/data-communication.html) - [Microsoft Docs](https://docs.microsoft.com/en-us/previous-versions/windows/it-pro/windows-server-2008-R2-and-2008/cc773263(v=ws.10))	Explore these resources to gain a comprehensive understanding of data communication concepts and principles.
2	**OSI Model:** - [GeeksforGeeks:](https://www.geeksforgeeks.org/osi-model/) - [Tutorials Point:] (https://www.tutorialspoint.com/osi_model/osi_model_introduction.htm) - [Cisco:](https://www.cisco.com/c/en/us/solutions/enterprise-networks/osi-model.html) - [Microsoft Docs:](https://docs.microsoft.com/en-us/windows/win32/secauthn/osi-model)	Click on the relevant links to access in-depth information on OSI Model.
3	**Wireless Communication:** - [GeeksforGeeks:](https://www.geeksforgeeks.org/wireless-communication/) - [Tutorials Point:] (https://www.tutorialspoint.com/wireless_communication/wireless_communication_introduction.htm) - [Cisco:](https://www.cisco.com/c/en/us/solutions/enterprise-networks/wireless.html) - [Microsoft Docs:](https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/iot-wireless/overview)	Click on the relevant links to access in-depth information on wireless communication.
4	**Other Useful Resources:** - [IETF (Internet Engineering Task Force)](https://www.ietf.org/)	Use these links to access additional resources and

	- [RFCs (Request for Comments) documents](https://www.ietf.org/rfc.html) - [Microsoft Docs](https://docs.microsoft.com/en-us/)	references related to data communication.
5	www.youtube.com	Search here with topics
6	www.google.com	Search here with topics

Subject Code	Subject Name	Period per Week		Credit
28555	Operating System	T	P	C
		2	3	3

Rationale	Diploma in Engineering Level students are required to acquire the knowledge skill and attitude on the area of system software with emphasis the basic concept of operating system software, Computer System Structure, control and manage the operating system. The process management systems including threads, scheduling, synchronization and deadlocks. The memory management including main and virtual memories, memory allocation, paging and segmentation. The storage management including file- system interface, mass storage structure and I/O systems. To configure and customize the Windows and LINUX Operating System in the based on network & distributed file systems.
Learning Outcome (Theoretical)	After Completing the subject, students will be able to: • State History and evaluation of Computer Operating System. • Interpret Basic concepts of operating system. • Illustrate Operating System Structure, control and manage the computer system. • Explain Process management. • Describe Memory management. • Discuss storage management. • State Installation process of Windows and Linux based Operating system. • Describe Windows and Linux commands and utilities. • Explain Distributed Systems, File system and Linux fundamentals. • State the procedure to configure and customize Windows and LINUX Operating System.
Learning Outcome (Practical)	After undergoing the subject, students will be able to : • Install Windows Operating System. • Install VMWare and Create Virtual Machines. • Install Linux operating system in VMWare environment. • Create Partition and Directories of Linux Operating System. • Create partition to a Hard disk using fdisk. • Perform the task to Use GRUB boot loader. • Perform Linux Operating System environment. • Perform basic Linux commands and utilities. • Perform bash (shell system). • Perform the operation of file systems, disks and other derives. • Manage the users account. • Perform text editors. • Perform printing in Linux. • Perform Process System Calls.

Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
1.	**General features of operating system** 1.1 Define Operating System. 1.2 Describe the functions of operating system. 1.3 Describe Kernel concept. 1.4 List the different types of computing environments. 1.5 Define Traditional Computing, Mobile Computing, Distributed Systems, Client-Server Computing, Peer to Peer Computing, Virtualization, Cloud Computing and Real Time Embedded System. 1.6 Describe the evolution of operating system. 1.7 Explain the role of operating system as an extended machine and as a resource manager. 1.8 Define Open Source Operating System, Multiuser, Multitasking and GUI.	2	**7**
2	**Operating system structure** 2.1 Define Operating System Services. 2.2 Describe User and Operating System Interface. 2.3 Define System Calls and System Programs. 2.4 Describe Types of System Calls. 2.5 Describe Design and Implementation process of Operating System. 2.6 State Simple Structure, Layered Approach, Microkernels, Modules, Hybrid Systems, Mac OS X, iOS and Android operating system.	**3**	**6**
3	**Batch processing system** 3.1 Define batch processing system. 3.2 Describe the method of batch processing system. 3.3 State the disadvantages of batch processing. 3.4 Describe the uses of job control language for operating system. 3.5 Describe the process of spooling.	**3**	**5**
4	**Process management and Threads** 4.1 Define Process, Threads and Process Scheduling. 4.2 Describe the process state with diagram. 4.3 Differentiate between process and program. 4.4 Describe the importance of process controls. 4.5 Explain the process Scheduling and scheduling queues. 4.6 Describe Communication in Client Server Systems.	**4**	**6**
5	**Process scheduling** 5.1 Define CPU Scheduling. 5.2 Describe the Scheduling criteria. 5.3 Mention the different scheduling algorithm.	**5**	**7**

	5.4 Describe FCFS – First come first serve, SJF – Shortest job first, RR- Round Robin, and Priority scheduling algorithm. 5.5 Define Multiple-Processor Scheduling. 5.6 State CPU and I/O burst cycle, CPU Scheduler and Dispatcher.		
6	**Deadlocks** 6.1 Define Deadlock, Preemptable and Non-Preemptable resources. 6.2 Mention the Necessary conditions of Deadlocks. 6.3 State the methods for Handling Deadlocks. 6.4 Describe the Deadlock Prevention. 6.5 Explain the Deadlock avoidance with algorithm. 6.6 Describe the Deadlock detection algorithm. 6.7 Explain the recovery process of Deadlock.	**3**	**6**
7	**Memory Management Technique** 7.1 Mention the function of memory management. 7.2 Describe the Single / Multiple partition schemes. 7.3 Explain fixed memory partition with separate / single input queue. 7.4 Explain the external and internal fragmentation. 7.5 Define re-locatable and dynamically re-locatable partition allocation. 7.6 Describe Swapping. 7.7 State the segmented allocation and segmented page. 7.8 Define virtual memory and demand paging.	**4**	**6**
8	**Storage and I/O System** 8.1 State Mass Storage System. 8.2 Describe Disk Structure, Attachment and Scheduling. 8.3 Define RAID Structure. 8.4 State the Characteristics and principle of I/O hardware. 8.5 Describe the role of operating system in I/O operation. 8.6 State the I/O aspects of operating System. 8.7 Describe the goals of I/O software. 8.8 Describe the function of each layer of I/O system.	**3**	**6**
9	**File system** 9.1 Mention the concept and attributes of file. 9.2 Describe the basic file operation. 9.3 State file pointer, file open count and disk location of file. 9.4 Mention the file types with common features. 9.5 Define file system. 9.6 Describe the organization of file system. 9.7 State the features of general file system. 9.8 Describe the free space management of disk space. 9.9 Describe the allocation methods of disk space.	**3**	**6**
10	**DOS, Windows, UNIX and Linux Operating system** 10.1 Mention the different operating system. 10.2 Describe the features of DOS, Windows, UNIX and Linux. 10.3 State the advantages and disadvantages of DOS and	**2**	**5**

	Windows Operating System. 10.4 State the advantages and disadvantages of Linux Operating System. 10.5 Comparison among DOS, Windows and Linux Operating System. 10.6 State the Future trends of operating system.		
	TOTAL	**32**	**60**

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	**Install Windows Operating System** 1.1 Follow workplace health and safety – OSH. 1.2 Install and configure Windows Operating System. 1.3 Follow necessary steps to configure Basic Desktop Experience. 1.4 Configure Network. 1.5 Perform popular Windows Commands and configure network by CMD. 1.6 Install and configure third party application. 1.7 Perform necessary steps to analyze running processes and to destroy any process. 1.8 Write a report.	2	2.5
2	**Install VMWare and Create Virtual Machines** 2.1 Install and configure VMWare Player/Workstation. 2.2 Perform necessary steps to configure Virtual Machines. 2.3 Configure multiple virtual machines. 2.4 Configure virtual network system. 2.5 Write a report.	**1**	1.5
3	**Install Linux operating system in VMWare environment** 3.1 Follow workplace health and safety – OSH. 3.2 Identify the purpose and functions of operating system. 3.3 Install and configure Operating system. 3.4 Set Boot sequence, Root password, Drive selection for installation, Drive partitioning, Necessary Packages. 3.5 Use Necessary command to up Network card, Configure Browsers. 3.6 Use Basic Command for customization. 3.7 Write a report.	1	1.5
4	**Create Partition and Directories (Linux Operating System)** 4.1 Create Partition as per requirements. 4.2 Create Directories as per specifications. 4.3 Set Directories and file permission.	1	1.5

	4.4 Perform Copy and move operation. 4.5 Mount External Drive as per specifications. 4.6 Create Users and group as per instruction. 4.7 Identify and Unpack Utility package. 4.8 Write a report.		
5	**Create partition to a Hard disk using fdisk** 5.1 Perform fdisk command for partition. 5.2 Delete the partition. 5.3 Create partitions. 5.4 Change the partition type. 5.5 Display the partition table. 5.6 Write a report.	1	1.5
6	**Use GRUB boot loader** 6.1 Boot the computer with GRUB. 6.2 Change or Add boot options (Temporarily or permanently). 6.3 Add a new GRUB boot image. 6.4 Write a report.	1	1.5
7	**Observe Linux Operating System environment** 7.1 Log on into the Linux & Familiar with the Desktop. 7.2 Check the home folder & Change the preferences. 7.3 Configure the panel/desktop. 7.4 Use the GNOME desktop, Megacity window manage and GNOME Panel. 7.5 Use menu, Add applet, application launcher and drawer. 7.6 Change panel properties. 7.7 Choose and use KDE desktop. 7.8 Write a report.	1	1.5
8	**Perform basic Linux commands and utilities** 8.1 Use the command options to modify the basic function of Linux commands. 8.2 Use two or more Linux commands in tandem by using input and output redirection. 8.3 Use the parameters with Linux commands. 8.4 Select and use the notational shorthand used in Linux documentation. 8.5 Use the Linux online man pages and help facilities. 8.6 Use the wildcards & Check the environmental variables. 8.7 List the processes running on the Linux system. 8.8 Destroy the processes. 8.9 Write a report.	1	1.5
9	**Operate Linux file system** 9.1 Identify different type of files and directories. 9.2 Move one directory to another. 9.3 Make a new file and directory. 9.4 Move and copy files. 9.5 Remove the files and directories. 9.6 Use chown and chgrp to change file and directory	1	1.5

	ownership. 9.7 Use chmod to change the file and directory permissions. 9.8 Use gunzip command to uncompress .gz files compressed by gzip. 9.9 Write a report.		
10	**Perform bash (shell system)** 10.1 Select the most common shells used in Linux. 10.2 Enter commands into bash. 10.3 Use wildcards that bash shell supports. 10.4 Use the history command with or without options. 10.5 Apply aliases command. 10.6 Use the input/output redirection command. 10.7 Use pipeline. 10.8 Modify the bash shell. 10.9 Write a report.	1	2
11	**Perform the operation of file systems, disks and other drives** 11.1 Mount the flash / optical drives. 11.2 Make a new file system. 11.3 Unmounts the flash / optical drives. 11.4 Use tar and gzip. 11.5 Use tar command to backup files in flash / optical drives. 11.6 Write a report.	1	2
12	**Manage the users account** 12.1 Make the root (super user) suppresser accounts. 12.2 Make the user accounts. 12.3 Operate user accounts. 12.4 Add and delete users. 12.5 Delete groups. 12.6 Write a report.	**1**	**1.5**
13	**Perform text editors** 13.1 Select the text editor in Linux. 13.2 Use vi editor to enter & edit text. 13.3 Use emacs to enter & edit text. 13.4 Write a report.	**1**	**1.5**
14	**Perform printing in Linux** 14.1 Select the printer to support in Linux. 14.2 Configure the printer. 14.3 Apply lpr, lpq, lprm and lpc commands for printing documents under Linux. 14.4 Write a report.	**1**	**1.5**
15	**Perform Process System Calls** 15.1 Write a program to implement the Process System Calls. 15.2 Start the Program. 15.3 Declare PID and get the PID by using the getpid() method. 15.4 Create a child process by calling the fork() system call.	**1**	**2**

	15.5 Check if(pid==0) then print the child process id and then print the parent process value Otherwise print. 15.6 Stop the program.		
	Total	**16**	**25**

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

Sl	Item Name	Quantity
01	Updated PC/Laptop	1 Nos Per Student
02	Windows Operating System	1 Nos Per Student
03	Linux Operating System	1 Nos Per Student
04	Internet Connection	As per Required

Sl	Book Name	Writer Name	Publisher Name & Edition
01	Operating System Concepts	Silberschatz Galvin	John Wiley & Sons (Asia) Pte ltd.
02	Operating Systems	Achyut S. Godbole	Tata McGraw-Hill
03	Modern Operating Systems	Andrew S. Tanenbaum	Prentice Hall of India
04	A Computer Fundamentals	P.K.Sinha	
05	Red Hat Fedora Linux 2 bible	Christopher Negus	
06	Learning Red Hat Linux	Bill Mc Carty	

Website References:

Sl	Web Link	Remarks
01	www.tatamcgrawhill.com	
02	www.phindia.com	
03	www.tatamcgrawhill.com	
04	http//www.interestingengineering .com	
05	www.wiley.com/college/silberschatz6e/0471417432/slides/ppt	
06	www.en.wikipedia.org	
07	www.computerworld.com	
08	www.computer.howstuffworks.com	
09	www.willamstallings.com/os4e.html	
10	www.deitel.com/books/os3e/slides.html	
11	www.freeCodeCamp.org	

Subject Code	Subject Name	Period per Week		Credit
28556	Project Works -1	T	P	C
		0	3	1

Rationale	Diploma in Engineering student is required to acquire the knowledge, skills and attitude in the area of implementing project. Project work is a subject where a student will deal with various types of real-life practical problem solution. After completion of this course, student will be able to feasibility study, algorithm and flowchart development, hardware settings, project implementation, have been given more emphasis on practical aspect rather than theoretical approach.
Learning Outcome	**After undergoing the subject, students will be able to:** 1. Prepare project proposal. 2. Develop a project. 3. Prepare report.

List of the projects (At least one project should be chosen by a particular group to implement using python or java programming):

- Stickman Story
- Voice controlled car
- Fire Alarm System
- Digital Clock
- Calculator
- Password Generator
- Puzzle Games
- File Read-Write Operation
- Grocery shop billing system
- House Security System
- Project using Arduino

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	**Prepare concept note of the Project** 1.1 Identify the projects 1.2 Identify the project implementation process. 1.3 Select the projects from **list of the project.** 1.4 Interpret project concept note. 1.5 Prepare a project concept note.	2	2.5
2	**Perform Feasibility Study of the Project** 2.1 Analysis the market trend 2.2 Identify resource availability 2.3 Collect Data and Information 2.4 Analys the collected data 2.5 Present Analyze data 2.5 Maintain the record of performed task	2	2.5
3	**Prepare algorithm of the Project** 3.1 Prepare Algorithm 3.2 Develop simulation of the algorithm to achieve the target. 3.3 Maintain the record of performed task.	2	5.0
4	**Prepare process flowchart of the Project** 4.1 Interpret process Flowchart 4.2 Create the process flowchart according to algorithm 4.3 Maintain the record of performed task.	1	2.5
5	**Prepare ER Diagram of the project** 5.1 Interpret ER Diagram 5.2 Prepare the ER Diagram 5.3 Maintain the record of performed task.	1	

6	**Prepare Hardware settings /Program coding of the project** 6.1 Identify the hardware components 6.2 Prepare the hardware for the project 6.3 Develop program to implement the project 6.4 Execute the program 6.5 Maintain the record of performed task.	3	6.0
7	**Test and debug of the project** 7.1 Test the project 7.2 Find out errors or bugs 7.3 Debug the project Module 7.4 Maintain the record of performed task.	1	2.0
8	**Perform Installation and Maintenance** 8.1 Install the project module. 8.2 Follow maintenance procedure-of the project module. 8.3 Maintain the record of performed task.	1	2.0
9	**Perform the documentation of the project** 9.1 Prepare project documentation 9.2 Prepare power point presentation regarding documentation 9.4 Maintain the record of performed task.	1	2.5
10	**Submit the project** 10.1 Present the power point presentation of the project. 10.2 Submit the project document. 10.3 Display the project.	2	
	Total	**16**	**25**

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

SL	Item Name	Quantity
01	Computer	As per required
02	Software	As per required
03	Hardware tools	As per required

SL	Book Name	Writer Name	Publisher Name & Edition
01	Computer Science Project Work	Sally Fincher	Springer
02	Computer Assignment	Lorem Ipsum	

Website References:

SL	Web Link	Remarks
01	http//www.google.com	
02	http//www.youtube.com	
03	http//www.w3schools.com	
04	Kandi.openweaver.com	