NATIONAL BOARD FOR TECHNICAL EDUCATION

CURRICULUM AND COURSE SPECIFICATIONS

HIGHER NATIONAL DIPLOMA (HND)

IN

COMPUTER SCIENCE

April, 2019

GENERAL INFORMATION

Higher National Diploma

Goal and Objectives of the programme

The programme is designed to produce graduates with knowledge and skills in computing to meet the national and global manpower needs

1.2 Objectives of the programme

Graduates of this programme should be able to:

i. Manage and optimise Operating Systems
ii. Design and implement programs for solving problems
iii. Manage computer installations and ICT centres
iv. Troubleshoot Computer Installations.
v. Carry out routine maintenance of Computer facilities
vi. Setup and manage Network Systems
vii. Design and manage Database systems
viii. Expand Business Enterprise

2.0 Entry Requirements

2.2 Higher National Diploma

The minimum entry requirement into the Higher National Diploma in Computer Science is as follows:_

a) The National Diploma in Computer Science obtained from an accredited programme, with at least the lower credit pass or
b) The Nigerian certificates in Education with major in Computer Education, at not more than the merit level pass
c) CPE I of CPN with at least the lower Credit.

In addition to (a), (b) and (c) above the candidate must have acquired not less than one year post ND/NCE/PCE I cognate work experience.

In exceptional cases, ND diplomats with a pass (CGPA of 2.0-2.49) in the ND examination with two or more years of cognate experience in the specific field may be considered for admission into the HND programme.

3.0 Curriculum

3.1 The curriculum of the HND programme consists of four main components. These are:

I. General studies/education
II. Foundation courses

III. Professional courses
IV. Supervised Industrial work experience scheme (SIWES).

3.2 The General Education component shall include course in
English Language
Communication
Mathematics
Citizenship (the Nigerian Constitution),
Entrepreneurship

3.3 The General Education component shall account for not more than 15% of total contact hours for the programme.

3.4 **Foundation Courses** include courses in Mathematics, and Statistics etc. The number of hours will vary with the programmes and may account for about 10 –15% of the total contact hours.

3.5 **Professional Courses** are courses, which give the student the theory and practical skills he needs to practice his field of calling at the technical/technologists level.

3.6 **Student Industrial Work Experience Scheme (SIWES)** shall be taken during the long vacation following the end of the second semester of the first year. See details of SIWES at paragraph 8.0.

4.0 Curriculum structure

4.1 HND programme

The structure of the programme is similar to that of the ND save that the SIWES at the end of the first year is not compulsory.

5.0 Accreditation

Programme offered either at HND level shall be accredited by the NBTE before the graduates can be awarded the Higher National Diploma certificates. Details about the process of accrediting a programme for the award of the HND is available from the Executive Secretary, National Board for Technical Education, P. M. B. 2239, Kaduna, Nigeria.

6.0 Conditions for the Award of the Higher National Diploma

Institution offering accredited programme will award the Higher National Diploma to candidates who successfully completed the programme after passing the prescribed course work, examinations, diploma project and the supervised industrial work experience. Such candidates should have completed a minimum of between 72 and 80 semester credit units depending on the programme.

6.1 Unified Grading System

The unified grading system to be applied in scoring all course work, examinations, project, etc is as stated on table below:

Marked Range	Letter Grade	WEIGHTING
75 and above	A	4.0
70 – 74	AB	3.5
65 – 69	B	3.25
60- 64	BC	3.0
55 – 59	C	2.75
50-54	CD	2.50
45 – 49	D	2.25
40-44	E	2.0
Below 40%	F	0.0 0

6.2 Classification of Diplomas

The final Cumulative Grade Point Average (CGPA) shall be determined (calculated) and applied to the classification of the Higher National diploma as follows:

Class (Level of Pass)	**CGPA**
Distinction	3.50 and Above
Upper Credit	3.00 – 3.49
Lower Credit	2.50 – 2.99
Pass	2.00 – 2.49
Fail	Below 2.00

7.0 Guidance notes for Teachers teaching the programme

7.1 The new curriculum is drawn in unit courses. This is in keeping with the provisions of the National Policy on Education which stress the need to introduce the semester credit units which will enable a student who so wish to transfer the units already completed in an institution of similar standard from which he is transferring.

7.2 In designing the units, the principle of the modular system by product has been adopted; thus making each of the professional modules, when completed provides the student with knowledge and skills, which can be used for recognition of self employed or employment purposes.

7.3 As the success of the credit unit system depends on the articulation of programmes between the institutions and industry, the curriculum content has been written in behavioural objectives, so that it is clear to all the expected performance of the student who successfully completed some of the courses or the diplomats of the programme. There is a slight departure in the presentation of the performance based curriculum which requires the conditions under which the performance are expected to be carried out and the criteria for the acceptable levels of performance. It is a deliberate attempt to further involve the staff of the department teaching the programme to write their own curriculum stating the conditions existing in their institution under which the performance can take place and to follow that with the criteria for determining an acceptable level of performance. The Academic Board of the institution may vet departmental submission on the final curriculum. Our aim is to continue to see to it that a solid internal evaluation system exists in each institution for ensuring minimum standard and quality of education in the programmes offered throughout the polytechnic system.

7.4 The teaching of the theory and practical work should, as much as possible, be integrated. Practical exercises, especially those in professional courses and laboratory work should not be taught in isolation from the theory. For each course, there should be a balance of theory to practice in the ratio of about 40:60.

8.0 SIWES programme

For additional practical experience due to the dynamic nature of the programme students are encouraged to continue with self development and/or seek for IT placement. This is not mandatory.

COMPUTER SCIENCE HIGHER NATIONAL DIPLOMA

YEAR I SEMESTER I

S/N	Course Code	Course Title	L	P	CU	CH	Prerequisite
1.	COM 311	Operating System I	2	2	3	4	
2.	COM 312	Database Design I	2	2	3	4	
3.	COM 313	Computer Programming Using C++	2	2	4	4	
4.	COM 314	Computer Architecture	2	2	3	4	
5.	COM 315	Python Programming Language	2	2	4	4	
6.	STA 314	Operations Research I	2	1	2	3	
7.	STA 311	Statistics Theory	2	1	2	3	
8.	GNS 301	Use of English III	2	0	2	2	
			16	12	23	28	

COMPUTER SCIENCE HIGHER NATIONAL DIPLOMA

YEAR I SEMESTER II

S/N	Course Code	Course Title	L	P	CU	CH	Prerequisite
1.	COM 321	Operating system II	2	1	3	3	COM 311
2.	COM 322	Database Design II	2	2	3	4	COM 312
3.	COM 323	Assembly Language	2	2	2	4	COM 124
4.	COM 324	Introduction to Software Engineering	2	2	4	4	COM 311
5.	COM 325	Introduction to Human-Computer Interface (HCI).	2	1	3	3	
6.	COM 326	Mobile Application Development	2	2	3	4	
7.	COM 327	Introduction to Artificial Intelligent	2	2	4	4	
8.	GNS 302	Communication in English III	2	0	2	2	
			16	13	24	28	

COMPUTER SCIENCE HIGHER NATIONAL DIPLOMA

YEAR II SEMESTER I

S/N	Course Code	Course Title	L	P	CU	CH	Prerequisite
1.	COM 411	Web Development (PHP)	2	3	4	5	
2.	COM 412	Project Management	2	2	2	4	
3.	COM 413	Compiler Construction	2	2	3	4	
4.	COM 414	Data Communication and Networks	2	2	3	4	
5.	COM 415	Multimedia	1	4	3	5	
6.	GNS 401	Communication in English IV	2	0	2	2	
7.	EED 413	Entrepreneurship Development	2	0	2	2	
			13	13	19	26	

COMPUTER SCIENCE HIGHER NATIONAL DIPLOMA

YEAR II SEMESTER II

S/N	Course Code	Course Title	L	P	CU	CH	Prerequisite
1.	COM 422	Computer Graphics and Animation	2	3	3	5	
2.	COM 423	Expert Systems and Machine Learning	2	3	4	5	COM 324
3.	COM 424	Ethical and Professional Practice in IT	2	0	2	2	
4.	COM 425	Seminar on Emerging Technologies	2	0	2	2	
5.	COM 426	Computer Security	2	2	2	4	
6.	COM 429	Project		6	6	6	
			10	14	19	24	

Programme: (Higher National Diploma) Computer Science	**Course Code: COM 311**	**Contact Hours: 45**
Course: Operating System I	**Semester: 1**	**Theoretical: 2 hours /week**
Year: 1	**Pre-requisite:**	**Practical: 2 hours /week**
Goal: This course is designed acquaint students with knowledge of and skills in Operating System		

General Objectives: On completion of this course the student should be able to:

1. Understand Operating Systems.
2. Know the structure, functions, and philosophy of Operating Systems.
3. Understand Inter process Communication.
4. Know various Scheduling Techniques.
5. Understand Interrupt and Masking Traps.
6. Understand Operating System Kernel.
7. Know the different Operating System commands.

	Theoretical Content			**Practical Content**		
	General Objective 1.0: Understand Operating Systems.					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Evaluation**
1 - 2	1.1 Define Operating System (OS) 1.2 Explain the Evolution of OS 1.3 List the characteristic of modern OS 1.4 Explain the concept of OS (Processes, Files, System calls, Shell, Kernel, etc.) 1.5 Explain the architecture of OS (Monolithic, Micro-kernel, Layered, Kernel) 1.6 Describe mode of operations of OS 1.7 Explain OS resource management 1.8 Discuss the characteristics and features of OS	Explain operating system (OS) Explain the importance of OS, Classify OS into batch, real time, timesharing and networking.	Presentation package Multimedia Projector Internet PC loaded with virtualization software with different OS installed			Describe how to operate various OS

	1.9 Design philosophy of OS and its advantages					
	General Objective 2.0: Know the structure, functions, and philosophy of Operating Systems					
3 -4	2.1 Describe process management 2.2 Explain process description (Process, States and Process Control Block (PCB)) 2.3 Describe Process Scheduling (Types, Comparison of different scheduling policies	Explain process management Explain process description Explain different types of process scheduling Compare different process scheduling processes	Presentation package Multimedia Projector Internet			Explain the design of various OS
	General Objective 3.0: Understand Inter process Communication					
4 - 5	3.1 Define process concepts 3.2 Explain Process creation and process terminations	Explain the concepts of process Explain Process	Presentation package Multi			Explore Interprocess communication and report your observations

	3.3 Describe Inter process communication (IPC) techniques 3.4 Explain process states, process table	creation and process terminations (watt signal, semylose and deadlock) IPC techniques Explain process states, process table	media Projector PC loaded with virtualization software with different OS installed			
	General Objective 4.0: Know various Scheduling Techniques.					
6 - 7	4.1 Define CPU Scheduling 4.2 List type of scheduling 4.3 Explain CPU scheduling criteria: preemptive and non-preemptive	Explain types of scheduling: preemptive non-preemptive (running-waiting, running-ready, waiting-ready and	Presentation package Multimedia Projector PC loaded with virtualization software with different OS installed	Develop CPU/OS scheduling	Guide students to develop schedules with OS	Demonstrate how schedules can be developed with operating system. Distinguish between pages and segment

	4.4 Describe Scheduling Algorithms (First Come First Serve (FCFS), Shortest-Job-First (SJF), Priority, Round Robin (RR), Multilevel Queue (MQ), Multilevel Feedback Queue (MFQ) 4.5 Recognise: Multiprogramming, Multiprocessing, Multitasking, and Multithreading	terminate) Explain CPU Scheduling criteria (CPU utilization, Throughput, TurnAround Time, Waiting Time, Load Average, Response Time				
	General Objective 5.0: Understand Interrupt and Masking Traps					
8 - 9	5.1 Define Interrupt 5.2 List out the different types of interrupt(Hardware Interrupt and Software Interrupt) 5.3 Explain masking traps	Explain Interrupt and Masking and explain the difference between them Explain the use of interrupt vector Explain the use of masking in relation	Presentation package Multimedia Projector PC			Define interrupt vector Describe the use of interrupt vector State the use of masking in relation to interrupt

		to interrupt Explain levels of Interrupt Differentiate between S/O interrupt timers, Hardware error and programming interrupt	loaded with virtualizatio n softwa re with differe nt OS install ed			Describe traps Differentiate between traps and interrupt Explain levels of interrupt Differentiate between S/O interrupt timers, Hardware error and programming interrupt
	General Objective 6.0: Understand Operating System Kernel.					
10 - 12	6.1 Define OS Kernel 6.2 Explain different types of Kernel 6.3 State the differences between OS and Kernel 6.4 Explain the component of OS system(Kernel,	Explain OS and its components	Presen tation packa ge Multi media Projec tor PC			Demonstrate the operation of various operating systems Describe the component of OS system

	Process Execution, Interrupt, memory management, multitasking, networking, security, user interface)		loaded with virtualization software with different OS installed			
	General Objective 7.0: Know the different Operating System commands.					
13 - 15	7.1 Exemplify Shell 7.2 State commands for navigating OS (cd, ls, pwd, etc.) 7.3 State commands for exploring OS(ls, file, less,	Explain shell and commands Explain how to navigate and explore the OS Explain commands for manipulating	Presentation package Multimedia Projector	Demonstrate how to open shell and execute commands	Guide students to write and execute commands, add/remove new users, install and uninstall	Explain what shell is List different

	etc.) 7.4 State commands to manipulate files and directories (mkdir, cp, mv, rm, ln, rmdir, type, etc.) 7.5 Describe how to access OS manuals and help resources 7.6 Show how searching and redirection works are done 7.7 Describe how to work with permissions 7.8 Explain common system administration (add/remove users, install/uninstall packages, update and upgrade system)	files and directories Explain to search resources and redirect the input of one command to another using commands like ((cat, piping, uniq, wc, grep, find, head/tail, tee etc.) Explain how to work with permissions	PC loaded with virtualization software with different OS installed		packages, update, upgrade system	types of system commands according Demonstrate the use of various systems commands Demonstrate how to install and uninstall packages, update, upgrade system Explain how to get help and access OS manuals

Assessment: Give details of assignments to be used: Coursework/Assignments 10%; Course test 10%; Practical 20%; Projects %; Examination 50%

Type of Assessment	Purpose and Nature of Assessment **(COM 311)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 1 progress test for feedback.	10
Practical / Projects	To be assessed by the teacher	20
Course work/ assignment	To be assessed by the teacher	20
Total		100

Programme: Statistics (Higher National Diploma)	**Course Code: COM 312**	**Contact Hours: 5 hours/week**
Course: Database Design I		**Theoretical: 2 hours /week**
Year: 1 Semester: 1	*Pre-requisite: COM212*	*Practical: 3 hours /week*

Goal: This course is designed to introduce student to computer database

General Objectives: On completion of this course, the student should be able to:

1. Understand the organization's information need and database concepts.
2. Understand and differentiate the various types of data models
3. Understand how to model data
4. Understand the design of relational databases design
5. Understand the structured query language (SQL)
6. Understand database systems architecture

	Theoretical Content			*Practical Content*		
	General Objective 1 (COM 312): Understand the organization's information need and database concepts.					
Week	**Specific Learning Outcomes**	*Teacher's activities*	*Resources*	*Specific Learning Outcomes*	*Teacher's activities*	*Evaluation*
1	1.1 Define Database and Database System 1.2 Explain types of information need. 1.3 List purpose of database systems	State types of information which organizations use. State different purposes for database systems.	White board, PCs Networked, Multimedia, Database software and flip chart.	Design and implement various types of data base models.	Guide students to design and implement various types of database models.	Explain purpose of database system
2	1.4 Explain data view and data model 1.5 Explain database administrators, users and languages.	Explain data view and models. State different types of model. Discuss different types of database languages. Explain database administrator and users	White board, PCs Networked, Multimedia, Database software and flip chart.	Design and implement various types of data base models.	Guide students to design and implement of various types of database models.	Explain data view and data model

	General Objective 2 (COM 312): Understand and differentiate the various types of data models					
3	2.1 Explain different types of data model: hierarchical, network and relational models	Explain the basic concepts of: hierarchical, network and relational models	White board, PCs Networked, Multimedia, Database software and flip chart.	Design and implement various types of database models.	Guide students to design various types of data base models	Explain different types of data model database packages and flip chart.
4	2.1 Explain different types of data model: hierarchical, network and relational models	Explain structure data diagrams.	White board, PCs Networked, Multimedia, Database software and flip chart.	Design and implement various types of database models.	Guide student accomplish the design of various types of data base models	Give different examples of data models
	General Objective 3 (COM 312): Understand how to model data					
5	3.1 Translate the concept of E-R, entity sets,entity relationship, weak entity sets.	Describe the basic concepts of E-R Explain entity set and entity relationship diagram	White board, PCs Networked, Multimedia, Database software and flip chart.	Design and implement E-R database schema and reduction of E-R schema into table.	Guide students to design and implement E-R database schema and reduction of E-R schema into table	Explain entity set and entity relationship diagram

6	3.2 Explain E-R database schema 3.3 Describe reduction of E-R schema into tables.	Explain weak entity sets Discuss the design of E-R data base schema Explain reduction at E-R schema into tables.	White board, PCs Networked, Multimedia, Database software and flip chart.	Design and implement E-R database schema and reduction of E-R schema into table.	Guide students to design and implement E-R database schema and reduction of E-R schema into table	Explain E-R database schema Give examples of E-R database schema
	General Objective 4 (COM 312): Understand the design of relational databases design					
7	4.1 Explain pitfalls in relational-database design 4.2 Explain Decomposition and Normalization	State the pitfalls in relational database design Explain Decomposition and Normalization	White board, PCs Networked, Multimedia, Database software and flip chart.	Design and implement relational database and normalize it.	To assist students accomplish the design of relational database and normalize it.	Explain pitfalls in relational database design
8	4.3 Explain domain-key normal form 4.4 Review alternative approaches to database design.	Explain domain-key normal form. Discuss the alternative approaches to database design	White board, PCs Networked, Multimedia, Database software and flip chart.	Design and implement the design of relational database and normalize it.	Guide students to design and implement relational database and normalize it.	Explain domain key normal form

	General Objective 5 (COM 312): Understand the structured query language (SQL)					
9	5.1 Explain the background of SQL 5.2 Give the basic structure of SQL	Discuss the background of SQL Discuss the basic structures	White board, PCs Networked, Multimedia, Database software and flip chart.	Implement structure of SQL	Guide students to implement structure of SQL	Give the basic structure of SQL
10	5.3 Explain nested sub-queries 5.4 Explain derived relations and views	Explain rested sub queries Describe derived relations	White board, PCs Networked, Multimedia, Database software and flip chart.	Implement the structure of SQL	To assist student accomplish the implement's of the structure of SQL	Explain nested sub-queries
11	5.5 Explain views	Explain views Discuss how databases can be modified.	White board, PCs Networked, Multimedia, Database software and flip chart.	Demonstrate the Implementation of the structure of SQL	To assist student accomplish the implement's of the structure of SQL	Explain view
				Demonstrate	Guide	Explain

12	5.6 Explain joined relations 5.7 Explain data definition language and embedded SQL.	Discuss joined relations Explain implementation of data definition language and embedded SQL.	White board, PCs, Networked, Multimedia, Database software and flip chart.	the implementa tion of data definition language and embedded SQL	students to implement structure of SQL	data definition language and embedded SQL
	General Objective 6 (COM 312): Understand database systems architecture					
13	6.1 Define centralized systems 6.2 Explain client- server systems	Explain centralized systems Explain client server systems	White board, PCs Networked, Multimedia, Database software and flip chart.	Demonstrate database systems architecture	Assist students to demonstrate database systems architecture	Explain centralized systems
14	6.3 Exemplify parallel systems	Explain parallel systems	White board, PCs Networked, Multimedia, Database software and flip chart.	Design database systems architecture Use parallel system	Guide students to design database systems architecture	Networked PC in a lab loaded with database packages and flip chart.

15	6.4 Explain distributed systems and network types	Explain distributed systems and types networks Differentiate between distributed systems and networked systems.	White board, PCs Networked, Multimedia, Database software and flip chart.	Design database systems architecture Use distributed systems and network type	Guide students to design a database systems architecture	Explain distributed systems and network types

Assessment: Give details of assignments to be used:

Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(COM 312)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feedback.	20
Practical	At least 5 homework to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Programme: Computer Science (Higher National Diploma)	**Course Code: COM 313**	**Contact Hours: 3**
Course Title: Computer Programming Using C++	**Semester: 1**	**Theoretical:** 2 hour /week
Year: 1	**Pre-requisite: COM 113**	**Practical:** 3 hour /week
Goal: This course is designed to enable students to acquire a basic knowledge and Skills in OO Programming Using C++ Language		

General Objectives: On completion of this course the Students, should be able to:

1. Understand Basic Concept of C++ Programming Language
2. Understand the fundamentals of C++
3. Understand Input and Output of Operations in C++
4. Understand functions and libraries in C++
5. Understand Object Oriented Programming Concepts
6. Understand pointers and arrays.
7. Understand how to apply object oriented C++ programming to database development.

	Theoretical Content			**Practical Content**		
	General Objective 1: Understand Basic Concept of C++ Programming Language					
Week	**Specific Learning Outcomes**	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1	1.1 Define C++ 1.2 Explain features of C++ 1.3 Describe C++ as Object Oriented Programming Language 1.4 Explain the importance of C++	Explain what is C++ Programming Language Explain the general features of C++ Explain why C++ is Object Oriented Programming Explain the importance of C++	Software lab with C++ Compiler installed Internet access.			Explain the features of C++ List the Importance of C++

General Objective 2: Understand the Fundamental Data Types, Constants and Variables of C++						
2-3	2.1 Explain data Types and Variables 2.2 List Various types of Operation 2.3 Define Keywords, Identifier, Constants, Escape Sequence etc. 2.4 Explain Floating-point object types etc 2.5 Explain Operators for fundamental types 2.6 Explain the structure of a simple C++ program	Explain Data types , Variable Explain types of Operations Explain Keywords, Identifier, Constants etc Explain float in point object types and operator for fundamental types Illustrate the structure of simple C++ program	Text Books Internet PCs Compiler			Explain how to write simple C++ program to display a line of text. Explain the structure of simple C++ programme
	General Objective 3 Understand Input and Output Operations in C++					

4-5	3.1 Identify Input / Output Operators in C++ 3.2 Discover Input /Output with streams 3.3 Describe Cin and Cout Objects 3.4 Explain how to Input and Output data in C++	Explain input/output operation in C++ Explain input and out with streams Explain C in and out objects Enumerate how to input and output data in C++	Textbooks Lecture notes C++ Compiler Internet PCs	Demonstrate input/output operations in C++ Demonstrate how to input and output data in C++	Guide students to demonstrate input and output operations	Describe variable Explain the various methods of data Input/Output
6-7	3.5 Outline Classes, Meta class and Objects 3.6 Describe the concept of Object life time 3.7 List different types of object	Explain meta class and objects Explain concept of object life time List different types of object	Textbooks PCs C++ Compiler			Enumerate different types of objects and differences between meta class
	General Objective 4: **Understand functions and libraries in C++**					
5	4.1 Define Function 4.2 Explain Inline, Overloaded and recursive Functions 4.3 Explain Passing and Default Arguments	Explain Function and its significance in C++ Explain Inline, Overloaded and recursive functions Explain Passing and default Arguments	PCs C++ compiler	Demonstrate how to use functions	Illustrate the use of Function Guide student to understand Passing Argument	State what function and overloaded functions are Differentiate between passing and default arguments

6	4. 4 Differentiate Library Functions and uses 4.5 Explain how to use functions and libraries in programs. 4.6 Explain Programmer defined Functions and C++ inbuilt Functions	Explain Library Functions and their uses Explain how to use functions and libraries in programs. Explain Programmer defined and Inbuilt functions	Textbooks PCs C++compilers			Explain functions and libraries in programs Define programmer defined functions
	General Objective 5 : Understand Object Oriented Programming Concepts					
7	5.1 Define Classes 5.2 Explain Concept of Methods 5.3 Define Objects 5.4 Explain Member Objects 5.5 Explain how to create and use Object	Explain classes, methods, objects and member objects. Explain how to create and use objects	Networked PC lab with C++ Compiler.	Demonstrate how classes work in C++ Demonstrate how to create objects	Illustrate how to create object from Class	Explain how to create objects from classes
8	5.6 Define Constructor Methods 5.7 Explain Constructor Call Methods 5.8 Explain Inline Methods 5.9 Explain how to Compile and run a C++ Program with class and Method	Explain constructor methods, constructor call methods and inline methods Explain how to Compile and Run C++ Program	Networked Software lab with C++ Compiler.	Write program using constructor methods, constructor call methods and inline methods	Illustrate how to Compile and run C++ Program	State what constructor method and line methods

	5.9 Explain Concepts of Inheritance 5.10 Explain Concepts of Polymorphism 5.11 Explain overloading in polymorphism 5.12 Explain the type of polymorphism and show how to implement the concept in C++ program.	Explain the concept of inheritance, Polymorphism and overloading in polymorphism	Networked Software lab with C++ Compiler.	Implement Concept of Polymorphism in C++ program	Illustrate how to implement concept of polymorphism in C++ program	Explain how to implement polymorphism in C++ program
	General Objective 6: Understand Arrays and Pointers					
9	6.1 Define and Initialize Arrays 6.2 Explain Class and Member Arrays 6.3 Explain one dimensional Arrays 6.4 Explain Multidimensional Array 6.5 Explain Arrays as Arguments	Define arrays Explain class and member arrays, one dimensional arrays and multidimensional array Explain arrays as arguments	Networked Software lab with C++ Compiler. Lecture Note Presentation Package , multimedia	Write C++ program that uses arrays	Demonstrate how to implement pointers and array in C++ programs.	Explain how to implement array in C++ programs
10	6.6 Define Pointer 6.7 Explain Pointer Arithmetic 6.8 Explain Arrays of Pointer 6.9 Explain Pointers to Pointers	Explain pointer, arithmetic pointer, array pointer Explain pointers to	Networked Software lab with C++ Compiler. Lecture Note Presentation Package ,	practice how to implement pointers and array in C++ programs.	Demonstrate how to implement pointers and array in C++ programs.	Explain pointer, arithmetic pointer, array pointer

	6.10 Explain Pointers to Functions 6.11 Explain Pointers to Objects 6.12 Describe block allocation of memory as against link list	functions pointers to objects Explain block allocation of memory as against link list	multimedia			
General Objective 7 :Understand how to apply object oriented C++ programming to database development						
12	7.1 Define Database 7.2 Define relational database 7.3 Explain steps of Database Design 7.4 Explain general object-oriented design guide lines 7.5 Explain object oriented Database. 7.6 Define Object database 7.7 Explain Object database Model 7.8 Explain how to design Object database 7.9 Explain how to apply C++ in database development	Define database, relational database Explain steps of database design Explain general object-oriented design guide lines Explain general object oriented design guide lines and object oriented database Explain how to design object database	PCs C++ Compiler	design database Apply C++ in database development	Illustrate how to design database Illustrate how to apply C++ in database development	Explain what data database is and the steps of database design Define general object oriented design guide lines

Assessment: Give details of assignments to be used:

Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **COM 313**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 1 progress test for feedback.	10
Practical	At least 10 home works to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

Programme: Computer Science (Higher National Diploma)	**Course Code: COM 314**	**Contact Hours: 3**

Course Title: COMPUTER SYSTEMS ARCHITECTURE	**Semester: 1**	**Theoretical: 2 hour /week**
Year: 1	**Pre-requisite: COM 112**	**Practical: 1 hour /week**

Goal: This course is designed to enable students to acquire a basic knowledge of Computer Organization .

General Objectives: On completion of this course the Students, should be able to:

1 Introduction to Computer System

2 Understand and analyze computer systems architecture.

3 Understand Computer Arithmetic and Operations

4 Understand the design of the control unites and CPU of a processor.

5 Understand the structure of computer instruction set

6 Understand the organization of different bus systems, and their characteristics in a computer system.

7 Understand the importance, organization and management of computer memory system.

8. Understand low-level parallelism and its implementation in a processor

	Theoretical Content			**Practical Content**		
	General Objective 1: Introduction to Computer System					
Week	**Specific Learning Outcomes**	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1	1.5 Describe Brief Historical Background of computer system 1.6 Describe Architectural development and Style 1.3 Explain Technological Development 1.4 Describe Performance Measures	Explain Historical Background Explain Architectural dev. & Style Explain Technological Dev. Describe Performance Measure	Text Books Internet Multi media PCs			Describe the architectural development of Computer system

General Objective 2 Understand and analyze computer systems architecture.						
2	2.1 Explain the different functional units in a computer systems and their operations: • Input/ Output units • Arithmetic and Logic Unit • Control Unit • Memory Unit • Registers 2.2 Describe Basic processor architecture 2.4 Explain Fetch and execute cycle.	Explain : (i) different Functional Units (ii) Basic processor architecture. (iii) Fetch and execute cycle. (iv) Interrupts and MORE	PCs, connected to an OHP. presentation Package Lecture notes. White board /Marker On line lecture notes in an electronic format accessible to students	Use a simulator package to investigate how an architecture is organized and functions.	Demonstrate using an architecture simulator package to show how architecture functions.	Explain Different Functional Unit of Computer system
3	2. 5 Explain Types of Computer architecture: • Von Neumann's Architecture • Reduced Instruction Set Computers (RISC) Architecture • Complex instruction Set Computers (CISC) Architecture 2.6 Explain RISC Design Principle 2.7 Discuss Merit and Performance of RISC Architecture	Explain Von Neumann's architecture and its feature Explain RISC & CISC Evolution cycle Explain RISC design Principle Discuss merits of	Textbook, multimedia PC			Differentiate between Von Neumann's & RISC Differentiate between RISC & CISC List the Merit of RISC

		RISC & Evaluate RISC systems performance.				Explain the performance of RISC
General Objective 3 Understand Computer Arithmetic and Operations						
4	3.1 Interpret concepts Number System 3.2 Interpret Integer Arithmetic 3.3 Describe two's Complement Representation 3.4Describe two's complement Arithmetic 3.5 Explain Floating Point Arithmetic	Explain Number System Explain Two's Complement Arithmetic Explain floating-point Arithmetic	Textbooks Lecture notes Internet PCs			Describe Number system Explain the two's Complement
	General Objective 4: Understand the design of the Control Units and Processing Unit of a processor					

5	4.1 Define Control Unit 4.2 Describe the structure of control unit. 4.3 Explain Hardwired control unit 4.4 Explain the functions of a control unit. 4.5 Differentiate types of control units 4.6 Explain the design of Micro-programmed control unit.	Explain Control unit Explain the structures of control Unit Explain Hardwired Control Unit Explain type of control unit Explain the design of micro-programmed Control Unit	Textbooks Internet PCs			Explain type of Control unit State the functions of Control Unit
6	4.7 Describe CPU Basics components 4.8 Identify Register set 4.9 Identify different components of Data path 4.10 Explain CPU Instruction cycle	Explain CPU Components Explain register set Explain Data path Explain CPU Cycle	Textbook. Multimedia PC			Explain Datapath Explain CPU Instruction cycle
	General Objective 5 : Understand the structure of computer instruction set					
7	4.1 Define Instruction Set 4.2 Describe the design of computer instruction set 4.3 List types of instruction set 4.4 Describe the operation of an instruction set 4.5 Explain the instruction set of a typical computer system.	Explain Instruction set Explain the design of instruction set Explain the classification of instruction set. Explain the operation of an Explain instruction	Textbook. Multimedia PC			List different type of Instruction set

		set of a typical computer system				
8	4.6 Describe Memory Location and Operation 4.7 Explain Addressing, immediate, Direct, Indirect, Indexed modes 4.8 Enumerate merits and demerits of chart/diagrams of the above 4.7. 4.9 Explain performance Measure 4.10 Explain Instruction Types: • Data Movement Instruction • Arithmetic and logical Instruction • Sequencing instruction • Input Output Instruction 4.11 Explain how to write different program segments using types of mode and Instruction Type	Explain Memory Location and Operation Explain different modes Explain performance Measure Explain Instruction Set Demonstrate how to write program segment using type of mode and Instruction Type	Textbook, multimedia , internet White board Chart/ diagrams			Explain how to construct frequency tables and graphs Enumerate the merits and demerits of charts and diagrams
General Objective 5: Understand the organization of different bus systems, and their characteristics in a computer system						

9	5.1 Explain the Bus concept 5.2 Explain how to draw different bus architecture. 5.3 Explain the concept of single bus and multiple bus architecture. 5.4 compare and contrast different bus architecture 5.5 Explain Synchronous and Asynchronous Buses 5.6 Explain different Bus Arbitration 5.6 Explain the organization of : ISA, EISA, VESA, PCI, USB, IDE, standard interface Bus systems.	distinguish different bus types in a computer systems hardware	PC, connected to multimedia. presentation of lecture notes. White board Internet On line lecture notes in an electronic format accessible to Students			Differentiate between Synchronous and Asynchronous Buses Explain different Bus Arbitrations
General Objective 6: Understand the importance, organization and management of computer memory system.						
10	6.1 Explain the concepts of Memory Hierarchy 6.2 Explain Memory structure of a computer system. 6.3 Explain Backing store, Internal store	Explain Memory Hierarchy Explain Memory structure of a computer system. Describe Backing store, Internal store Define and Explain Cache and cache	PC, Multimedia. Presentation of lecture notes. White board On line			Describe Memory structure of a computer system

	6.4 Explain Cache Memory and layers	layer.	lecture notes			
11-12	6.5 Explain Computer registers 6.6 The purpose and function of different level of memory in the overall structure 6.7 Explain Cache Memory Organization: • Direct mapping • Full associative Mapping • Set Associative Mapping	Explain Computer registers Explain purpose and function of different level of memory in the overall structure. Explain Cache Memory Organization	PC, Multimedia. Presentation of lecture notes. White board On line lecture notes			Explain Function memory Explain Memory Mapping
	6.8 Explain the concept of Main Memory 6.9 Explain the concept of Virtual Memory. 6.10 Explain the concept of one level store. 6.11 Memory management technique: • Page • Segment • Paged Segment	Explain concept of Main Memory Explain virtual Memory Explain one level store Explain Memory mgt. techniques	PC, Multimedia presentation of lecture notes. White board On line lecture notes			Explain virtual memory Explain Memory management techniques
	General Objective 7: Understand low-level parallelism and its implementation in a processor					

13-14	7.1 Explain the concept of parallel computing 7.2 Explain how parallel computing can be achieved 7.3 Explain the benefits of parallel computing 7.4 Explain Concept of Pipelining 7.5 Explain basic pipeline for a typical computer system. 7.6 Explain Problems associated with pipeline operation 7.7 Explain Performance optimization using pipelining.	Explain how to compile and run program in different computer systems and evaluate their performances. Explain pipelining Explain Problem associated with pipeline operation	Text books PCs, Multimedia	Compile and run program	Assist students in their practical work	Explain Parallel Computing State the benefit of parallel computing Outline problems associated with pipeline operation

Assessment: Give details of assignments to be used:

Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **COM 114**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 1 progress test for feed back.	10
Practical	At least 10 home works to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

	Department/ Programme: Computer Science	**Course Code: COM 315**		**Credit Hours: 6 hours/week**
	Subject/Course: PROGRAMMING IN PYTHON			**Theoretical: 2 hours/week**
	Year: Semester:	**Pre-requisite:**	**COM**	**Practical: 4 hours /week**

General Objectives: On completion of this course, the student should be able to:

1.0 Understand the Features of Python and Powershell Program Development Environment.

2.0 Understand and work with Python Data Types.

3.0 Understand Control Structures in Python.

4.0 Understand Functions, Libraries and Modules in Python

5.0 Understand Object Oriented Concepts in Python

6.0 Understand working with Databases in Python.

7.0 Understand the Basics Data Analysis with Python.

	General Objective 1.0: Understand the Features of Python and Powershell Program Development Environment.					
Week/s	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Evaluation**
1	1.1 Explainthe main features of Python. 1.2 Explain the functions of the Python Powershellprogrammers development environment.	Describe the features of Python; It is interpreted, Object Oriented, Interactive, and a Scripting language. Explain the difference between an interpreted language and a compiled language. Explain the function of the Python Powershell development environment.	PC and a multimedia projector. Python Interpreter White board.	Assign values to numeric and string variables and display it using the Print command.	Guide students to assign values to numeric and string variables and use the Print command to display it.	What are the main features of Python programming language? What is the function of Python Powershell?
	General Objective 2.0: Understand working with Python Data Types					

2-3	2.1 Explain data types 2.2 Explain the concept of Variables, Strings, and Constants. 2.3 Explain the concept of casting 2.4 Explain Lists and Tuples 2.5 Explain Operators in Python .	Explain variables and outline the rules for creating variables Explain the Data types; Integer, Float, Complex, string, etc. Explain the concept of Casting. Discuss: Arithmetic operators Assignment operators Comparison operators Logical operators Identity operators Membership operators Bitwise operators	PC and a multimedia projector. Python Interpreter White board.	Create variables for Integers, Floating point numbers, and Strings. Assigns values to the variables. Use arithmetic, assignment, logical, and comparison operators on variables and constants. Use the constructor functions int(), float(), and str() to specify a data type on a variable. Manipulate Lists and Tuples using Len(), Append(), Insert(), Del(), Clear(), functions. Use the Tuple() method to create a Tuple and apply the Len() and Del() functions. Use the Def command to create a Function. Write a short program to call the function.	Guide students to create variables for different data types. Demonstrate how to use data types, operators, variables, and constants in Python. Guide students on how to write simple Python program to display texual or numeric output. Guide students to create and work with Lists, Tuples, and Functions.	Explain Data Types and operators. Describe Lists and Tuples.

	General Objective 3.0: Understand Control Structures in Python.					
4-5	3.1 Explain conditional statements in Python 3.2 Explain Loops in Python; For Loops, While Loops	Describe the use of conditional blocks such as IF…ELIF and ELSE Explain how FOR and WHILE loop constructs work.	PC and a multimedia projector. Python Interpreter White board.	Write programs using IF statement, using IF and ELIF construct, and using IF…ELIF…ELSE construct. Write programs that use the WHILE loop, WHILE with BREAK, WHILE with CONTINUE Write programs that use the FOR loop, FOR with BREAK.	Demonstrate the implementation of Conditional Statements. Guide students on using IF, ELIF, ELSE statements. Demonstrate the implementation of FOR and WHILE loops. Guide students on using WHILE, BREAK, and CONTINUE commands.	How does the IF statement work? Explain how FOR and WHILE loops work.
	General Objective 4.0: Understand Functions, Libraries and Modules in Python					
6-7	4.1 Explain Functions and differentiate between Library functions and User-defined functions. 4.2 List the rules for creating functions. 4.3Explain the need for	Explain Functions and function parameters. Outline the rules for creating functions	PC and a multimedia projector. Python Interpreter White board.	Use the Def command to define a function and set its parameters. Call the function. Use the Return statement to exit a function. Create a recursive function by writing a programs that creates a user-defined function which calls itself.	Guide students to: Use the Def command to define a function and set its parameters. Call the function. Use the Return statement to exit a function.	Explain Functions and function parameters.

	recursive functions. 4.4Explain modules. .	Explain Recursive functions Explain modules Explain how recursive functions work Discuss Python Library functions.		Write programs that calls built-in functions from the Python Library Write a program that is made of at least two modules.	Create a recursive function by writing a programs that creates a user-defined function which calls itself. Write programs that calls built-in functions from the Python Library Write a program that is made of at least two modules.	
	General Objective 5.0: Understand Object Oriented Concepts in Python					
7-8	5.1 Explain Object Oriented programming 5.2 Define Class and Object 5.3 Define Methods 5.4 Define Parent and Child Classes	Explain Object Oriented concepts: Abstraction, Polymorphism, Inheritance, and Encapsulation. Explain Methods and how they relate to Objects in a Class. Explain Parent Class and Child Class	PC and a multimedia projector. Python Interpreter White board.	Create a class named MyClass, with a property named x Create an object named p1, and print the value of x Create a class named Person, use the __init__() function to assign values for name and age Insert a function that prints a greeting, and execute it on the p1 object Create a Parent Class named Person, with firstname and lastname properties, and a printname method Create a class named Student, which will inherit the properties and methods from the Person class		
	General Objective 6.0: Work with Databases in Python					

9-10	6.1 List the different databases that Python API supports 6.2 Explain MySQL database commands.	List and explain the different Databases that Python API supports. Explain database operations and the syntaxes and functions of the following database command: Create Database, Create Table, Insert, Select, Where, Order by, Delete, Drop Table, Update, Join	PC and a multimedia projector. Python Interpreter White board.	Create a database named "mydatabase" using the Create Database command. Create a table named "customers" with two fields “Name” and “Address” in “mydatabase” using the Create Table command. Insert a record in the "customers" table using the Insert Into command Query the “customers” using the Select..From..Where statement Delete a record from “customers” using the Delete...From…Where statement Delete “customers” from “mydatabase” using the Drop Table statement	Guide students to: Create a database named "mydatabase" using the Create Database command. Create a table named "customers" with two fields “Name” and “Address” in “mydatabase” using the Create Table command. Insert a record in the "customers" table using the Insert Into command Query the “customers” using the Select..From..Where statement Delete a record from “customers” using the Delete...From…Where statement Delete “customers” from “mydatabase” using the Drop Table statement	
	General Objective 7.0: Understand the Basics of Data Analysis with Python					
	7.1 Explain the concept of Big Data	Explain Big Data and its	PC and a multimedia	Create a three dimensional array using the array command, assign data type to	Demonstrate the functions of NumPy	Outline the strengths of

11- 12	7.2 Outline the strengths of Python as a programming language for Big Data analysis. 7.3 Explain the functions of NumPy, Pandas, and MatplotLib libraries.	characteristics: Volume, Velocity, Variety, and Veracity. Explain why Python is a programming language that is used for Big Data analysis. Explain the functions of essential Python libraries for data analysis such as NumPy, Pandas, and MatplotLib.	projector. Python Interpreter White board.	the array using dtype argument, and check its dimension using ndim Method. Create a series using the Series() Method, print the series using a Print statement. Create a Dataframe in Pandas using the Dataframe statement and print it using the Print statement.	by creating an array using the Array function, assigning data type to the array using dtype argument, and check its dimension using ndim() Method. Demonstrate the functions of Pandas by creating a series using the Series() Method, print the series using a Print statement. Demonstrate how to create a Dataframe in Pandas using the Dataframe statement.	Python as a programming language for Big Data analysis.
13	7.4 Define Dataset and explain how it differs from a Database. 7.5 Explain the commands used for importing and exporting datasets. Give their syntaxes.	Explain the function of Datasets. Differentiate between a Dataset and Database. Explain the process of importing and exporting datasets.		Import and open a CSV file using the Import statement and the Open () function. Export CSV files using the WriteRow() function. Import data into a Python dataset using the Import statement and the Insert function.	Demonstrate how to import and open CSV files using the Import statement and the Open () function. Demonstrate how to export CSV.	

14-15	7.6 Explain the need for cleaning data in preparation for analysis. 7.7 Explain correlation and why it an important metric in data analysis. Explain unstructured and semi structured data.	Explain the process of cleaning and preparing data for analysis. Explain correlation and outline the different types of correlation. Explain unstructured and semi structured data Introduce NoSQL databases and explain features of MongoDB.		Use the Fillna() and Dropna() functions to fill missing values and drop missing values respectively in a dataset. Calculate correlation using the Corr() method. Use the pyMongo function in Pyhton to connect to MongoDB and insert, update, and delete records using the Insert(), Update(), and Delete methods.	Guide students to use the Fillna() and Dropna() functions to fill missing values and drop missing values respectively in a dataset. Illustrate how correlation is calculated using the Corr() method. Guide students to work with commands in a NoSQL database like MongoDB.	Explain unstructured and semi structured data.

Assessment: Give details of assignments to be used:

Coursework/ Assignments %; Course test20 %; Practical %; Project 20s %; Examination 60 %

Type of Assessment	Purpose and Nature of Assessment **(COM 412)**	Weighting (%)

Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 1 progress test for feed back.	20
Practical / Projects	To be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

SECOND SEMESTER COURSES

Programme: (Higher National Diploma) Computer Science	**Course Code: COM 321**	**Contact Hours: 3**
Course: Web Technology	**Semester: 2**	**Theoretical: 2 hours /week**
Year: 1	**Pre-requisite:**	**Practical: 1 hours /week**
Goal:		

General Objectives:

On Completion of this course the student should be able to:

1.0 Understand memory management technique.
2.0 Understand issues involved in virtual memory systems.
3.0 Understand file management in operating systems.
4.0 Understand processor scheduling Techniques.
5.0 Know how to deal with deadlocks simulation computing.
6.0 Understand implementation of various resource management techniques in real life operating system.

	Theoretical Content	**Practical Content**
	General Objective 1.0 Understand memory management technique.	

Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1-4	1,1 Explain Memory Management 1.2 Explain Memory Management techniques 1.3 Explain the following: • Dynamic partition • Fixed partition • Fragmentation • Simple Paging • Simple Segmentation 1.4 Explain the strength and weakness of each technique.	Explain memory Management Explain swapping, fixed partition, paging, segmentation, fragmentation, allocation, and dynamic partitioning Explain the advantages and disadvantages of the memory management techniques and Give examples of real life OS in which the techniques have been implemented.	Multimedia Projector Presentation Package Online lecture notes,	Demonstrate how to carry out memory management by – Swapping, fixed partition, paging, loading, linking, fragmentation and segmentation	Guide the students on how to carry out memory management using various techniques Guide the students to carry out memory management task	List and explain the steps involved in Memory management Explain Memory Management techniques
	General Objective 2.0 Understand issues involved in virtual memory systems.					
5-7	2.1 Explain the concept of Virtual memory in an operating system. 2.2 Explain Demand paging and Demand segmentation technique, the various page replacement algorithm, and specify the strength and weakness of each technique 2.3 Explain virtual memory	Explain Virtual memory and the need for it. Explain how virtual memory is Implemented and name the virtual memory techniques Explain the demand Paging technique. Page replacements	Multimedia Projector Presentation Package Online lecture notes,	Demonstrate and analyze the effect of virtual memory system in an operating system Demonstrate how to: Implement Various virtual	Guide students in their Investigations into virtual memory .	Explain the requirement of virtual memory management system

	paging and virtual memory segmentation	algorithm Least Recent Used (LRU), First In First Out (FIFO),Second chance, The Clock Not-recently used (NRU), optimal etc. Explain the: Advantage and disadvantages of the page replacement algorithm. Explain the strength and weakness of Virtual memory paging and Virtual memory segmentation		memory management techniques		
	General Objective 3.0 Understand file management in operating systems.					

8-9	3.1 Explain the concept of file system and its management in Operating System (OS).	Explain Files and directory. Explain common file operation e.g. creation, delete, update etc. Explain File management techniques and Security and protection mechanism on files. Explain File system (FAT, NTFS, exFAT, Hierarchical FS, HFS Plus, High Performance FS, Apple FS and UNIX FS) implementation in specific OS e.g. UNIX, LINUX, Windows, IOS, Android etc	Multimedia Projector Presentation Package Online lecture notes.		.	Explain file system and its management in OS
	General Objective 4.0 Understand processor scheduling Techniques.					
10-11	4.1 Explain Processor scheduling techniques	Explain Multi level queuing schedule. Explain the Real time active scheduling. Explain Scheduling	Multimedia Projector Presentation Package Online	Demonstrate Re-entry of codes in a processor and multi processor system	Guide students in Re-entry of codes in a processor and multi processor	Explain processor scheduling techniques

		and dispatching in a Multi-processor system. Explain the necessity of codes in a multiprocessing system	lecture notes.		system.	
	General Objective 5.0 Know how to deal with deadlocks simulation computing					
12-13	5.1 Explain Deadlock occurrence in computing and the methods of deadlock avoidance, prevention and detection.	Explain what deadlock mean and give examples of deadlock. Explain condition for deadlock. Explain method of deadlock prevention and avoidance Explain technique of Deadlock detection	Multimedia Projector Presentation Package Online lecture notes.			Explain deadlock occurrence in computing
	General Objective 6.0: .0 Understand implementation of various resource management techniques in					

	real life operating system..					
13-15	Explain Resource management techniques in Operating Systems (OS) .	Explain Implementation technique employed in managing processor, main memory, the drive and information in operating system like UNIX,LINUX Windows, IOS Android etc.	Multimedia Projector Presentation Package Online lecture notes.	Demonstrate how to carry out a comparative analysis of implemented resource management technique in two or more OS.	Guide and assist students to carry out a comparative analysis of implemented resource management technique in two or more OS.	Explain resource management techniques in OS

Assessment: Give details of assignments to be used: Coursework/ Assignments %; Course test 20%; Practical %; Project 20%; Examination 60%

Type of Assessment	Purpose and Nature of Assessment **(COM 113)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 1 progress test for feedback.	20
Practical / Projects	To be assessed by the teacher	20
Total		100

	Programme: Computer Science (Higher National Diploma)	**Course Code: COM 322**	**Contact Hours: 5 hours/week**
	Course: Database Design II		**Theoretical: 2 hours /week**
Year: 1	**Semester: 2**	**Pre-requisite: COM 312**	**Practical: 3 hours /week**

Goal: This course is designed to provide the student with further knowledge of databases and data analytics

General Objectives: On completion of this course, the students should be able to:

1. Know object oriented data model and object oriented languages.
2. Understand the design of object-oriented databases.
3. Understand file structure and physical storage
4. Understand the concept of indexing and hashing
5. Understand query processing
6. Understand the concept of transactions and concurrency control
7. Understand recovery systems
8. Understand DBMS applications

	Theoretical Content			**Practical Content**		
	General Objective 1 (COM 322): Know object oriented data model and object oriented languages					
Week	**Specific Learning Outcomes**	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1 -2	1.1 Explain object oriented data models 1.2 Explain the concept of object oriented languages. 1.3 Explain features of Object Oriented Database Management System (OODB) 1.4 List OODB packages	Explain different types of data models. Explain the concept of object oriented languages Mention different types of object oriented languages e.g. OOPascal, visual C++, PHP, Java etc. Explain Features of OODMBSare complexity, inheritance, encapsulation and persistency	White board, Multimedia Projector, DBMS Packages			Explain object oriented data model and list examples of OODB
	General Objective 2 (COM 322): Understand the design of object-oriented databases					
3-4	2.1 Explain forms, reports and triggers. 2.2 Explain Unified Modelling Language (UML)	Explain how to design forms reports and triggers in object oriented databases. Explain UML, class and activity diagram Explain use of UML in database diagram	White board, Multimedia Projector, DBMS Packages	Design of various types of forms, reports and triggers	Guide students to design of various types of forms, report and triggers	Design class and activity diagram form for a named application

	General Objective 3 (COM 322): Understand file structure and physical storage					
5	3.1 Explain physical storage media and tertiary storage devices 3.2 Explain access and organization of records, and data –dictionary. 3.3 Explain storage structure of object oriented databases	Revise the physical storage media. Discuss the various types of tertiary storage devices eg MP3, CD-rom, DVD Memory cards, tapes, flash etc Explain access mode and record organization and data-dictionary storage concept. Explain the storage structure of object oriented databases.	White board, Multimedia Projector, DBMS Packages			Discuss the various types storage devices

	General Objective 4 (COM 322): Understand the concept of indexing and hashing					
6-7	4.1 Explain the basic concepts of indexing and hashing. 4.2 Explain ordered indices 4.3 Explain B+ and B– tree index files 4.4 Explain the concept of static and dynamic hasting 4.5 Explain multiple-key access.	Explain the concepts of indexing and hashing. Discuss ordered indices Explain B+,B- tree and the concept of static and dynamic hasting. Explain multiple-key access concept.	White board, Multimedia Projector, DBMS Packages	Invoke indexing and hashing and to design record with multiple keys.	Guide students to design record indexing and hashing and to design record with multiple keys.	Compare other indexes and tree index files
	General Objective 5 (COM 322): Understand query processing					
8-9	5.1 Explain the concept of catalogue information. 5.2 Explain the selection operation 5.3 Explain sorting and join operations 5.4 Explain the evaluation of expressions 5.5 Explain the transformation of relational expressions.	Explain the concept of catalogue information. Discuss the selection, sorting and join operations Evaluate expressions and transform relational expressions.	White board, Multimedia Projector, DBMS Packages	Write and test SQL statements to perform sorting and join operations	Guide students to perform sorting and join operations	Discuss the roles of SQL statements in DB query execution

	General Objective 6 (COM 322): Understand the concept of transactions and concurrency control					
10-11	6.1 Explain transaction, transaction state, atomicity and durability 6.2 Explain concurrent executions, serializability, recoverability and isolation. 6.3 Explain transaction in SQL and texts for serializability. 6.4 Explain the concept of lock based protocols, time-stamp-based and validationbased protocols. 6.5 Understand multiple granularity,multiversion schemes and deadlock handling. 6.6 Understand the insert and delete operations 6.7 Understand concurrency in index structures	Explain transaction state, atomicity and durability. Discuss concurrent executions, serialization recoverability and isolation. Explain transaction in SQL and how to test for serializability. Discuss lock-based protocols time-strip based protocols Explain multiple granularity, multiversion schemes and deadlock handling Explain the insert and delete operations, and concurrency in index structures.	White board, Multimedia Projector, DBMS Packages	Implement the some transaction in SQL which include insert and delete operations.	Guide students to achieve some transactions in SQL which include insert and delete operations.	Discuss transaction concept and its state

	General Objective 7 (COM 322): Understand recovery systems					
11-12	7.1 Explain failure classification and storage structures. 7.2 Explain recovery system. 7.3 Explain log based recovery and shadow paging. 7.4 Understand recovery with concurrent transaction 7.5 Define buffer 7.6 Explain buffer management.	Discuss failure classification and storage structure. Explain recovery and shadow paging. Explain recovery with concurrent transaction. Explain buffer management, buffer pool, frame, replacement policy,buffer allocation Discuss various management schemes	White board, Multimedia Projector, DBMS Packages			Explain different kind of failure and list recovery schemes Explain buffer management strategies

	General Objective 8 (COM 322): Understand DBMS applications					
13-14	8.1 Explain decision support system (DSS). 8.2 Explain data analytics and data mining 8.3 Explain Data warehousing (DW) concept. 8.4 Explain concept of Big Data 8.5 Understand spatial and geographical databases 8.6 Understand multi-media databases 8.7 Explain mobility and personal data bases	Discuss DSS Discus data analytic : (descriptive, diagnostic, predictive prescriptive), data mining, Text mining, and Data mining tasks Explain data warehousing, dimensional modelling, fact table Explain spatial and geographical data bases. Discuss multimedia databases.	White board, Multimedia Projector, DBMS Packages	Design DW house for an application	Guide students to design DW	Differentiate between predictive and prescriptive analytic

Assessment: Give details of assignments to be used:
Coursework/ Assignments 10 %; Course test 10 %; Practical 20 %; Projects %; Examination 60 %

Type of Assessment	Purpose and Nature of Assessment **(COM 322)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feedback.	20
Practical	At least 5 home works to be assessed by the teacher	20
Total		100

	Department / Programme: Computer science	**Course Code: COM 415**		**Credit Hours: 5 hours/week**
	Subject/Course: ASSEMBLY LANGUAGE			**Theoretical: 2 hours/week**
	GOALS: The course is designed to enable students acquire knowledge of and skills in Assembly Language			
	Year: HND 1 Semester: 11	**Pre-requisite:**	**COM 212**	**Practical: 3 hours /week**

General Objectives: On completion of this course the student should be able to:

1.0 Understand historical development of Assembly language.

2.0 Understand the basic terms in Assembly language.

3.0 Know the Assembly language program layout.

4.0 Understand the different structural format.

5.0 Know the different addressing formats and modes.

6.0 Know the Assembler.

7.0 Know the representative groups of instructions in the instruction set.

8.0 Understand the process of testing Assembly language program and output

9.0 Understand Assembly process

	Course: Computer Science	**Course Code: COM 323**			**Credit Hours: 5 hours/week**	
					Theoretical: 2 hours/week	
	Year: HND1 Semester: 11	**Pre-requisite: COM 212**			**Practical: 3 hours /week**	
	Theoretical Content			**Practical Content**		
	General Objective 1.0: Understand historical development of Assembly language					
Week/s	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Evaluation**
1	1.1 Explain the concept of assembly language 1.2 Historical background of assembly language 1.3 The features of assembly language 1.4 The Differences between assembly language, machine language and high level language	Discuss historical background of assembly language, highlighting problem of machine language. Discuss features of assembly , machine and high level language Compare and contrast the features of Assembly Language (AL) with Machine Language (ML) and High level Language (HLL).	White board and marker pen PC Loaded with Assembler, Presentation package. Multimedia projector	Observe examples of assembly language and high level language Program and note the differences	Guide student on how to identify features of assembly language Show example of assembly language and high level language Program and note the differences	Describe the historical background of assembly language State the Differences between assembly language, machine language and high level language

	General Objective 2.0: Understand the basic terms in Assembly Language.					
2-3	2.1 Explain the meaning of operation code, operand, instruction and register. 2.2 Explain the relationship among operation code, operand and instruction. machine instruction	Explain with example basic terms in Assembly Language e.g. operation code, operands. etc Explain machine and pseudo code instruction with examples.	White board and marker pen PC Loaded with Assembler, Presentation package. Multimedia projector	Write a simple assembly language program involving operation code, operand, instruction and register. .	Guide the students in a accomplishing coding simple assembly language program	Describe the following: Operation code Operand Instruction and register
	General Objective 3.0: Know the Assembly Language programme layout.					
4-5	3.1 Explain the program layout 3.2 Explain the position of label, Assembly Language program. operation codes, operands. 3.3 Explain functions and comments. Purposes of the components •The Assembly Language of Assembly language coding forms. statement	Explain the program layout Explain the position of label, Assembly Language program. operation codes and operands Explain the functions and comments. purposes of the components •The Assembly Language coding forms.	White board and marker pen PC Loaded with Assembler, Presentation package. Multimedia projector	Write a simple assembly language program to show operation codes, operands.	Guide the students in writing and assembling a simple assembly language program	Describe program layout Describe the position of label, Assembly Language program. operation codes, operands.

	General Objective 4.0: Understand the different instructional formats					
6-7	4.1 Explain the instruction format 4.2 Explain the fields of an instruction format 4.3 Explain the function of registers. 4.4 Explain the concept of assembly linking 4.5 Explain how to link an assembly language program 4.6 Explain the function of the BIOROM and to use the INT instruction to perform basic I/O operation	Explain the instruction format Discuss various instructions format. Explain different types of instructions; register – register; register – storage; storage -storage; indexed register and immediate instruction on a specific machine. Explain the concept of assembly linking Explain how to link an assembly language program	White board and marker pen PC Loaded with Assembler, Presentation package. Multimedia projector	Write assembly language program involving instruction set	Guide the students on how to write assembly language program	Describe instruction set State the differences between the instruction sets Describe

	General Objective 5.0: Understand the different addressing formats and modes					
	Special Learning Objectives	**Teachers Activities**				
8-9	5.1 Define address format 5.2 Explain the addressing formats – zero, one two operand instruction. 5.3 Explain the different types of addressing modes: relative, absolute, register, immediate indexed and deferred.	Discuss various addressing modes. – Explain how to calculate effective addresses of various addressing modes on a specific machine. Explain with example of each types of addressing modes in 5.3.	White board and marker pen PC Loaded with Assembler, Presentation package. Multimedia projector .	Write assembly language program involving instruction set	Guide students on how use different addressing mode in an assembly program	Describe different addressing format
	General Objective 6.0 Know Assembler Directives					
10	6.1 Explain the Assembler directives and their functionality 6.2 Explain Assembler directives	Explain the Assembler directives and their functionality Explain Assembler directives with examples State the functions of Assembler such as ORG, DC, DB, EQU, RMB, END, CSEET, etc.	White board and marker pen PC Loaded with Assembler, Presentation package. Multimedia projector	Write pseudo code for an assembler program	Guide students on how to write pseudo code for an assembler program students	Describe assembly directive State their functionality
	General Objective 7.0: Know the representative groups of instruction in the instruction set.					
	Special Learning Objectives	**Teachers Activities**				
11-12	7.1 Explain instruction set 7.2 Assembly language instruction set.	Explain an instruction set. Explain arithmetic instruction addition, subtraction, multiplication and division.	White board and marker pen PC	Write assembly language program using different	Guide the students to write and run assembly language	Describe the instruction set Describe

		Explain AND, OR and exclusive OR instruction. Explain the branch instructions Explain the conditional and unconditional instruction. Explain the load and store instruction. Explain the bit manipulating instruction. Explain the move instruction and I/O instruction.	Loaded with Assembler, Presentation package. Multimedia projector	instruction set.	program using different instruction set.	conditional and unconditional instruction.

	General Objective 8.0: Understand the process of testing Assembly language program and output					
	Special Learning Objectives	**Teachers Activities**				
13-14	8.1 Explain the procedures of running an assembly language program. 8.2 Explain the assembly language output layout. 7.2 Explain different parts of assembly language output. 7.3 Explain Job control statement in the output	Explain the command sequence to assemble and run an assembly language program. . Explain assembly language output layout. Explain different parts of assembly language output. Explain how to Identify job control statement in the output	White board and marker pen PC Loaded with Assembler, Presentation package. Multimedia projector .	Write assembly language program involving different job control statement.	Guide students in writing assembly language program involving job control statement	Describe assembly language output layout.

	General Objective 9.0: Understand Assembly Processes.					
	Special Learning Objectives	**Teachers Activities**				
15	9.1 Explain different passes in an assembly process • 9.2 Explain different assembly program errors 9.3 Explain one pass two pass assembly its functions	Explain the process of Assembly. Explain with examples possibly assembly program errors. Explain errors in one pass two pass assembly process	White board and marker pen PC Loaded with Assembler, Presentation package. Multimedia projector	Write assembly language program containing one pass and two pass assembly	Guide students in writing assembly language program containing one pass two pass assembly	Identify assembly language program error Describe on and two pass assembly process.

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test 30 %; Practical %; Projects 40 %; Examination 30%

Type of Assessment	Purpose and Nature of Assessment **(COM 323)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	30
Test	At least 2 progress tests for feed back.	30
Projects	Substantial piece of work	40
Total		100

Recommended Textbooks & References:

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) COMPUTER SCIENCE			
COURSE: INTRODUCTION TO SOFTWARE ENGINEERING		**Course Code: COM 324**	**Contact Hours:4 Hours/week**
GOAL: This course is designed to provide the students with knowledge and concept of Software Engineering			
Year: 1 Semester: 2	**Pre-requisite: COM 311**	**Theoretical:**	**2 hours /week**
		Practical:	**2 hours /week**

GENERAL OBJECTIVES:

On completion of this course the student should be able to:

1.0 Understand the Fundamental of Software Engineering
2.0 Understand Software Process and Models
3.0 Understand Software Requirements
4.0 Understand Software Design Process
5.0 Understand Software Development
6.0 Understand Software Testing
7.0 Understand Software Management

PROGRAMME:HIGHERNATIONAL DIPLOMA (HND) COMPUTER SCIENCE						
COURSE: INTRODUCTION TO SOFTWARE ENGINEERING				**COURSE CODE: COM 324**		**CREDIT HOURS: 4**
YEAR 1: SEMESTER 2	**PRE- REQUISITE**			**Theoretical: 1hr Practical: 3 Hours**		
Theoretical Content				**Practical Content**		
GENERAL OBJECTIVE1.0 : Understand the Fundamentals of Software Engineering						
Week	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objectives**	**Teachers Activities**	**Evaluation**
1-3	1.1 Define Software Engineering 1.2 Explain the need for Software Engineering 1.3 Explain the characteristics of good software 1.4 Explain Software Evolution	Discuss Software Engineering and the need for it Explain the characteristics of good software Explain Software Evolution	White Board. PC loaded with Presentation package and connected to multimedia Projector Online lecture notes			What are the characteristics of good software?

	General Objective 2.0: Understand Software Process and Models					
	2.1 Explain Software Process and its activities 2.2 Explain Software generic Process model 2.3 Explain Software process models i.e. waterfall, Spiral, V-model, Rapid Application Development, Agile etc. 2.4Explain Software Prototyping and Types 2.5 Explain advantages and Disadvantages of Prototyping?	Explain Software Process, its activities and Software generic Process model Explain various software process models Explain Software Prototyping, its advantages and Disadvantages and types	White Board and marker. PC loaded with Presentation package and connected to multimedia Projector Online lecture notes	Observe and compare strengths and weaknesses of various software process models	Guide to identify and compare the strengths and weaknesses of various models	What are the strengths and weaknesses of various software process models?
General Objective 3.0: Understand Software Requirements						
4-7	3.1 Explain Requirement Engineering Process 3.2 Explain various techniques for requirements elicitation e.g. Data Flow technique, structured natural language 3.3 Explain software specification and its importance 3.4 Explain the structure of software requirements specification (SRS) documents	Explain Requirement Engineering Process Explain various techniques for requirements elicitation Explain software specification and its importance Explain the structure of software requirements specification (SRS) documents	White Board and marker PC loaded with Presentation package and connected to multimedia Projector Online lecture notes	Determine specification for systems using various techniques Create SRS Document of systems.	Give students to determine specification for systems using various techniques Assist in creating SRS Document of systems.	Demonstrate how to determine specifications and create SRS documents?

	General Objective 4.0: Understand Software Design Process					
8	4.1 Explain Software Design and its importance 4.2 Explain stages in Software design process 4.3 Explain software design tools e.g. Algorithm, UML, XML etc. 4.4 Explain Software Design Strategies	Explain Software Design and its importance Explain stages in Software design process Explain software design tools e.g. Algorithm, UML, XML etc. Explain Software Design Strategies	White Board and marker. PC loaded with Presentation package and connected to multimedia Projector Networked PCs Loaded With XML, UML	Create simple object-oriented designs of some systems using XML, UML	Guide students create simple object-oriented designs of some systems using XML and UML	Demonstrate how to use XML and UML to create simple object-oriented designs of some systems
9-10	4.5 Explain Software Design model: data/class, architectural design, interface design and component design 4.6 Explain object oriented design: classes, objects, components etc. 4.7 Explain Software Architecture and architectural styles 4.8 Explain design quality attributes e.g. cohesion, coupling, understand ability, adaptability etc. 4.9 Explain Software Design Verification	Explain Software Design model . Discuss object oriented design Explain Software Architecture, architectural styles and design quality attributes Explain Software Design Verification	White Board and marker. PC loaded with Presentation package and connected to multimedia Projector Networked PCs Loaded With XML, UML	Create object-oriented designs of some systems using XML, UML	Guide students create simple object-oriented designs of some systems using XML and UML	Demonstrate how to use XML and UML to create simple object-oriented designs of some systems

	General Objective 5.0: Understand Software Development					
11-12	5.1 Define Software Development 5.2 Explain the activities involved in software development 5.3 Explain Application Program Interface (APIs) and their uses 5.4 Explain various software Development tools and their Uses 5.5explain the process of developing software using various development tools e.g. Notepad++, PHP, Python, Visual Studio, C++, Java etc	Explain Software Development and its activities Explain APIs and uses Explain various software development tools and their Uses Explain the process of developing software using various development tools	White Board and marker. PC loaded with Presentation package and connected to multimedia Projector Networked PCs Loaded With software development tools	Develop software using suitable software development tools e.g. PHP, C++, Java etc	Guide students to develop software using suitable software development tools	What are the strengths and weaknesses of various software development tools? Demonstrate how to develop software using suitable software development tools
	General Objective 6.0: Understand Software Testing					
13-14	6.1 Define software Testing and its importance 6.2 Explain Test Phases: unit testing, integration testing, system testing etc. 6.3 Explain Test Methods: black box, white box, static etc. 6.4 Explain software testing types: installation testing, usability testing, recovery testing, security testing etc. 6.5 Explain Software Testing	Explain Software Testing, its importance and types Explain Test Phases, Test Methods, and Techniques Distinguish between software Validation and Verification Explain the process of software validation and verification	White Board and marker. PC loaded with Presentation package and connected to multimedia Projector Networked PCs Loaded With software development tools	Draw up testing schedule and perform the testing accordingly	Guide students to draw up testing schedule and perform the testing accordingly	Distinguish between Test Types, Test Phases, Test Methods, and Test Techniques?

	Techniques: fault injection, Application program Interface (API) Testing, static testing etc. 6.6 Distinguish between software Validation and Verification 6.7 Explain the process of software validation and verification					
	General Objective 7.0: Understand Software Management					
15	7.1 Explain Software Project Management 7.2 Explain the activities involved in software management: proposal writing, project planning and scheduling, project monitoring etc. 7.3 Explain Software project scoping 7.4 Explain Software project planning and its activities 7.5 Explain Software Quality Management: quality control and quality assurance	Explain Software Project Management and its activities Discuss Software project planning and its activities Explain Software project Scoping Discuss Software Quality Management	White Board and marker. PC loaded with Presentation package and connected to multimedia Projector Networked PCs Loaded With software development tools Online lecture materials	Write project proposal Perform Project planning and scheduling	Guide students to write project proposal Perform Project planning and scheduling	Demonstrate how to write project proposal, perform project planning and scheduling?

		organization, and chief programmer teams) Illustrate software management structures. Explain programmer productivity (Analysis time, design time, coding tune, validation tune) Explain factors affecting programmer productivity.	On line lecture notes		planning and scheduling	

Assessment: Give details of assignments to be used:

Coursework/ Assignments 10%; Course test 20%; Practical 10%; Examination 60%

Type of Assessment	Purpose and Nature of Assessment **(COM 324)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 home works to be assessed by the teacher	10
Assignment	One assignment to be set by the teacher	10
Total		100

Recommended Textbooks & References:

	Department/ Programme:	**Course Code: COM 325**		**Credit Hours: 3 hours/week**
	Subject/Course: INTRODUCTION TO HUMAN COMPUTER INTERACTION			**Theoretical: 2 hours/week**
	Year: One Semester: Two	**Pre-requisite:**		**Practical: 1 hours /week**

General Objectives: On completion of this course the student should be able to:

1.0 Understand what interaction design is.

2.0 Understand the conceptualize interaction.

3.0 Understand Principles and application of user centred design

4.0 Understand designs for collaboration and communication.

5.0 Understand how interfaces affect users.

6.0 Understand the process of interaction process.

7.0 Understand how to test and model users.

	Theoretical Content			**Practical Content**		
	General Objective 1: Know what is interaction design					
Week/s	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Evaluation**
1-2	1.1 Explain Human computer interaction and interaction design. 1.2 Explain Usability and Design Principles. 1.3 Explain Learnability, Memorability, and Interface Metaphors.	Explain what Human computer interaction is and why it is needed. Discuss design and explain what interaction design is. Discuss the make up of interaction design Discuss why HCI requires working together as a multi disciplinary team Explain the purpose of interactive design in big business such as website consulting, mobile computing industry Explain what is involved in the process of interaction design State the goals of interaction design (usability and user experience) State design and usability principles	White Board PC Multimedia Projector User Interface prototyping software (like Pencil, Axure RP, Wireframe, Rapid UI, Design Sketch, etc.)	Design a data entry form prototype that incorporates the design principles of Constraining, Consistency, and Affordance.	Guide students to design a data entry form prototype that incorporates the design principles of Constraining, Consistency, and Affordance.	What is Human computer interaction? Explain Usability and Design Principles
	General Objective 2: Understand the conceptualize interaction					
3-4	2.1 Explain problem space. 2.2Explain Conceptual	Discuss the problem space Discuss conceptual models based on activities.	White Board PC	Design an interface prototype that incorporates at	Demonstrate the use of Interface metaphors.	What is a metaphor? Give examples of design

	models based on activities and objects 2.3 Explain interface metaphors and interaction paradigms.	Discuss the conceptual models based on objects Explain interface metaphors Explain interaction paradigms	Multimedia Projector User Interface prototyping software (like Pencil, Axure RP, Wireframe, Rapid UI, Design Sketch, etc.)	least two design metaphors, one of which must be original.	Demonstrate how real life experience is used to come up with Design Metaphors. Guide students to identify Interface metaphors incorporated in the design of common software like Operating Systems, Word Processors, and Spreadsheets.	metaphors.
	General Objective 3: Understand principles and application of user centred design					
5-6	3.1 Explain conceptual frameworks for cognition i.e mental models, information processing and external cognition.	Explain Cognition Discuss conceptual frameworks for Cognition. Mental models Information processing External Cognition Explain informal design from theory to Practice.	White Board PC Multimedia Projector User Interface prototyping software	Take turns to conduct the Stroop Test in pairs Knowledge from the physical world to the digital world. Conceptual frameworks for	Demonstrate perception interferenceby conducting Stroop Test. Demonstrate the use of conceptual frameworks for cognition.	Explain conceptual frameworks for cognition.

			(like Pencil, Axure RP, Wireframe, Rapid UI, Design Sketch, etc.)	cognition.		
	General Objective 4: Understand designs for collaboration and communication					
7-8	4.1 Explain social mechanisms used in communication and collaboration 4.2 Ethnographic issuesin collaboration and communication. 4.3 Discuss language framework and distributed cognition	Explain the social mechanisms used in communication and collaboration. Explain conversational mechanisms and collaborative technologies that support them. Explain collaborative technologies to support coordination Discuss Ethnographic studies of collaboration and communication Discuss the language / action framework and distributed cognition	White Board PC Multimedia Projector User Interface prototyping software (like Pencil, Axure RP, Wireframe, Rapid UI, Design Sketch, etc.)	Be able to: apply social mechanisms used in communication and collaboration. Design a prototype of a collaborative interface	Guide students on how to apply social mechanisms used in communication and collaboration. Illustrate different collaborative systems and identify the design goals for each. Guide students to design a prototype of a collaborative interface	What are the social mechanisms used in communication and Collaboration?
9	4.4 Explain different interface types and describe their interaction	Explain different interface types; Graphic User Interfaces, Speech based interfaces, Mobile interfaces, Augmented Reality interfaces, Virtual Reality	White Board PC			Explain different interface types and describe

	processes. 4.5 Explain the specific design considerations for different interface types.	interfaces, Wearable interfaces, etc. Explain design considerations for each interface type.	Multimedia Projector User Interface prototyping software (like Pencil, Axure RP, Wireframe, Rapid UI, Design Sketch, etc.)			their interaction processes.
	General Objective 5: Understand how interfaces affect users					
10	5.1 Explain affective and expressive interfaces. 5.2 Explain the application of anthropomorphism to interaction design. 5.3 Define virtual characters and agents.	Discuss affective and its aspects. Discuss expressive interfaces Explain user frustrations and how to deal with user frustration. Justify the application of anthropomorphism to interaction design. Explain virtual characters and agents. Discuss different kinds of characters - Synthetic characters - Animated agents	White Board PC Multimedia Projector User Interface prototyping software (like Pencil, Axure RP, Wireframe, Rapid UI, Design Sketch, etc.)	Design an interface prototype that conveys emotion.	Guide students to design expressive interfaces that convey emotion.	Explain affective and expressive interfaces

		- Emotional agents - Embodied conversational interface agent. Explain general design concerns -Believability of virtual characters - Appearance - Behavior - Mode of interaction				
	General Objective 6:Understand the process of Interaction Design					
11-12	6.1Explain the Waterfall model, Iterative model, and Spiral model of Interaction Design. 6.2 Explain Life cycle models in software engineering and HCI	Explain different interaction design models; Waterfall model, Iterative model, Spiral model. Explain the three characteristic of User-centered design: Iterative Design, Focus on Users and Tasks, Constant Evaluation. Identify users and their needs Explain how to generate alternative designs and choose among alternative designs.	White Board PC Multimedia Projector User Interface prototyping software (like Pencil, Axure RP, Wireframe, Rapid UI, Design Sketch, etc.)	Conduct user and task analysis for a given project. Design a prototype of the above project using User-centered Design principles.	Guide student to conduct user and task analysis for a given project. Guide students to comeup with a User-centered Design of the above project.	Explain the Waterfall model, Iterative model, and Spiral modelof Interaction Design.
13-15	6.3 Explain user	Explain user testing	White	Preparing test	Guide students	

	testing. 6.4 Explain Formative evaluation, Field Study, and Controlled Experiment 6.5 Explain domain analysis of users.	Explain different kinds of user testing: Formative evaluation, Field Study, and Controlled Experiment Explain the basic issues in designing and testing typical tasks Explain the basic issues in selecting typical users and their domains. Explain issues in preparing the test conditions.	Board PC Multimedia Projector User Interface prototyping software (like Pencil, Axure RP, Wireframe, Rapid UI, Design Sketch, etc.)	conditions. Evaluating and testing a project.	to prepare test conditions. Evaluating and testing a project.	

	Department/ Programme: Computer Science	**Course Code: COM 326**		**Credit Hours: 6 hours/week**

	Subject/Course: **MOBILE APPLICATION DEVELOPMENT**			**Theoretical: 2 hours/week**
	GOALS: The course is designed to enable students acquire knowledge on and skills in mobile application development			
	Year: 1 Semester: 2	**Pre-requisite:**	**COM 113**	**Practical: 4 hours /week**

1: **General Objectives:** On completion of this course the student should be able to:

1.0 Understand basic concepts and features of mobile devices

2.0 Understand general mobile application development architecture

3.0 Understand mobile user interface (UI) designs and solve challenges regarding layouts.

4.0 Understand the process of developing the UI interfaces based on customer requirement

5.0 Understand how to develop navigational flows between user interfaces.

6.0 Evaluate compatibility, design and User experience of mobile application

7.0 Understand how to build Mobile Application's logical model design.

8.0 Understand how to implement different data layer to facilitate as a bridge between database and business logic.

9.0 Understand how to connect/integrate all the developed features/modules into a single mobile application.

	Subject/Course: **MOBILE APPLICATION DEVELOPMENT**	**Course Code: COM 326**		**Credit Hours: 6 hours/week**
				Theoretical hours/week

	Year: 1 Semester: 2	**Pre-requisite:**			**Practical: 4 hours /week**	
	Theoretical Content			**Practical Content**		
Week/s	**Specific Learning Outcomes**	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
	General Objective 1: Understand basic concepts and features of mobile devices					
1	1.1 Explain mobile devices and basic features of mobile devices. 1.2 Explain smart phones /tablets and their functionalities 1.3 Describe carriers plans, contracts associated with plans, and how these contracts can vary widely. 1.4 Explain platform implications and considerations, for example Mac, PC, Linux, iOS, Android, Firmware 1.5 Explain the difference between cellular, Wi-Fi, and wired networks 1.6 Explain fundamentals of mobile applications developments	Explain mobile devices and basic features of mobile devices. Explain smart phones /tablets and their functionalities Describe carriers plans, contracts associated with plans, and how these contracts can vary widely. Explain platform implications and considerations, for example Mac, PC, Linux, iOS, Android, Firmware Explain the difference between cellular, Wi-Fi, and wired networks Explain fundamentals of mobile applications developments	White board and marker pen Mobile Phone Loaded with APPs Multimedia projector			Describe the features and functionalities of mobile phones and common mobile Apps .
	General Objective 2: Understand mobile application development Architecture					

2	2.1 Describe Mobile apps system development architecture 2.2 Explain Front end and backend modules and their functionalities 2.3 State different features and components of dynamic and interactive mobile apps. 2.4 Differentiate between customized and off-the-shelf mobile apps..	Describe Mobile apps system development architecture Explain Front end and backend modules and their functionalities and give examples Explain different features and components of dynamic and interactive mobile apps. Differentiate between customized and off-the-shelf mobile apps..	White board and marker pen Mobile Phone Loaded with APPs Pcs Multimedia projector	Design an interactive mobile apps.	Guide students to design an interactive mobile apps	Describe mobile Apps development architecture. Differentiate the following terms (a) customized and (b)off-the-self mobile apps.
Week/s	**General Objective 3: Understand mobile user interface (UI) designs and solve challenges regarding layouts.**					
3-4	3.1 State the different wire-framing components used in mobile platforms. 3.2 Explain all user interface components, list those that are common in all mobile platforms and those that are different in different mobile platforms and the linkage between all the different wire-framing components. 3.3 Describe the right way to position different components according to different mobile platforms. 3.4 Explain various graphic designing tools and the how to use them for	Explain the different wire-framing components used in mobile platforms. Explain various types of all user interface components used in mobile Apps developments. Explain with illustration various graphic designing tools and the how to use them for user interface designs, layouts and patterns. Describe the right way to position different components according to different mobile	White board and marker pen Mobile Phone Loaded with APPs Pcs loaded with Mobile Apps Compiler (Swift) Multimedia projector	Develop a simple mobile UI screen layout showing different components.	Guide students to simple mobile UI screen layout showing different components.	Develop a simple mobile UI screen layout showing different components.

	user interface designs, layouts and patterns.	platforms.				
Week/s	**General Objective 4: Understand the process of developing the UI interfaces based on customer requirement**					
5-6	4.1 Explain the customer (user) requirements and how to elicit them. 4.2 Describe how to create a mockup (demo) client platform for user/customer. 4.3 Explain the way to analyze customer requirements and ensure the design meets them. 4.4 Explain market trends and how to develop analytical skills. .	Discuss the customer (user) requirements and how to elicit them. Describe how to create a mockup (demo) client platform for user/customer. Explain with illustration how to analyze customer requirements and ensure the design meets them. Explain market trends and how to develop analytical skills. .	Software Tools such as: Spreadsheets Illustrators Mobile Phone Loaded with APPs Pcs loaded with Mobile Apps Compiler (Swift) Multimedia projector	Create mock ups with a positive user experience. Illustrate customer's UI interface requirements. .	Guide students to Identify different user experiences that are linked with different mobile and Create mock ups with a positive user experience.	Create mock ups with a positive user experience. Illustrate customer's UI interface requirements.
	General Objective 5: Understand how to develop navigational flows between user interfaces.					
	5.1 State different guidelines related to designing navigational flow for	Explain different guidelines related to designing navigational	Software Tools such	Design a mobile app	Guide student to design a	Develop a simple apps to

7-8	different mobile platforms and their applications. 5.2 Explain application of common gestures and their impacts in user interaction with mobile applications. 5.3 State the diverse effects of excessive usage of gestures on the user experience.	flow for different mobile platforms and their applications. Explain application of common gestures and their impacts in user interaction with mobile applications. Discuss the diverse effects of excessive usage of gestures on the user experience.	as: Spreadsheets Illustrators Pcs loaded with Mobile Apps Compiler (Swift) Multimedia projector	to illustrate the use of different gestures in the designing of the user experience of the application.	mobile app to illustrate the use of different navigational flows and gestures in the designing of the user experience of the application	use different navigational and gestures in the designing of the user experience of the application.
Week/s	**General Objective 6: Evaluate compatibility, design and user experience of mobile applications**					
9	6.1 Explain how to make forms for the collection of feedback. 6.2 Explain user cognitive processes and how to extract useful conclusions from the feedback. 6.3 Analyze the feedback and inculcate any changes required to the mobile apps.	Explain how to make forms for the collection of feedback. Understanding user cognitive processes and how to extract useful conclusions from the feedback. Explain how to analyze the feedback and inculcate any changes required to the mobile apps.	Software Tools such as: Spreadsheets Illustrators Pcs loaded with Mobile Apps Compiler (Swift) Multimedia projector	Use simple program to demonstrate how to analyze the feedback and inculcate any changes required to the	Guide the student how analyze the feedback and inculcate any changes required to the	Develop a feedback forms, and use feedback to effect changes to the user interface of a simple program.

Week/s	**General Objective 7: Understand how to build mobile's applications logical model.**					
10-11	7.1 Describe how to build Domain Model, Systems sequence	Explain how to build Domain Model, Systems sequence	Software Tools such	Install and use a special tools	Guide the student how a	Use any available tool

	diagrams and Class diagrams. 7.2. Explain how to install all tools required for making diagrams required for representing architecture. 7.3 Describe how to use special tools for creating class diagrams e.g. Enterprise Architect.	diagrams and Class diagrams. Explain how to install all tools required for making diagrams required for representing architecture. Explain how to use special tools for creating class diagrams e.g. Enterprise Architect.	as: Enterprise Architect; Illustrators Pcs loaded with Mobile Apps Compiler (Swift) Multimedia projector	to create a class diagram for an enterprise solution.	special tools to create a class diagram for an enterprise solution.	to create a class diagram for an enterprise solution.

Week/s	**General Objective 8: Understand how to implement different data layer to facilitate as a bridge between database and business logic.**					
12-13	8.1 Describe how to break down a task into smaller modules and sub tasks. 8.2. Explain DBMS, and how to develop and Integrate SQL script with programming language. 8.3 Explain how to handle concurrent database connections. 8.4 Explain store procedures; n-tier architecture and the term 'CRUD.' (Create Retrieve Update Delete). 8.5 Describe how to develop	Explain how to break down a task into smaller modules and sub tasks. Explain DBMS, and how to develop and Integrate SQL script with programming language. Explain how to handle concurrent database connections. Explain store procedures; n-tier architecture and the term 'CRUD.' (Create Retrieve Update Delete). Describe how to develop	Software SQL Server SQL Language SQL Editor Pcs loaded with Mobile Apps Compiler (Swift) Multimedia projector	Create layers for interacting with the database and demonstrate how to correctly handle multiple connections and effectively manage database operations .	Guide the student how Create layers for interacting with the database and demonstrate how to correctly handle multiple connections and effectively manage database	Create business layers for interacting with the database.

	business layers for interaction with the database. 8.6 Explain Groups, roles, Access Rights and its critical roles in securing the data.	business layers , setup groups, assign roles and Access Rights and how it helps securing the data. .			operations .	
Week/s	**General Objective 9: Understand how to connect/integrate all the developed features/modules into a single mobile application**					
14-15	9.1 Describe how to code the functionality in different platforms. 9.2. Explain how to connect different features/module. 9.3 Describe tools specifically made for running unit tests and integrate unit-tested modules. . 9.4 Explain how to Test application's robustness in worst possible conditions. 9.5 Describe how to carry out compatibility test. 9.6 Explain the procedure of mobile apps deployments.	Explain how to code the functionality in different platforms. Explain how to connect different features/module and integrate unit-tested modules. Explain the procedure for configuration of the tools used for making stress tests. Explain how to test the application on different hardware, iOS and screen, and which hardware supports the iOS version to ensure robustness and compatibility. Discuss the procedure to use any IDE tools (e.g. Swift) to deploy mobile apps	Software SQL Server SQL Language SQL Editor Pcs loaded with Mobile Apps Compiler (Swift) Multimedia projector	Develop and deploy a full scale robust mobile apple .	Guide the student how Create Develop and deploy a full scale robust mobile apple .	Give group and individual Project on full mobile enterprise solutions.

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test20 %; Practical %; Projects 20 %; Examination 60 %

Type of Assessment	Purpose and Nature of Assessment **(COM 326)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 1 progress test for feed back.	20
Practical / Projects	To be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

	Department / Programme: COMPUTER SC. (HND)	**Course Code: COM 327**		**Credit Hours: 4 hours/week**
	Subject/Course: Introduction to Artificial Intelligence (AI) **GOAL: T**o acquaint the student with the basic programs in the field and their underlying theory in AI.			**Theoretical: 2 hours/week**

	Year: I Semester: 2	**Pre-requisite: COM 311**		**Practical: 2 hours /week**

General Objectives:
On Completion of this course the student should be able to:

1.0 Understand the concept of artificial intelligence and tools

2.0 Understand the problem solving techniques using formal and informal language.

3.0 Know how to relate problem solving to Artificial Intelligence.

4.0 Understand forms of learning

5.0 Understand problem solving by search strategy

6.0 Understand Artificial Intelligent Agents

7.0 Understand concept of Deep Learning

8.0 Understand Model performance measures

	General Objective 1: Understand the concept of artificial intelligence					
Week/s	**Specific Learning Outcomes**	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation

1 -2	Explain : • Basic concepts of A.I. • A.I. techniques • Application areas of A.I.	Explain the concept of Artificial intelligence. Discuss A. I techniques; Neural Network, fuzzy logic, genetic algorithm Explain areas of applications	White board, multi-media devices, MATLAB,WEKA, SPSS, TANAGRA, 11ANTS, MINITAB, etc			. Discuss the AI origin and techniques
	General Objective 2: Understanding problem solving techniques using formal and informal language					
3-4	Ability to understand: • Problem solving techniques using formal and informal languages	Explain the various approaches to problems formulation with specific examples.	White board, multi-media devices, MATLAB,WEKA, SPSS, TANAGRA, 11ANTS, MINITAB, PROLOG, LISP, etc			Describe a simple problem suitable for AI solution

	General Objective 3: Know how to relate problem-solving to Artificial intelligence

5-6	Ability to understand: • The concept of relating problem-solving to Artificial intelligence.	Explain self-adjusting systems and learning machines as they relates to artificial intelligence. Explain the fundamental concepts of simulations, perception and recognition. Describe the basic components and functioning of human brain and the central nervous systems.	White board, multi-media devices, WEKA,, TANAGRA, 11ANTS, , PROLOG, LISP, etc			Discuss major problem solving tactics in AI.

	General Objective 4: Understand Forms of Learning					
7	4.1 Define Learning 4.2 Explain Forms of Learning,	List and explain forms of learning (Decision Trees and the ID3 Algorithm, Statistical Learning)	White board, multi-media devices, WEKA,, TANAGRA, 11ANTS, , PROLOG, LISP, etc			Discuss learning and learning characteristics
	General Objective 5: Understand Problem solving by Searching Strategies					
8-10	5.1 Understand Searching for Solutions, 5.2 Know AI Search Strategies: 5.3. Know kind of AI search strategy	Explain various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms) Uninformed Search Strategies: Breadth-First Search, Depth-First Search, Depth-limited Search, Iterative Deepening Depth-first Search	White board, multi-media devices, WEKA,, TANAGRA, 11ANTS, , PROLOG, LISP, etc			Write term paper on search strategies and forms search strategies

	General Objective 6: Understand Artificial Intelligent Agents					
11-13	6.1. Understand different types of AI agents 6.2 Explain structure of intelligent agents 6.3 Explain agent environments	Explain types AI agents • Simple reflex • Model based reflex • Goal based Explain parameters for ideal agents. • Agent program, machine used (processor), agent functions etc Explain characteristics of agent environment: • Discrete/continuous • Observable/partially observable • Static/Dynamic • Single/multi • Deterministic/non-Deterministic • Accessible/inaccessible etc	White board, multi-media devices, WEKA,, TANAGRA, 11ANTS, , PROLOG, LISP, etc			Explain features of agents and environment
	General Objective 7: Understand concept of Deep neural network (Deep Learning)					

14	7.1 Explain DL concept	Explain DL history DL architecture DL Applications	White board, multi-media devices, WEKA,, TANAGRA, 11ANTS, , PROLOG, LISP, etc			Differentiate between neural network and DL
	General Objective 8: Understand Model Performance Measures					
15	8.1 Explain model performance measure	Explain model performance measure such as confusion matrix, ROC, accuracy, sensitivity, specificity	White board, multi-media devices, WEKA,, TANAGRA, 11ANTS, , PROLOG, LISP, etc			Discuss how to derive sensitivity and specificity from confusion matrix

Assessment: Give details of assignments to be used:

Coursework/ Assignments 10 %; Course test 10 %; Practical 20 %; Projects 0 %; Examination 60 %

Recommended Textbooks & References:

THIRD SEMESTER COURSES

Programme: (Higher National Diploma) Computer Science	**Course Code: COM 411**	**Contact Hours:**

Course: Web Development (PHP)	**Semester: 1**	**Theoretical: hours /week**
Year: 1	**Pre-requisite: COM 113, COM 225**	**Practical: hours /week**
Goal: This course is designed to enable students to acquire knowledge of and skills in developing web applications with PHP		

General objectives: At the end of this course, students should be able to:

1. Understand the concepts of Client-server architecture, and setup and configure development environment
2. Understand how to write scripts, work with conditional statements
3. Understand how to work with form data and create database connections
4. Understand how work with dates, arrays, sessions and cookies
5. Understand how to create and use user-defined functions
6. Understand the concept of Object Oriented Programming
7. Understand how to Validate Data, Handle Exceptions, test and debug web applications
8. Understand the concepts of file handling and application security

	Theoretical Content	**Practical Content**
	General Objective 1.0: Understand the concepts of Client-server architecture, and setup and configure development environment	

Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1 - 2	1.1 Explain Client-server architecture 1.2 Explain web pages 1.3 Explain Static and Dynamic web pages 1.4 Explain the history of PHP 1.5 Explain the history of MySQL and why it fits well with PHP 1.6 Explain MariaDB as an alternative to MySQL 1.7 Explain web and application servers (Apache, tomcat, Payara, etc.) 1.8 Explain how to download, install and configure PHP Compiler (XAMPP, WAMP, MAMP, LAMP, easyPHP, etc.) 1.9 Explain how to start and stop Apache and MySQL servers	Explain client and server Explain the concept of client-server architecture Explain the differences between static and dynamic web pages Explain the history of PHP and its trend Explain MySQL Explain different types of web servers	PC loaded with Presentation package Multimedia Projector Internet	Download and configure software	Guide the students on how to download and configure the development environment	Explain client-server architecture List different types of databases that could be used in developing web applications Trace the history of PHP and MySQL Explain how to download and configure the development environment

	1.10 Explain how to configure phpMyAdmin 1.11 Explain how to use phpMyAdmin to test the MySQL Server and set password 1.12 Explain how to configure xDebug 1.13 Explain how to download text editor (Notepad++, Sublime Text, Atom) 1.14 Explain how to verify that all software are working correctly	Explain the process to download and install required software				
	General Objective 2.0: Understand how to write scripts, work with conditional statements					
3 - 4	2.1 Explain the basic PHP Syntax, tags, statements, whitespace, comments and simple statements 2.2 Explain how to embed PHP in HTML 2.3 Explain common built-in Functions 2.4 Explain how to declare	Explain the syntax, tags, statements, whitespace, comments and simple statements Explain how to declare variables and constants Explain the	PC loaded with Presentation package Multimedia Projector PHP Compiler, text editors, web and database servers	Develop PHP syntax and comments	Guide students how to write PHP tags	Write simple PHP tags Identify comments in web applications Explain common PHP built-in functions

	variables and Constants 2.5 Explain PHP Superglobals Arrays 2.6 Explain how to run programs 2.7 Explain how to fix simple coding errors	use of PHP superglobal arrays Explain the process of running PHP applications				Write and run simple web applications
	2.8 Explain operators 2.9 How to use the equality and identity operators 2.10 How to use the relational operators 2.11 How to use the logical operators 2.12 (Arithmetic, comparison, logical, bitwise) 2.13 Explain the selection and iteration structures 2.14 Explain how to work with If Conditions 2.15 Explain how to work with If…else Conditions	Explain operators and how to use them in web applications Explain the use of operators Explain how to form conditional statements using If and if...else conditions	PC loaded with Presentation package Multimedia Projector PHP Compiler, text editors, web and database servers	Observe operators and how to use them write conditional statement using if, if…else and nested if…else statements write iteration statements using the	Aid students on how to code and use operators Guide students how to form Boolean expression Guide students to write different conditional statements using selection	Use operators to form different kind of Boolean expressions Use truth tables to evaluate different Boolean expressions Write codes to demonstrate the selection structures

	2.16 Explain how to work with Nested If…else Condition 2.17 Explain how to work with Ternary statements 2.18 Explain how to work with Break and continue 2.19 Explain how to work with switch Statement 2.20 Explain how to work with while loop 2.21 Explain how to work with do…while loop 2.22 Explain how to work with For loop	Explain how to use nest if statements Explain how to use switch as alternative to if…else statements Explain how to use the iteration structure using while, do…while and for loops		while, do…while and for loops	and iteration structures	Write codes to demonstrate the iteration structure
	General Objective 3.0: Understand how to work with form data and create database connections					

5 - 6	3.1 Explain form 3.2 Understand the difference between Post and get 3.3 Explain How to work with form data 3.4 Explain How to get data from text boxes, password fields, hidden fields and text area 3.5 Explain how to get data from other controls such as radio button, checkbox, list and dropdown list 3.6 Explain how to process and validate user inputs 3.7 Explain preserving user input when a Form is Incomplete 3.8 Explain how to use phpMyAdmin to work with MySQL database 3.9 Explain how to create database, tables 3.10 Explain how create and use connection using PHP Data Access Object (PDO) and mysqli	Explain how to create forms using HTML tags Explain how to name fields on forms Explain how to get data from forms Explain how to process user inputs Explain how to preserve using data when errors occurred Describe how to use phpMyAdmin to work with MySQL database Explain how to use phpMyAdmi	PC loaded with Presentation package Multimedia Projector PHP Compiler, text editors, web and database servers	Construct forms with various types of fields (textfield, textbox, checkbox, radion buttons, etc.) Write web application to get data from the form constructed above Display processed data on web browser Demonstrate how to work with database using phpMyAdmin helper	Guide students to write codes that get data from forms and processit Guide students to work with phpMyAdmin Guide students how to write codes to process data Demonstrate sample database web application to the student	Write codes that get data from forms, process the data and display results on web browser Create database, tables and insert sample data in the tables Write application that works with database Write web application that retrieve records from multiple tables

	3.11 How to get and modify data from PHP Application 3.12 Explain how to RETRIEVE records 3.13 Explain How to INSERT, UPDATE AND DELETE data 3.14 Explain database constraints (referential integrity, primary, foreign key, unique, 3.15 Explain how to get data from multiple tables	n to create databases, tables and enter sample records Explain how to retrieve, insert, update and delete data using php codes Explain how to project and restrict data Explain how to get data from multiple database tables				
	General Objective 4.0: Understand how work with dates, arrays, sessions and cookies					

7 - 8	4.1 Explain how to create and use timestamps to work with dates 4.2 Explain how to create and format timestamps 4.3 Explain how to use the strtotime function 4.4 Explain how to use objects to work with dates 4.5 Understand how to use the DateTime class 4.6 Explain how to use the DateInterval class 4.7 Explain how to use the DateInterval and DateTime classes together	Explain to create web applications that use date and time Explain how to convert string to timestamps and vice-versa Explain how to use classes to work with date and time	PC loaded with Presentation package Multimedia Projector PHP Compiler, text editors, web and database servers	Demonstrate how to create web applications that use the date and time	Guide students to create web application that use date and time Guide students to use object with date and time	Create web applications that use date and time Convert the application above to use date and time classes instead
7 - 8	4.8 Explain Arrays 4.9 Explain different types of arrays 4.10 Explain how to create and initialize Arrays 4.11 Explain how manipulate arrays (append, add, delete, read, read and loop) an Array	Explain an array and its types Explain how to manipulate arrays Explain how to loop	PC loaded with Presentation package Multimedia Projector PHP Compiler, text editors,			Explain arrays and its index Write web applications that use arrays

	4.12 Explain how to work with for each loops with arrays 4.13 Explain how to Work with multi-dimensional Arrays 4.14 Explain how to work with variable substitution 4.15 Explain how to use functions to work with arrays 4.16 Explain how to fill, merge, slice and splice arrays 4.17 Explain how to work with queues and stacks 4.18 Explain how to get sum and product of elements 4.19 Explain how to search, sort and modify arrays 4.20 Explain cookies and sessions 4.21 Explain how to set and get a cookie 4.22 Explain how to enable and disable cookies in a browser	through arrays using for each loop Explain multi-dimensional arrays Explain variable substation Explain filling, merging, slicing, and splicing arrays Explain how to find the sum, product and average of elements in an array Explain how to modify arrays Define cookie and session	web and database servers			Write web applications that demonstrate the use of multi-dimensional arrays Write web applications that calculate the sum, product, average of given numbers Explain how to modify arrays Show how to create cookies and sessions Explain how to store data in session Write

	4.23 Explain why session tracking is difficult with HTTP 4.24 Explain how session tracking works 4.25 Explain how to start a session 4.26 Explain how to set and get session variables 4.27 Explain how to end a session 4.28 Explain how to Manage a session	Explain how to get data from cookies and sessions Explain session tracking and why it is difficult Explain how to store and retrieve data in session Explain how to manage session				application to get and retrieve data from session (e.g. a shopping cart)
	General Objective 5.0: Understand how to create and user-defined functions					
9	7.1 Explain user-defined functions 7.2 Explain how to create and call functions 7.3 Explain how to Pass arguments to functions (by value and reference) 7.4 Explain how to provide default	Explain functions Explain how to create functions Explain parameter passing in	PC loaded with Presentation package Multimedia Projector PHP Compiler,			Write login forms that use sessions Explain functions

	values for parameters 7.5 Explain how to use variable-length arguments 7.6 Explain how to create and use library of functions 7.7 Explain how to set include path 7.8 Explain how function scope works 7.9 Explain how to create and use namespaces 7.10 Explain how to work with variable functions, anonymous, callbacks and closures 7.11 Explain the MVC pattern 7.12 Explain how to use the MVC to simply coding	functions Explain how to create functions with variable number of arguments Explain how create and use libraries Explain function scope Explain different types of functions	text editors, web and database servers			Refactor the applications created in the previous lessons to use functions
	General Objective 6.0: Understand the concept of Object Oriented Programming					
11	6.1 Explain the concept of object oriented programming 6.2 Explain how to create and use classes 6.3 Explain how to code class	Explain inheritance, encapsulation, polymorphism and abstraction	PC loaded with Presentation package Multimedia Projector			Explain inheritance, encapsulation, polymorphism and abstraction

	constants, properties and methods (class constants, static properties and methods) 6.4 Explain how to use access modifiers (public, private and protected) 6.5 Explain how to encapsulate properties 6.6 Explain how to work with constructors, destructors, setters and getters 6.7 Explain how to loop through an object's properties 6.8 Explain how to clone and compare objects 6.9 Explain how to inspect an object 6.10 Explain how to work with inheritance 6.11 Explain how to use the protected access modifier 6.12 Explain how to create abstract and final classes and methods 6.13 Explain how to work with interfaces and traits	Explain how to create and use classes Explain how to create and use class members (fields, methods, properties, constructors, etc.) Explain how to work objects Explain how to work with interfaces and traits	PHP Compiler, text editors, web and database servers			Explain how to create and use classes Explain how to create and use class members (fields, methods, properties, constructors, etc.) Explain how to work objects Explain how to work with interfaces and traits Write web applications that use the concept of object oriented programming

	General Objective 7.0: Understand how to Validate Data, Handle Exceptions, test and debug web applications					
12 - 13	7.1 Explain regular expressions and its uses 7.2 Explain how to match character 7.3 Explain how to use the character class) 7.4 Explain how to create complex patterns 7.5 Explain how to use look-ahead assertions 7.6 Explain how to create a multiline regulation expressions 7.7 Explain how to create and use global regular expressions 7.8 Explain how to replace a regular expression with a string 7.9 Explain how to split a string on	Explain how to create and use regular expressions Explain how to use regular expression to validate data Explain conversion between regular expression and strings and vice-versa Explain how to use regular expressions to validate	PC loaded with Presentation package Multimedia Projector PHP Compiler, text editors, web and database servers	Create and use regular expressions	Guide students how to create and use different types of regular expression Guide students how to code, test and debug web application	Show how to create and use regular expressions Explain how to validate data using regular expressions Explain how to convert regular expressions to strings and vice-versa Explain how to use regular expressions to validate different types of user inputs

	a regular expressions 7.10 Explain how to use regular expressions for data validation 7.11 Explain how to handle exceptions 7.12 Explain how to create and throw exceptions 7.13 Explain how to use the try-catch statement 7.14 Explain testing and debugging 7.15 Explain errors 7.16 Explain how to trace the execution of PHP codes 7.17 Explain how to configure the xDebug debugger 7.18 Explain how set and remove breakpoints 7.19 Explain how to step through codes 7.20 Explain how to inspect variables	different types of user inputs (numbers, dates, emails, etc.) Explain how to use structured exception handling using try-catch statement Explain testing and debugging Explain errors Explain how to trace the execution of codes Explain how to work with breakpoints Explain how				(numbers, dates, emails, etc.) Explain how to use structured exception handling using try-catch statement Explain how to test and debug web applications Explain how to locate errors such as (logical, syntax and runtime errors) in programs Explain how to trace the execution of codes

	7.21 Explain how to inspect the stack trace	step through codes Explain variable inspection				Explain how to inspect variable and stack trac
	General Objective 8.0: Understand the concepts of file handling and application security					
14 - 15	8.1 Explain file Input/Output (I/O) 8.2 Know how to open and close file 8.3 Know how to read from file and write to a file 8.4 Know different file reading and writing modes 8.5 Understand how to upload files and images 8.6 Understand sending Email 8.7 Understand the Shortcomings of mail function	Explain file system Explain how to open and close file Explain various reading and writing modes Explain how to read and write to file Explain file uploading	PC loaded with Presentation package Multimedia Projector PHP Compiler, text editors, web and database servers			Create web application that write “Hello World” to a named file Write code that retrieve the data above and prints it to browser Survey different libraries that can be used to send email from web

	8.8 How to working with external libraries to send email (PEAR Mail, PHPMailer, etc) 13.1Explain authentication 13.2Explain two types of authentication (basic and form-based) 13.3 Explain how to use a secure connection 13.4 Explain how SSL authentication works 13.5 Explain how get a digital certificate 13.6 Explain how to request a secure connection 13.7Explain how to encrypt and decrypt data	Explain how create applications that send emails Explain how to create applications with user authentication Explain basic and form-based authentication Explain how Secured Socket Layer (SSL) works Explain how get a digital certificate Explain how to request a secure connection				application Demonstrate how to use one of the libraries above create form-based and basic authentication application create web application that encrypt and decrypt Create digital certificate and demonstrate how to use it with web application

		Explain data encryption and decryption				

Programme: Computer Science (Higher National Diploma)	**Course Code: COM 412**	**Contact Hours: 5 hours/week**
Course: Project Management		**Theoretical: 2 hours /week**
Year: 2 Semester: 1	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to provide students with knowledge in and skills for Project Management
General Objectives: On completion of this course, the students should be able to: 1.0 Understand the basic Concepts of Project Management 2.0Understand the Project Lifecycle 3.0 Understand Project Requirements Analysis and Documentation 4.0 Understand Project Planning 5.0Know how to Design Work Breakdown Structures 6.0 Know how to Design PERT Charts 7.0Understand Project Execution and Quality Management 8.0 Understand Project Risk Management 9.0 Understand Project Costs Management

Theoretical Content		**Practical Content**

General Objective 1.0: Understand the basic Concepts of Project Management						
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Evaluation**
1-2	1.1 Explain Project and its characteristics 1.2 Explain the various types of projects 1.3 Distinguish between project, seminar and Term paper 1.4 Explain Project scope, milestones and outcomes 1.5 Explain Project Management and its importance 1.6 Explain Project Management Software, examples and their uses e.g. MS Project 1.7 Outline the uses of Project Management software 1.8 Outline the roles of Project Managers	Explain Project, its characteristics and types Distinguish between project, Seminar and Term paper Discuss Project scope, milestones and outcomes Discuss Project Management and its importance Explain the uses of project management software Explain the roles of Project Managers	White board . PCs loaded with Project Management software and connected to a multimedia projector and flip chart.	Create a New Project using project management software Generate project scope and milestones	Guide students to create a New Project using project management software Guide students to generate project scope and milestones	Demonstrate how to create a New project and generate project scope and milestones
General Objective 2.0: Understand the Project Lifecycle						
3	2.1 Define Project Lifecycle 2.2 Explain the stages of Project Lifecycle: initiation, planning, execution, monitoring/control and Closure 2.3 Explain Project Management	Explain the stages of Project Lifecycle Discuss Project Management triangle	White board. PCs loaded with Project Management software, Word	Develop project proposal	Guide students to develop project proposal	What are the stages of Project Lifecycle? Demonstrate how to create project

	Triangle 2.4 Explain Project Proposal 2.5 Explain Project Charter 2.6 Explain Project Team and role of members in project cycle	Explain Project Charter, Project Proposal and its sections Explain the process of setting up a project team and role of members	Processing package and connected to a multimedia projector and Flip chart.			proposal?
General Objective 3.0: Understand Project Requirements Analysis and Documentation						
4	3.1 Explain project requirements 3.2 Explain projects requirements gathering techniques 3.2 Explain Project Requirement Analysis tools: Data Flow Model (DFM), ERM, Coloured Petri Nets (CPN) 3.4 Outline the components of a requirements document: technical architecture, development planning, testing etc.	Explain project requirements and requirement gathering techniques Explain Project Requirement Analysis tools Explain the elements of a requirements document	White board. PCs loaded with Word processing packages and connected to a multimedia projector and flip chart. Drawing Package	Gather project requirements using appropriate technique Analyse requirements using a range of techniques Create project requirement document	Guide students to gather project requirements using appropriate technique Illustrate requirements Analysis using a range of techniques Guide students to create project requirement document	Demonstrate how to analyse project requirements using a range of techniques Demonstrate how to create requirement document
General Objective 4.0: Understand Project Planning						
5-6	4.1 Explain Project Planning and its importance 4.2 Explain project planning activities: creating project plan,	Explain Project Planning, its importance and activities Outline tools for project	White board and Marker. PCs loaded with Project	Set project goals Create project	Guide students to set project goals Guide students	Set project goals Demonstrate project

	resource plan, Financial plan etc. 4.3 Outline tools for project planning e.g. PERT Chart, Gantt chart, WBS, RAM etc. 4.4 Explain project goals based on SMART and CLEAR Goals 4.5 Explain the project scheduling 4.6 Explain the project cost estimation	planning Explain project goals based on SMART and CLEAR goals Explain the project scheduling and cost estimation	Management software and connected to a multimedia projector and flip chart.	schedule create project cost estimates	to create project schedule Illustrate how to create project cost estimates	scheduling and cost estimation
General Objective 5.0: Knowhow to Design Work Breakdown Structures						
7	5.1 Explain Work Breakdown Structure (WBS) and its importance 5.2 State the conventions for designing WBS 5.3 Explain the steps involved in designing a WBS	Discuss Work Breakdown Structure (WBS), its importance and conventions Discuss the steps involved in designing a WBS	White board and Marker. PCs loaded with Project Management software and connected to a multimedia projector and flip chart.	Create the Work Breakdown Structure	Guide students to create the Work Breakdown	Demonstrate how to create Work Breakdown Structures
General Objective 6.0: Know how to Design PERT Charts						

8	6.1 Explain PERT Chart 6.2 Explain PERT terminologies: event, activity, slack/float, critical path and fast tracking 6.3 Explain Time Estimate Table: Optimistic, Pessimistic, most likely and Expected Time 6.4 Explain PERT chart conventions 6.5Explain steps involved in designing PERT charts	Explain PERT Chart, its terminologies and conventions Explain Time Estimate Table Explain steps involved in designing PERT charts	White board and Marker. PCs loaded with Project Management software and connected to a multimedia projector and flip chart.	create project time estimate Table Design PERT chart of a selected project Identify the Critical Path of the project in the chart	Guide student to create project time estimate Table Guide students to design PERT chart of a selected project Guide students to identify the Critical Path of the project in the chart	Demonstrate how to create project time estimate table and PERT Chart? Identify the Critical Path of the project in the chart
9	6.6Explain Network Diagram 6.7 Explain Network terminologies e.g. Early Start (ES), Early Finish (EF), Late Start (LS) and Late Finish (LF) 6.8Explain the Steps for creating a Network diagram	Explain Network Diagram and terminologies Discuss the Steps for creating Network diagram	White board and Marker PCs loaded with Project Management software and connected to a multimedia projector and flip chart.	Design Network diagrams of selected projects	Guide students to design Network diagrams of selected projects	Demonstrate how to design Network diagrams of selected projects.
General Objective 7.0: Understand Project Execution and Quality Management						
10-11	7.1 Explain project execution 7.2Explain Project execution Process e.g. Software projects 7.3Explain the tools for Project Execution e.g. Software projects	Explain project execution process, tools, input and outputs Discuss Project testing, error detection and	White board and Marker. PCs loaded with software development	Execute a simple project e.g. software project Test projects for possible	Guide students to execute simple projects e.g. software project Guide students	Demonstrate how to execute, test and amend projects e.g. software

	7.4 Explain project inputs and outputs 7.5 Explain Project testing, error detection and amendments 7.6 Explain Quality Management and its importance 7.7 Explain Quality Assurance and Quality Control 7.8 Explain Project Progress Report	amendments Discuss Quality Management and its importance Discuss Project Progress Report	tools and connected to a multimedia projector and flip chart.	errors and amendments	to test projects for possible errors and amendments	project
General Objective 8.0: Understand Project Risk Management						
12-13	8.1 Explain Project Risk and Risk Management 8.2 Explain the various categories Of project risks: business risks, technical risk; generic and product specific risks etc. 8.3Explain the stages in Risk management process: identification, analysis, ranking etc. 8.4Explain Risk Mitigation, Monitoring and Management (RMMM) Plan/Table 8.5 Explain the concept of Project Risk Exposure (RE) and its Calculation	Discuss project risks categories and management Explain the stages in risk management process Explain RMMM Plan/Table Discuss the concept of Project Risk Exposure (RE) and its calculation	White board and Marker. PCs loaded with Project Management software and connected to a multimedia projector and flip char	create Project RMMM Table Calculate Project Risk Exposure of selected projects based specified risk data	Guide students to create Project RMMM Table Guide students to calculate Project Risk Exposure of selected projects	Demonstrate how to create Project RMMM Table Demonstrate how to calculate Project Risk Exposure of selected projects
General Objective 9.0: Understand Project Costs Management						

14-15	9.1 Explain Project Cost Management 9.2 Differentiate between Cost overrun and Cost Escalation 9.3 Explain Cost of Quality and types 9.4 Explain Control Cost Process and Techniques 9.5 Explain cost estimation methods e.g. Estimate to Complete(ETC), Estimates at Completion (EAC) etc. 9.6 Explain project cost reports	Explain Project Cost, Cost overrun, Cost Escalation and Cost Management Discuss Cost of Quality and types Discuss Control Cost Process and Techniques Explain cost estimates Process and control cost techniques Discuss project cost reports	White board and Marker. PCs loaded with latest version of project management software and connected to a multimedia projector and flip chart.	Generate control cost estimates Generate relevant project cost reports	Guide students to generate control cost estimates Guide students generate relevant project cost reports	Demonstrate how to generate control cost estimates Demonstrate how to generate relevant project cost reports

Assessment: Give details of assignments to be used: Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment Weighting (%)	**Purpose and Nature of Assessment (CSE41---)**	**Weighting (%)**
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for Feedback.	20
Practical	At least 5 homework to be Assessed by the teacher	20
Total		100

PROGRAMME: HIGHER NATIONAL DIPLOMA(HND) COMPUTER SCIENCE			
COURSE: COMPILER CONSTRUCTION	**Course Code: COM 413**	**Contact Hours:4 Hours/week**	
GOAL: This course is designed to provide the students with knowledge of and skills in Compiler Construction			
Year: 2 Semester: 1	**Pre-requisite: COM 313**	**Theoretical:**	**2 hours /week**
		Practical:	**2 hours /week**

GENERAL OBJECTIVES:

On completion of this course the student should be able to:

1.0 Understand the basics of compilation process
2.0 Understand the language and grammar for source program specification
3.0 Understand lexical and syntax analysis
4.0 Understand top-down and bottom-up parsing
5.0 Understand semantic analysis – syntax directed translation
6.0 Understand intermediate code generation
7.0 Understand code optimization
8.0 Understand runtime storage management
9.0 Understand code generation
10.0 Understand symbol table management
11.0 Understand error handling in a compiler
12.0 Understand bootstrapping & compiler generation tools

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) COMPUTER SCIENCE						
COURSE TITLE : COMPILER CONSTRUCTION				**COURSE CODE: COM 414**	**CONTACT HRS: 4/Week**	
COURSE SPECIFICATION: Theoretical Contents				**COURSE SPECIFICATION: Practical Contents**		
Week	**Specific Learning Outcomes**	**Teachers Activities**	**Resources**	**Specific Learning Outcomes**	**Teachers Activities**	**Evaluation**
	Objective 1.0: The Basics of Compilation Process					
1	1.0 Basics of compilation process 1.1 Differences among compiler, assembler, interpreter and other language translators	To explain: • Language Processing System • Why Learn About Compilers? • Challenges of Compiler Design & Construction • Structure of a Compiler • Classification of Compiler (One-pass compiler & Multi-pass compiler)	White Board. PC loaded with Presentation package and connected to multimedia Projector Online lecture notes	Practice • Installation of compiler • Identify elements of programming environments • Compilation process of a program • Errors generated by the compiler	Students should be assisted to: • load a compiler • Identify elements of programming environments • In the Compilation process of a sample program	Explain the following terms with example i Compiler, ii Assembler iii Interpreter
	Objective 2.0: Language and Grammar for Source Program Specification					
2	2.1 Concepts of formal grammar and languages	To: • Define grammar, languages. • Describe a grammar as a • Generating scheme for languages. • Explain the rule of formal • Grammar.	PC loaded with Presentation package and connected to multimedia	• Compiling of high level language using compiler	Students should be assisted: • To use Pascal/C/Java or any other HLL to write a	Define grammar, languages. Explain the rule of formal Grammar.

		• Define: an alphabet, string, a Phase. • Write production or rewriting rules. • Construct syntax trees for Sentences. • Differentiate between ambiguous • And unambiguous sentences. • Define the relations between contains transpose, reflexive, transitive. • Explain regular expressions • Explain grammars and productions • Explain grammar and language classification	Projector Online lecture notes		program for compilation in the language • To identify errors generated by the use of a particular compiler	
	Objective 3.0: Lexical and Syntax Analysis					
3 - 4	3.1 Role of Lexical Analyzer (Scanner) 3.2 Role of parsers or recognizers in a compiler	To: • Describe the role of Lexical Analyzer (Scanner) • Define Token, Pattern and Lexeme • Explain role of finite automata in token recognition for programming languages. • Explain the steps involved in lexical analyzer (scanner) design (both manual and automatic approach) • Discuss the lexical analyzer generator tool e.g. Lex or any other related tool. • Explain the role of input buffering in lexical analyzer design • Describe the role of Syntax Analyzer (Parser) in a compiler.	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes	To Learn: • How to write a simple Scanner • How to write a parser for output of the scanner.	Students should be assisted: • To design a Scanner algorithm to identify each category of tokens, generated symbol table • Write simple program to implement the scanner algorithm in C, PASCAL, JAVA, C# and	Define Token, Pattern and Lexeme Explain role of finite automata in token recognition for programming languages. Explain the steps involved in lexical analyzer (scanner) design Explain the role of input buffering in lexical analyzer

		• Explain how to specify programming language syntax using Context Free Grammar (CFG) • Explain the following CFG concepts: derivation, Parse Tree, Ambiguity of Grammar, Disambiguation of Grammar, Left Recursive Grammar, Removal of Left Recursion, Left Factoring of Grammar • Explain Parsing Techniques -Top down Parsing and Bottom-Up Parsing			any other HLL. • Use C, PASCAL, JAVA, C# and any other HLL. to serve as input to the scanner • Use the scanner program to serve as subroutine of the new parser. • Design an algorithm to implement any HLL grammar (FORTRAN, C, JAVA, C#, PROLOG, SMALL TALK, etc) • Implement the HLL grammar in any of the following : JAVA, C, C++, Visual Basic etc.	design Describe the role of Syntax Analyzer (Parser) in a compiler. Explain how to specify programming language syntax using Context Free Grammar (CFG)

	Objective 4.0: Understand the top-down and bottom-up parsing					
5- 6	4.1 Basic principles of top down parsers 4.2 Basic principles of bottom up parsers	To: • Describe top down parsing techniques with appropriate illustrations • Explain recursive descent parsing techniques with appropriate algorithm, parsing table and illustrations • Explain predictive parsing techniques with appropriate algorithm, parsing table and illustrations • Explain bottom up parsing technique with appropriate illustration • Explain Operator-precedence parsing technique with appropriate algorithm, parsing table and illustrations • Discuss LR-Parsing techniques such as LR (0) or SLR, LR (1) and LALR (1) with appropriate algorithm, parsing table and illustrations • Explain the limitation syntax analyser	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes	To learn how to write a top-down parser for output of the scanner To learn how to write a Bottom - Up parser for output of the scanner	To assist students to: • Use the scanner program to serve as subroutine of the new top-down and new Bottom-Up parser. • Design an algorithm to implement any HLL grammar (FORTRAN, C, JAVA, C#, PROLOG, SMALL TALK, etc) Implement the HLL grammar in any of the following : JAVA, C, C++, Visual Basic etc.	Explain recursive descent parsing techniques with appropriate algorithm, parsing table and illustrations Explain predictive parsing techniques with appropriate algorithm, parsing table and illustrations Explain the limitation syntax analyzer

	Objective 5.0: Semantic Analysis – Syntax Directed Translation					
7	5.1 Role of Semantic Analyzer	To: • Explain the role of Semantic Analyzer • Explain The Semantics of Language Constructs - *Attributes* • Explain attribute grammar, syntax directed translation and syntax directed definition. • Discuss Syntax-Directed Translation Schemes(SDT) • Explain L-attribute definition	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes	To learn how to implement type checking and array bound	To assist the students write simple program and matched data type and array bounds.	Explain the role of Semantic Analyzer Explain The Semantics of Language Constructs - *Attributes*
	Objective 6.0: Intermediate Code Generation					
8 - 9	Role intermediate code generation and the principles involved.	To explain: • Intermediate Representation (IR) • Graph Form of IR • Reverse Polish Notation (RPN) Form of IR • Evaluating Postfix Notation Using Stack • Three-Address Code Form of IR • Syntax-directed translation into three-address code • Syntax Directed Translation • Implementation of three-address statements such as Quadruples, Triples and Indirect Triples • Addressing array elements • Structures Associated with IR • Program Dependence Graph	A PC loaded with a compiler software and Presentation package and connected to multimedia Projector Online lecture notes Reference manual on compilers	To learn how to implement stack machine code for Postfix stack machine.	To demonstrate to students how to implement stack machine code for Postfix stack machine.	Explain the following terms: i. Intermediate Representation (IR) ii. Graph Form of IR iii. Reverse Polish Notation (RPN) Form of IR

	Objective 7.0: Code Optimization					
10	Purpose of code optimization	To discuss: • Type of Optimization • Machine-Independent Code Optimization • Control Flow Analysis using Basic Blocks, Control Flow Graph • Sources of Optimization in Control Flow Analysis • Data Flow Analysis • Machine-Dependent Code Optimization such as Register Allocation, Instruction Scheduling, Peephole Optimizations, e.t.c.	A PC loaded with a compiler software and Presentation package and connected to multimedia Projector Online lecture notes Reference manual on compilers	To learn how to write source **code** that the compiler can effectively **optimize**	To demonstrate to students how to write source **code** that the compiler can effectively **optimize** using any HLL	List and explain Types of Optimization
	Objective 8.0: Runtime Storage Management					
11	Role of a runtime storage management in compilation process.	**To explain:** • Source Language Issues That Affect Compiler • Storage Organization during Program Execution • Activation Record and Activation Tree • Typical Activation Record for a Language with Stack-Dynamic Local Variables • Dynamic Chain and Local Offset • Runtime Storage Allocation Strategies such as Static Allocation and Dynamic Allocation	A PC loaded with a compiler software and Presentation package and connected to multimedia Projector Online lecture notes Reference manual on	To learn how to manage runtime storage in a compiler	To demonstrate how runtime storage in a compiler using dynamic memory in HLL	Explain runtime storage in a compiler using dynamic memory in HLL

		• Parameter Passing Methods	compilers			
	Objective 9.0: Code Generation					
12	Role of a code generation and the principles involved.	To Explain: • Issues in the Design of a Code Generator • Model of the Target Machine • Standard Code Generation Strategies • Code Generation from Linear Sequence of Three-Address Statements. • Code Generation from Abstract Syntax Trees • Code Generation from DAG	A PC loaded with a compiler software and Presentation package and connected to multimedia Projector Online lecture notes Reference manual on compilers	To learn how to generate Machine code from Three-Address statements, abstract syntax tree, DAG using Assembly Language	To show the students how to generate Machine code from Three-Address statements, abstract syntax tree, DAG using Assembly Language	Generate Machine code from Three-Address statements
	Objective 10.0: Symbol Table Management					
13	Symbol table management techniques and their role in the compilation process.	To explain: • The Role of the Symbol Table • Basic Symbol Table Operations • The Symbol Table Implementation Technique such as Linear List, Binary Tree and Hash Table • Ways of Storing Names in the Symbol Table • The Management of the Scope of Information	A PC loaded with a compiler software and Presentation package and connected to multimedia Projector Online lecture notes	To learn symbol table management techniques using access database or any other database tool	To demonstrate to student how to manage symbol table using concepts from database software such as access database or any other database tool	Explain the Symbol Table Implementation Technique such as Linear List, Binary Tree and Hash Table

			Reference manual on compilers			
	Objective 11.0: Error Handling in a Compiler					
14	Error handler	To Explain: • Error Diagnosis in a Compiler • Type of Errors Captured by Compiler • Error Recovery Strategies • Recovery from Lexical Phase Errors • Recovery from Syntactic Phase Errors • Panic Mode Recovery • Error Recovery in LR Parsing • Predictive Parsing Error Recovery • Recovery from Semantic Errors	A PC loaded with a compiler software and Presentation package and connected to multimedia Projector Online lecture notes Reference manual on compilers	To learn how to design error trapping routine and integrate it with the parser	To assist students in designing error trapping routine and integrate it with the parser Write a program to trap syntactically wrong statement any HLL (e.g PASCAL, C, JAVA, etc Generate program listing and error list of wrong statement Write a program to generate error list of wrong statements	Designing error trapping routine and integrate it with the parser

	Objective 12.0: Bootstrapping & Compiler Generation Tools					
15	12.1 Bootstrapping of a compiler 12.2Compiler generation tools	To explain: • The concepts of bootstrapping • Discuss compiler writing tools	A PC loaded with a compiler software and Presentation package and connected to multimedia Projector Online lecture notes Reference manual on compilers	To learn bootstrap and use compiler writing tools	To demonstrate to students how to bootstrap and use compiler writing tools	A PC loaded with a compiler software and connected to an OHP. Reference manual on compilers

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(COM 414)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feedback.	20
Practical	At least 5 home works to be assessed by the teacher	20
Total		100

PROGRAMME: HIGHER NATIONAL DIPLOMA(HND) COMPUTER SCIENCE		
COURSE: DATA COMMUNICATION ANDNETWORKS	**Course Code: COM 414**	**Contact Hours:4 Hours/week**
GOAL: This course is designed to provide the students with knowledge of and skills in Data Communication and Network		

Year: 2 Semester: 1	**Pre-requisite: COM 111**	**Theoretical:**	**2 hours /week**
		Practical:	**2 hours /week**

GENERAL OBJECTIVES:

On completion of this course the student should be able to:

1.0 Understand data communication and different equipment/components used.

2.0 Understand the Concept of Networking Devices

3.0 Understand Open System Interconnect (OSI) Reference Model

4.0 Understand Local Area Networks and Networks of LANs.

5.0 Understand the Wide-Area Routing and Internetworking

6.0 Understand the Concept of Computer Network Topology

7.0 Understand the Data Link Layer

8.0 Understand the Physical Layer

9.0 Understand the basics of the transport layer

10.0 Understand Network Applications and Management

11.0 Understand the security aspects of networks.

12.0 Understand the basics of cloud computing

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND) COMPUTER SCIENCE

COURSE TITLE :DATA COMMUNICATION ANDNETWORKS				COURSE CODE: COM 415	CONTACT HRS: 4/Week	
COURSE SPECIFICATION: Theoretical Contents				COURSE SPECIFICATION: Practical Contents		
	General Objective 1.0 :Understand Data Communication and Networking equipment/components used					
Week	**Specific Learning Outcomes**	**Teachers Activities**	**Resources**	**Specific Learning Outcomes**	**Teachers Activities**	**Evaluation**
1	1.1 Describe Basic Data Communication concepts, 1.2 Identify and List Data communication equipment 1.3 Describe the concept of Packet-Switched Networks.	Introduce computer networks and Data Communication concepts. -Explain the need for networks. - Give an overview of today's Internet. -Define Fundamental concepts, such as messages, packets, and frames and packet switching versus circuit switching.	White Board. PC loaded with Presentation package and connected to multimedia Projector Online lecture notes			Describe Basic Data Communication concepts, Identify and List Data communication equipment Describe the concept of Packet-Switched Networks.
General Objective 2.0: Understand the Concept of Networking Devices						
2	2.1 Identify Networking Devices.	Explain the purpose, features, and functions of the following network components: . Hubs, Switches, Bridges,	White Board. PC loaded with			Identify different Networking Devices.

		Routers, Gateways, CSU/DSU, Network interface cards (NICs), Integrated Services Digital Network (ISDN) adapters, Wireless access points (WAPs), Modems. Transceivers (media converters), Firewalls etc	Presentation package and connected to multimedia Projector nline lecture notes			
General Objective 3.0:Understand OSI Reference Model						
3	3.1 Describe and Identify the seven layers of Open Systems Interconnect (OSI) Model.	Describe the primary functions of each layer of OSI reference model Identify the OSI layer at which a particular network activity takes place Identify the OSI layer at which a particular network component functions	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes			Identify and define the seven layers of OSI model
General Objective 4.0: Understand Local Area Networks and Networks of LANs.						

4	4.1 Describe Local Area Networks 4.2 Identify Local Area Networks 4.3 Describe and Identify Networks of LANs.	-Explores the implementation of small networks. -Describe pointers for constructing a network with devices and making connections. -State examples of local area networks (LANs), and describe how such LANs are inter networked. Next, the chapter explores address conversion protocols by which addresses at layers 2 and 3 are converted to one another. The Spanning-Tree Protocol (STP). Virtual LANs (VLANs).	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes	Connect both LAN (Local-Area Network) and WAN (Wide-Area Network) switching technologies. LAN standards (IEEE standards 802 for LANs) • Interconnecting LANs • LAN Hardware (server platforms, backup devices, LAN adapters, printers, etc.) • LAN system software, LAN application software	Guide students on how to interconnect different networks	Describe and identify Local Area Networks and Networks of LANs.
General Objective 5.0:Understand the Wide-Area Routing and Internetworking						

5	5.1 Explain routing in Wide Area Networks (WANs) 5.2 Describe IP packet format 5.3 Explain path selection algorithms 5.4 Explain IPv6 and its packet format.	- Explain routing in wide area networks (WANs) and related routing algorithms and protocols. -Describes IP packet format and basic routing policies such as :- Internet Control Message Protocol (ICMP), Dynamic Host Configuration Protocol (DHCP), and Network Address Translation (NAT). -Explain path selection algorithms such as: Open Shortest Path First (OSPF) protocol, and the Routing Information Protocol (RIP) followed by the inter domain routing protocols Border Gateway Protocol (BGP) covering both internal BGP (iBGP) and external BGP (eBGP).	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes			Describe Wide-Area Routing and Internetworking

		-IPv6 and its packet format. -Congestion-control algorithms at the network layer: network-congestion control and link-flow control and technique to estimate the link-blocking probability				
General Objective 6.0: Understand the Concept of Computer Network Topology						
6	6.1 Define Network Topology 6.2 Type of Network Topologies 6.3 Advantage and disadvantage of each topology	Identify the four standard topologies and their variations Describe the advantage and disadvantage of each topology Determine an appropriate topology for a given Network plan.	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes			Distinguish between various Network topology Explain where and how to implement the various topology
General Objective 7.0: Understand the Data Link Layer						

7	7.1 Describe the principles behind data link layer services: error detection, correction 7.2 Explain sharing a broadcast channel: multiple access link layer addressing reliable data transfer, flow control 7.3 Explain Instantiation and implementation of various link layer technologies.	Identify Data Link Layer : Data Link Layer – Accessing the Media Describe the Media Access Control Logical Link Control Addressing and Framing Data	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes			Describe the principles behind data link layer services Instantiation and implementation of various link layer technologies.
General Objective 8.0: Understand the Physical Layer						
8	8.1 Define Physical Layer of the OSI Reference model 8.2 Explain Communication Signals	Identify various Physical link layer devices and protocol	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes			Describe the Physical Layer of the OSI Reference model.
General Objective 9.0: Understand the basics of the transport layer						

9 - 10	9.1 Describe the OSI transport layer.	-Discuss techniques for Transmission Control Protocol (TCP) congestion control. -Describes congestion avoidance methods in a TCP session. -Discuss of methods of congestion control.	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes			Explain the basic of the transport layer
General Objective 10.0: Understand Network Applications and Management						

11-12	10.1 Describe Basic Network 10.2 Explain Network Applications and Management	Describe Domain Name System (DNS); e-mail protocols, such as SMTP and Webmail, the World Wide Web (WWW), remote login, File Transfer Protocol (FTP), and peer-to-peer (P2P) networking. - Techniques of Network management techniques protocol.	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes			Describe and perform Basic Network Applications and Management
General Objective 11.0: Understand the security aspects of networks.						
13-14	11.1 Explain Network threats, hackers, and attacks. 11.2 Explain Cryptography Techniques 11.3 Security aspects of wireless networks.	-Introduces network threats, hackers, and attacks. -Discusses cryptography techniques: public- and symmetric-key protocols, encryption	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes	Manage network Security & access rights. Implementing ciphering techniques.	Guide student on how to implement network security measures.	Describe and perform Network Security

		standards, key-exchange algorithms, authentication methods, digital signature and secure connections, firewalls, IPsec, and security methods for virtual private networks. -Describe security aspects of wireless networks.				
General Objectives 12.0: Understand the basics of cloud computing						
15	12.1 Explain Cloud Computing 12.2 Define basic terms of Cloud Computing	-Describe cloud computing, large data centres, networking segments of data centres, and virtualization in networking. -Define basic terms such as virtualization, virtual machines,	PC loaded with Presentation package and connected to multimedia Projector Online lecture notes	Develop Cloud computing	Guide student to implement cloud computing.	Describe and apply cloud computing in a network environment.

		and the structure of large data centers constructed from server racks and large data bases.				

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(COM 414)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 home works to be assessed by the teacher	20
Total		100

	Department/ Programme: **HND Computer Science**	**Course Code: COM 415**		**Credit Hours: 5**
	Subject/Course: Multimedia			**Theoretical: 1 hours/week**
	Year: 2 Semester: 1	**Pre-requisite:**		**Practical: 4 hours /week**
	GOALS: The course is designed to enable students acquire knowledge of and skills in Multimedia.			

General Objectives: On completion of this course, the students should be able to:

1. 0 Understand the basics of multimedia tools
2. 0 Understand Visual Communication and Interactive Media
3. 0 Understand Website design and Authoring
4. 0 Understand basic process of graphic design and illustration
5. 0 Understand Video Communications
6. 0 Understand how to work with Group Project Session
7. 0 Understand Print and Digital Media Publication

	Course: Multimedia	**Course Code: COM 415**			**Credit Hours: 5**	
					Theoretical: 1 hours/week	
	Year: 2 Semester: 1	**Pre-requisite:**			**Practical: 4 hours /week**	
	Theoretical Content				**Practical Content**	
	General Objective 1: Understand the basics of multimedia tools					
Week/ s	**Specific Learning Outcomes**	**Teacher's activities**	Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1	1.1 Explain multimedia 1.2 Explain types and application areas of multimedia tools	Explain the basic concept of multimedia Explain types and application areas of multimedia tools	White board and marker pen PC Loaded with multimedia packages Multimedia projector			List different multimedia tools and their respective functions

General Objective 2: Understand Visual Communication and Interactive Media						
2-6	2.1 Explain Visual communication 2.2 Explain the process in visualization setting – Audience needs, Images selection and design plans. 2.3 Explain design elements when preparing images, resolution, topography and image generation devices. 2.4 Explain how to use presentation packages to do (a) Image selection and Manipulation (b) Image formatting 2.5 Explain interactive media and the needs in the society 2.6 Explain interactive media design elements using common media packages (e.g Adobe flash) 2.7 Discuss with examples the process of creating an interactive media interface 2.8 Explain the steps involved in building interactive media elements using common interactive package (e.g. Flash professional)	Explain Visual communication and process in visualization setting, Audience needs, Images selection and design plans. Explain design elements when preparing images, resolution, topography and image generation devices. Explain how to use presentation packages to do (a) Image selection and Manipulation (b) Image formatting Explain interactive media and show areas of application in the society Explain interactive media design elements using common media packages (e.g Adobe flash) Discuss with examples the process of creating an interactive media interface	White board and marker pen PC Loaded with multimedia packages Multimedia projector	Practice how visual communication can be actualized Demonstrate how to achieve the following: Images, resolution, topography and image generation devices. Demonstrate the following: Image selection and manipulation Show interactive media design elements using common media	Guide the students on how to create Visual communication and process in visualization. Guide the students on image selection and manipulation, image formating	Describe how to create visualization, image selection Image, image formatting Describe the interactive media and show how it can be build Describe the Design elements

		Explain the steps involved in building interactive media elements using common interactive package (e.g. Flash professional)				
	General Objective 3.0: Understand Website design and Authoring					
7-8	3.1 Explain the basic concept of website design 3.2 Explain the steps involved in site design and page layout 3.3 Explain the anatomy and functionalities of web authoring packages(eg Dreamweaver) (a) Explain the functions and interfaces 3.5 Explain with examples how to develop and maintain website using and web authoring package	Explain with examples the basic concept of website design Explain the steps involved in site design and page layout Explain the anatomy and functionalities of web authoring packages(eg Dreamweaver and also Explain the functions and interfaces	White board and marker pen PC Loaded with multimedia packages Multimedia projector	Demonstrate the functionalities of web authoring packages Develop and show how to maintain websites using web authoring packages	Guide the students on how to design simple website, Web authoring packages functionalities Demonstrate how to design a simple website	Describe the steps for developing websites Describe the Web authoring packages functionalities

	General Objective 4.0: Understand basic process of graphic design and illustration					
9-10	4.1 Explain the concept of graphics design and illustrations 4.2 Discuss the following elements in preparing Graphics (a)graphics compositions, resolution and size (b) use of symbols and representative graphics (c) video, web and point file formats 4.3 Explain element of illustrator package, user interface and their functions 4.4 Explain how to create graphics for web, print and video using a common graphics illustrator package	Explain the concept of graphics design and illustrations Explain the following elements in preparing Graphics - graphics compositions, resolution, symbol and size Explain video, web and point file formats Explain element of illustrator package, user interface and their functions Explain how to create graphics for web, print and video using a	White board and marker pen PC Loaded with multimedia packages Multimedia projector	Demonstrate a simple graphics and illustration Show how to use symbols and representative graphics Demonstrate on how to create graphics for web	Guide the students on how to use illustration packages Design and develop graphics for web	Describe graphics compositions, resolution and size Describe the use of symbols and representative graphics

		common graphics illustrator package				
	General Objective 5.0: Understand Video Communications					
11-12	5.1 Explain the concept and benefits of video communications 5.2 Explain with examples various application areas of video communications 5.3 Discuss the design elements of video sequence and general principles of video shooting	Explain the concept and benefits of video communications Explain showing examples various application areas of video communications Explain the design elements of video sequence and general principles of video shooting	White board and marker pen PC Loaded with multimedia packages Multimedia projector	Demonstrate how to perform video communications Demonstrate how to design video sequence and show general principles of video shooting	Guide the students on how to create video communications Direct the students on how to produce video sequence and video shooting	Describe graphics video communication creation Describe the steps in video shooting

	General Objective 6: Understand how to work with Group Project Session					
13-14	6.1 Explain how to write project report 6.2 Explain how to present a project in class presentation.	Explain the basics project report Explain how to present a project in class presentation	White board and marker pen PC Loaded with multimedia packages Multimedia projector	Demonstrate how to write project report and how to do project presentation	Guide the students on how to write simple project report	Describe project report and its presentation processes
	General Objective 7: Understand Print and Digital Media Publication					
15	7.1 Define print and digital media publications and state their differences 7.2 Explain design principles, elements, and page layout composition of web and digital publication 7.3 List and discuss different types of print and digital media packages 7.4 Explain in detail the process of creating print, web and digital publications using any common packages listed above (e.g Adobe InDesign)	Explain print and digital media publications and state their differences Explain design principles, elements, and page layout composition of web and digital publication discuss different types of print and digital media packages Explain in detail the process of creating print, web and digital publications using any common	White board and marker pen PC Loaded with multimedia packages Multimedia projector	Demonstrate how to design digital media publications Demonstrate how to design page layout and digital publication	Guide students on how to create digital media publications Direct students on how to create page layout and digital publication	Describe digital media publication Illustrate how to create page layout and digital publication

		packages listed above (e.g Adobe InDesign)				

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test 20%; Practical 20 %; %; Examination 60%

FOUTH SEMESTER COURSES

Programme: COMPUTER SCIENCE. (Higher National Diploma)	**Course Code: COM 422**	**Credit Hours: 5 hours/week**
Course Title: **COMPUTER GRAPHICS AND ANIMATION**	**Semester: II**	**Theoretical: 2 hours/week**
Year: HND II	**Pre-requisite:**	**Practical: 3 hours /week**
Goal: To train the students to acquire skills and mastery in the use of different software producing graphics and animation.		

General Objectives: On completion of this course the student should be able to:

1.0 Know the basic concept of computer graphics

2.0 Know various design elements used when preparing graphics

3.0 Understand what 2D and 3D animation is and its uses in different fields today.

4.0 Know how to make Vector images and text .

5.0 Understand Basic scripting .

6.0 Understand how to make a slide Show in animation

7.0 Understand how to create graphics using drawing and shape tools .

8.0 Understand how to apply different animation software to objects.

9.0 Understand the Concept Video Editing

	Theoretical Content			**Practical Content**		
	General Objective 1: Know the basic concept of computer graphics and animations					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Evaluation**

1	1.1 Explain the concept of graphics 1.2 Explain the origin of computer graphics 1.3 Identify the purpose, audience, and audience needs for preparing graphics 1.4 Explain the standard of copyright rules for artwork, graphics, and graphic use 1.5 Explain image processing	Explain the concept of graphics Explain the origin of computer graphics Explain the purpose, audience and audience needs for preparing graphics Explain the standard of copyright rules for artwork, graphics, and graphic use Explain image processing as a picture analysis	Whiteboard Markers PC loaded with Graphic packages Multimedia Reference manual on graphic packages.			Explain the concept of Graphics State the purpose, audience, and audience needs for preparing graphics
	General Objective 2: Know various design elements used when preparing graphics					

2	2.1 Describe a picture element 2.1 State design principles, elements and graphic composition when preparing graphics 2.2 Describe the typography of Graphics 2.3 Explain the use of symbols and representative graphics 2.4 Explain the terminology use when working with graphics	Explain a picture element Explain the principles, elements and graphic composition when preparing graphics Explain the typography of graphics Explain various symbols use in representing graphics Explain the terminology use when working with graphics	Whiteboard Markers PC loaded with Graphic packages Multimedia Reference manual on graphic packages.	Install software, Use mouse/keyboard, Use all the elements of the GUI in presenting a graphic design	Guide students to install related software and the use mouse/keyboard in preparing graphics	Describe a picture element Identify and explain different terminologies used when working with graphics
	General Objective 3: Understand what 2D and 3D animation is and its uses in different fields today					
3	3.1 Explain what 2D and 3D Animation is 3.2 Explain the types of 2-D and 3-D animation	Explain what 2D and 3D Animation is Explain the types of 2-D animation: • Keyframe • Stop motion Explain the types of	Whiteboard Markers PC loaded with Graphic packages Multimedia Reference manual on	Browse interactive presentations	Guide students browsing interactive presentations and also to use the 2D and 3D animation	What is 2D and 3D animation State the uses of 2D and 3D animation

	3.3 State the uses of 2D and 3D animation 3.4 Identify the software for 2D and 3D animation	3-D animation Explain the uses of 2D and 3D animation in: Business, Education, Entertainment, Infotainment Identify the software for 2D and 3D animation .e.g. Adobe After Effects, Adobe Flash Professional, Anime Studio, Antics 2-D Animation, Apple iAd Producer, Autodesk Animator, Cacani, DigiCel Flipbook, Dimp Animator, DrawPlus, e.t.c.	graphic packages.			

	General Objective 4: Know how to make Vector images and text					
4-5	4.1 Explain vector drawing concepts 4.2 Explain how to make a graphic symbol, Button and a movieclip with their respective attributes 4.3 Explain how to make a text box with dynamic/static text.	Explain the concept of vector drawing Explain how to make a graphic Symbols, Graphics, Movie Clip Explain how to add a text box with dynamic/static text	Whiteboard Markers PC loaded with Graphic packages Multimedia Reference manual on graphic packages.	Make a simple graphic symbol, Button and a movie clip	Guide students in the use of graphic symbol, button and a movie clip	State the procedures involved in creating graphic symbols and adding text box with dynamic/static text
	General Objective 5: Understand Basic scripting					
6	5.1 Give an introduction to the Action Panel 5.2.Explain instance name and labels 5.3.Give an introduction to Action Scripting	Explain the Action Panel: • Main Action Window • Output window Explain instance name and labels Explain Action Scripting: • Importance of Movie clips in Action scripting • Basic Actions: GoTo, Play,	Whiteboard Markers PC loaded with Graphic packages Multimedia Reference manual on graphic packages. Internet	Explore and use basic action scripts in an animation or on a button Experiment with the scripts	Guide students in the use of basic actions in animation Guide students in the experiment	Explain instance name and labels

		Stop, Toggle, High Quality, Stop All sounds, etc.				
	General Objective 6: Understand how to make a slide Show in animation					
7	6.1 Describe how to animate an interactive (full window) slide show by importing pictures, adding scenes, adding play, pause, forward, rewind, quit buttons and make an exe file.	Explain different dimensions of the slideshow in graphic animation Explain basic GUI of the slideshow: Image area, Text area, Button area Explain how to adding interactive buttons: Next, Previous, Quit Explain how to saving the slideshow and exporting Full scale slideshow as an exe file	Whiteboard Markers Computer, Graphic Tablet, Speakers, Headphones, Scanner, Internet,	Add interactive buttons to design	Guide students on how to add interactive buttons Guide students in saving the slideshow and exportation	State different the dimensions of a slideshow for web/presentations
	General Objective 7: Understand how to create graphics using drawing and shape tools					

8	7.1 Explain how to create documents 7.2 Explain how to use drawing and shape tools 7.3 Explain how to use type tools 7.4. Explain how to use scanned or photographic images 7.5 Describe how to create realistic graphics 7.6 Describe how to modify and transform objects	Explain how to create documents Explain how to use drawing and shape tools Explain how to use type tools Explain how to use scanned or photographic images 7.5 Explain how to create realistic graphics 7.6 Explain how to modify and transform objects	Whiteboard Markers PC loaded with Graphic packages Multimedia Reference manual on graphic packages Internet	Demonstrate knowledge in the creation of document using different drawing tools, photographic images and also modify objects.	Guide students in the creation of document using different drawing tools, photographic images and also modify objects.	Describe how to create using different drawing tools Describe how to create realistic graphics
	General Objective 8: Understand how to apply different animation software to objects					
9	8.1 Explain Animation with examples 8.2 Explain how to apply different animation software to objects	Explain how to apply different animation software to objects	Graphic software, Multimedia Internet	Apply animation software to objects	Demonstrate how to apply animation software to objects	Explain how to apply an animation software to objects
	General Objective 9: Understand the Concept Video Editing					

10-12	9.1 Explain the concept of video editing 9.2 Explain the processes involve in video editing 9.3 Explain the concept of cinematography	Explain the concept of video editing Explain the processes involve in video editing Explain the concept of cinematography	Graphic software, Multimedia Internet	Design a simple motion picture	Guide students in different groups on how to create motion pictures and edit video	Explain the concept of video editing and state the process

Assessment: Give details of assignments to be used:

Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **COM 422**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 1 progress test for feedback.	10
Practical	At least 10 home works to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

	Department / Programme: COMPUTER SC. (HND)	**Course Code: COM 423**		**Credit Hours: 5 hours/week**
	Subject/Course: Expert System and Machine Learning .			**Theoretical: 2 hours/week**
	Year: II Semester: 2	**Pre-requisite:** COM327		**Practical: 3 hours /week**
	GOAL: At the end of the course, the student should be able to build expert intelligent system using machine learning (ML) tools.			

General Objectives:

On Completion of this course the student should be able to:

1. Understand Expert System (ES) concepts
2. Understand Knowledge representation
3. Understand the methodology of human knowledge Transfer Into an ES
4. know ES architecture and tools
5. Understand types of ES
6. Understand development of an expert system
7. Understand Machine Learning (ML) concept
8. Understand ML algorithms
9. Understand learning models from data and evaluation measures.

	Course: Computer Science	**Course Code: COM 423**		**Credit Hours: 5 hours/week**

	Course Title: Introduction Expert System and Machine Learning.			**Theoretical: 2 hours/week**
	Year: HND11 Semester: 11	**Pre-requisite:**		**Practical: 3 hours /week**
	Theoretical Content		**Practical Content**	

Week/s	**Specific Learning Outcomes**	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Evaluations
	General Objective 1: Understand Experts Systems Concept					
1-2	Explain the concept of expert system 1.1 Explain the basic principles and Role of knowledge acquisition in expert systems. 1.2 Explain programming languages for expert systems. 1.3 Explain current state of expert system development 1.4 Explain the concepts of genetic Algorithms	--Explain the concept, history and application of expert systems --Discuss the principles and the role of Knowledge acquisition in expert systems. --Explain programming languages for expert system e.g. prolog and LISP. -- Discuss applications of expert systems and probably future development. --Discuss neural networks, language processing and Genetic Algorithms.] – Explain the use of a PC based expert systems shell.	White board, PC , Multimedia and the compilers (WEKA, etc)	Design expert systems program using UML, XML for modeling and WEKA for implementation etc	Guide student to design expert systems program using UML, XML for modeling and PROLOG for implementation Demonstrate with a practical problem	Explain features and roles of ES

General Objectives 2: Understand Knowledge acquisition and representation						
3	2.1 Explain knowledge extraction methods. 2.2 Explain Knowledge representation, 2.3 Explain issues associated with knowledge acquisition 2.4 Explain the functions of Knowledge Engineers 2.5 Know type of Knowledge	Explain various knowledge acquisition and representation schemes , Explain various problems of knowledge acquisition Explain the roles of knowledge Engineer, Domain expert Explain type of knowledge – heuristic, deep, meta, categorical, structured and unstructured	White board, PC , Multimedia and the compilers CLIPS Python, R language etc)			. What are the issues associated with knowledge acquisition
	General Objective 3: Understand the methodology of human knowledge Transfer Into an ES					
4	3.1 Explain different reasoning methods adopted for designing of inference component of ES 3.2 Explain how to represent knowledge in an uncertain domain	Explain the different reasoning methods: backward, chaining, forward chaining etc	White board, PC , Multimedia and the compilers (WEKA, CLIPS, etc)			Explain various reasoning techniques

	General Objective 4: know ES architecture and tools					
	4.1 Describe ES Architecture 4.2 Sketch the block diagram of ES 4.3 Explain the function of ES components 4.4 State the functions of ES components	Explain the ES architecture with diagrams	White board, PC , Multimedia and the compilers (PROLOG, LISP etc			Sketch ES architecture state the functions of the component
	General Objective 5: Understand types of ES					

	5.1 Explain types of ES 5.2 Explain operational mode of ES	Explain types and operational modes of ES.	White board, PC , Multimedia and the compilers (PROLOG, LISP etc			What are the types and operational modes of ES
	General Objective 6:Understand development of an expert system					
	6.1 Explain the developmental stages of ES 6.2 Explain Performance Evaluation of ES	Explain the developmental stages and performance evaluation of ES	White board, PC , Multimedia and the compilers (PROLOG, LISP etc	Ability to solve real world problems	Demonstrate with real world solving of problems	Discuss developmental stages of ES
	General Objective 7: Understand ML concept					

	7.1 Explain ML concept and its tools 7.2 Explain learning and types	Explain ML concept and its tools Discuss learning List learning types- supervised, unsupervised , reinforcement learning	White board, PC , Multimedia and the compilers (PROLOG, LISP etc	Explore with suggested standard packages to identify machines learning features	Guide students to explore the languages for machine learning features	Discuss types of learning.
	General Objective 8: Understand ML algorithms					
	8.1 Explain ML algorithms 8.2 Explain clustering algorithm 8.3 Explain supervised learning: Classification algorithm	Discuss the ML algorithm Explain ML algorithm K-Mean, Self Organising Map (SOM) , Decision Tree, Random Forest, SVM nearest neighbour	White board, PC , Multimedia and the compilers (JAVA, C++) and packages: MATLAB, Tanagra, WEKA, RapidMiner, SPSS, etc	Carry out practical to implement algorithm with standard packages and present reports	Guide and provide data set for the practical. Interprets the output	Differentiate among the learning techniques
	General Objective 9: Understand learning models from data and evaluation measures.					
	9.1 Explain the use of the ML models, 9.2 Explain probability and classification,	Explain ML algorithms Explain Bayes optimal decisions	White board, PC , Multimedia and the compilers MATLAB,	Learn to associate the ML models real life problems	Guide the students to adopt a suitable model	Formulate real life problems for a given ML model

	9.2 Explain Model performance measures	List and explain Model performance measures : SSE, RMSE, ROC, MAE, Confusion matrix etc	Tanagra, WEKA, RapidMiner, SPSS etc		for real life problems and present the results using appropriate performance measure	

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test20 %; Practical %; Projects20 %; Examination 60 %

Programme: Higher National Diploma (HND) Computer Science	**Course Code: COM 424**	**Contact Hours: 4 hours/week**
Course: IT Professional Practice		**Theoretical: 2 hours /week**
Year: 2Semester: 2	**Pre-requisite:**	**Practical: 1 hours /week**

Goal: This course is designed to provide students with knowledge and skills needed to practice IT profession

General Objectives: On completion of this course, the diplomates should be able to:
1.0Understand the Concepts of IT Professional Practice
2.0 Understand Legal and Ethical issues in IT Practice
3.0Understand the Principles of Group Working
4.0Understand Quality Management in IT Practice
5.0Understand Job Application Process
6.0Know how to Access Relevant Information for IT Practice
7.0Know how to Make Successful Multimedia Presentations

Theoretical Content				**Practical Content**		
General Objective 1.0Understand the Concepts of IT Professional Practice						
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Evaluation**
1	1.1 Explain the concept of Profession, Professional, and	Explain Profession, Professional, and	White board and Marker.			What are the basic

	Professional Practice 1.2 State the basic requirements for IT professional practice 1.3 Explain professional bodies and their roles e.g. Computer Professionals (Registration Council of Nigeria) (CPN), Nigeria Computer Society (NCS), British Computer Society (BCS) etc. 1.4 Outline the importance and process of registering with IT Professional bodies	Professional Practice Explain the basic requirements to practice as an IT professional Discuss the roles of IT professional bodies. Explain the importance and process of registering with IT Professional bodies	Networked PCs loaded with Presentation package Multimedia projector and flip chart			requirements for IT professional practice? What are the IT professional bodies?
General Objective 2.0 Understand Legal and Ethical issues in IT Practice						
2-3	2.1 Explain Morals, Ethics and Laws 2.2 Explain the code of ethics/bye laws of relevant professional bodies e.g. Computer Professionals of Nigeria (CPN), NCS, BCS etc. 2.3 Explain the obligations of IT professional to: fellow professionals, employer, the nation and society. 2.4 Explain the sanctions for violating code of ethics of the profession	Discuss Morals, Ethics and Laws Discuss the byelaws/ code of ethics of relevant professional bodies Discuss the obligations of IT professional Discuss the sanctions for violating code of ethics of the profession	White board and Marker. Networked PCs loaded with Presentation package Multimedia projector and flip chart code of ethics &Byelaws of relevant professional bodies	Search the internet for bye laws of foreign IT professional bodies	Guide students to search the internet for bye laws of foreign IT professional bodies	.What are the obligations of IT professional to fellow professionals, employer, the nation and society?
	2.4 Explain Copyright, patent,	Explain Copyright,	White board			Distinguish

4	trademark, and intellectual property, 2.5 Explain Piracy and Plagiarism 2.6 Outline the laws relating to copyright, patent, trademark, intellectual property, piracy and plagiarism etc. 2.7 Explain Cybercrime and Internet Laws 2.8 Explain the sanctions for violating IT laws	patent, trademark and intellectual property Discuss Piracy and Plagiarism Explain the laws relating to copyright, patent, trademark, intellectual property, cybercrime piracy, plagiarism etc. Discuss the sanctions for violating IT laws	and Marker. Networked PCs loaded with Presentation package Multimedia projector and flip chart Copies of IT Laws and Federal Constitution			between Copyright, patent, trademark, intellectual Property, piracy and plagiarism?
General Objective 3.0: Understand the Principles of Group Working						
5	3.1 Explain the concept of Group and Team 3.1 Outline the need for group working in IT practice 3.3Explain the different types of Groups: project group, peer group, in-group, out-group etc. 3.4Explain group dynamics and the role of members 3.5Explain the Stages of Group Development (Tuckman's & Jensen's model): forming, storming, norming, performing and adjourning	Discuss the concept of Group and Team their importance in IT practice Discuss the types of Groups, group dynamics and roles of members Discuss the Stages of Group Development (Tuckman's/Jensen's)	White board and Marker. Networked PCs loaded with Presentation package Multimedia projector and flip chart.	Form groups amongst students using Tuckman's & Jensen's model for simple IT task Perform simple IT task in groups	Guide students to form groups amongst themselves for simple IT tasks Guide students to Perform simple IT task in groups	Demonstrate how to form groups and perform tasks in groups?
6	3.6Explain the concept of Balanced Team	Discuss the concept of Balanced Team	White board and Marker.	Assess the group performances	Guide students to assess group performances	Demonstrate how to assess the

	3.7Describe Belbin's Team Roles: plant, resource investigator, shaper, completer finisher etc. 3.7 Explain the process of assessing the effectiveness of a team using Belbin's Team roles	Explain Belbin's Team Roles State the process of assessing the effectiveness of a team using Belbin's Team roles	Networked PCs loaded with Presentation package Multimedia projector and flip chart.	over a specified period using Belbin's team roles	over a specified period using Belbin's team roles	effectiveness of a team?
General Objective 4.0: Know how to Make Successful Presentations						
7-8	4.1 Explain Presentation and types e.g. multimedia 4.2 State the importance of presentations in IT practice. 4.3 Outline the factors to consider when planning presentation: title, target audience, allocated time etc. 4.4 Explain the criteria for a good multimedia presentation 4.5 Explain the generic outline of multimedia presentations: Introduction, Aim, Topics for discussion, Topic 1 …. The End 4.6 Explain the process of creating and making successful presentations 4.7 State the importance of object animation and Note pages in presentations	Describe Multimedia Presentation and its importance in IT practice Explain the factors to consider when planning a multimedia presentation Explain the criteria for a good multimedia presentation Discuss the generic outline of multimedia presentation Discuss the importance of object animation and Note pages in presentations	White board and Marker. Networked PCs loaded with Presentation package Multimedia projector and flip chart.	Plan and create multimedia presentations with relevant slides Make multimedia presentations	Guide students to plan and create multimedia presentations with relevant slides Guide students to make multimedia presentations	Demonstrate how to plan, create and make multimedia presentations

General Objective 5.0: Understand Quality Management in IT Practice						
9	5.1 Explain the Quality Management in the context of IT products & services 5.2 Outline the need for quality management in IT practice 5.3 Explain the stages of quality Management: define standards and processes, quality assurance, quality improvement 5.4 Explain the process of setting up quality standards in IT organizations	Explain Quality Management and the need for quality management in IT practice Discuss the stages of quality management: Explain the process of setting up quality standards in IT organizations	White board and marker. PCs loaded with presentation package. Multimedia projector and flip chart. Samples of IT products	Produce quality standards for specified IT products and services	Guide student to produce quality standards for specified IT products and services	What are the stages of Quality management?
10	5.5 Explain Quality Management Principles (ISO 9001 or latest): customer focus, leadership, people involvement, process approach etc. .5.6 Explain the process of monitoring and controlling the quality of products and services in IT organizations	Discuss the principles of Quality Management Explain the process of monitoring and controlling the quality of products and services in in organization	White board and Marker. Networked PCs loaded with Presentation package Multimedia projector and flip chart. Multimedia			What is Quality Management Principles based on ISO 9001 or Latest?

			projector and flip chart			
General Objective 6.0: Understand Job Application Process						
11-12	6.1 Explain the IT job Market 6.2 Explain the various roles of IT professionals e.g. Software Developer, Database Administrator, Network Engineer etc. 6.3 Outline the requirements for one's suitability for each role 6.4 Explain Career Paths within each role in IT Profession	5.1 Discuss IT job Market and roles of IT professionals Explain the requirements for one's suitability for each role Discuss Career Paths within each roles in IT Profession	White board and Marker. Networked PCs loaded with Presentation package Multimedia projector and flip chart	Search the Internet for Job Advertisement Identify requirements for each advertised job	Guide students to search the Internet for Job Advertisement Guide students to identify requirements for each advertised job	What are the requirements for one's suitability for each IT role in the job market?
13	6.5 Explain the job application Process: advertisement, curriculum vitae (CV) and covering letter, interview and aptitude tests etc. 6.6 Describe the structure and Content of a good CV: computer and recruiter friendly 6.7 Explain process of restructuring a CV and covering letter to suit job specifications	Discuss the job application process Discuss the structure and content of a good CV Discuss the restructuring process of a CV and covering letter to suit job specifications	White board and Marker. Networked PCs loaded with Presentation package and word processing package. Multimedia projector and flip chart. Samples of job vacancy advertisement;	Develop a copy of good curriculum vitae, covering letter for job application	Develop a copy of good curriculum vitae, covering letter for job application acceptance letter	Demonstrate how to develop good curriculum vitae and covering letter for job application?

			good and poor curriculum vitae			
General Objective 7.0: Knowhow to Access Relevant Information for IT Practice						
14	7.1 Explain data, information, knowledge and understanding 7.2 Describe various types of information needed for IT practice: job (contract & employment) advertisement, training, current trends, conferences, workshops etc. 7.3 Describe various sources of data/information: conferences, workshops, website of professional bodies, print media, government publications, virtual libraries etc.	Explain data, information, knowledge and understanding Discuss various types of information needed for IT practice Describe various sources of data/information	White board and Marker. Networked PCs loaded with Presentation package Multimedia projector and flip chart.			What are the types of information and sources for IT practice?
15	7.4 Describe the various types of Searches: simple, advanced and Meta searches. 7.5 Describe the various search Techniques: Boolean logic, parenthesis, phrase searching, truncation, wildcards etc. 7.6 Explain stages in information search process 7.7 Discuss the need for information Validation and verification 7.8 Discuss the process of information validation and	Describe the various types of searches Describe the various search techniques. Explain stages in information search process: initiation, selection, exploration, formulation, collection, search closure Discuss the need for information validation Explain the process of	White board. PC in a lab with internet access; loaded with office packages, search engines and connected to a multimedia projector and flip chart	Search for relevant information using appropriate search tools.	Guide student to search for relevant information using appropriate search tools	Demonstrate how to search, and retrieve relevant information using appropriate search tools

	verification	information validation				

Assessment: Give details of assignments to be used: Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment Weighting (%)	**Purpose and Nature of Assessment (COM 312)**	**Weighting (%)**
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for Feed back.	20
Practical	At least 5 homework to be Assessed by the teacher	20
Total		100

PROGRAMME: **HND COMPUTER SCIENCE**

COURSE TITLE: **COMPUTER SECURITY**
COURSE CODE: **COM 426**

CREDIT HOURS **3 HOURS**

DURATION: Hours/Week: Theory: 1 hour; Practical: 2 hours

GOAL: This course is designed to equip students with the practical knowledge in computer networking.

GENERAL OBJECTIVES

On completion of this course the student should be able to:

1. Understand Network Security Essentials
2. Understand Cyber Attack and Attack Analysis
3. Understand how to Perform Incident Response
4. Understand how to Analyze Network Traffic
5. Understand how to Identify System Vulnerabilities
6. Understand how to use PowerShell to Analyze a System
7. Understand Denial of Service (DoS) Attack, SQL Injection Attack and how to Recover from it
8. Understand how to Conduct Log Analysis and Cross Examination for False Positives

PROGRAMME: H**ND COMPUTER SCIENCE**						
COURSE: Computer Security				**COURSE CODE:COM 221**		**CREDIT HOURS: 2**
YEAR: 2	**SEMESTER: 2**	**PRE: REQUISITE**		**Theoretical: 2 hours**	**Practical: 2 Hours**	
Goal: This course is designed to equip students with the practical knowledge of Securing Computers and Networks						
Theoretical Content				**Practical Content**		
GENERAL OBJECTIVE: 1.0 Understand Basic Security Essentials						
Week	**Specific Learning Outcome**	**Teachers Activities**	**Learning Resources**	**Specific Learning Objectives**	**Teachers Activities**	**Evaluation**
1	1.1 Explain basic security terminologies: • Data Backup • Social Networking • Antiviruses Protection • Disaster Recovery • Internet Security • Credit Card Frauds 1.2 Explain the following • Wireless & Home Network Security • Bluetooth Security • Smartphone Security • Mobile Device Security 1.3 Explain OS Security (Linux, Windows)	Briefly explain the Following: • Data Backup • Social Networking • Antiviruses Protection • Disaster Recovery • Internet Security • Credit Card Frauds • Wireless & Home Network Security • Bluetooth Security • Smartphone Security • Mobile Device Security • OS Security	Marker and White Board. PC loaded with Presentation Package Multimedia projector Virtual Machine with OS installed	Backup Data Install Antivirus	Guide students on how to backup data Guide the students on how to secure a system using antivirus etc	Explain basic security terminologies
	GENERAL OBJECTIVE: 2.0 Understand Cyber Attack and Attack Analysis					
2	2.1 Explain Cyber Attack	Explain Cyber Attack	Marker and White Board.	Analyse logs	Guide students on how to	Explain the process of

	2.2 Explain how to Conduct Log Analysis. 2.3 Explain how to Cross Examine for False Positives	Explain how to Conduct Log Analysis. Explain how to Cross Examine for False Positives	PC loaded with Presentation Package Multimedia projector Virtual Machine with OS installed	Examine system for false positive	analyse logs using find, grep etc	analysing logs using find and grep
	GENERAL OBJECTIVE: 3.0 Understand how to Perform Incident Response					
3	3.1 Explain Incidence Response 3.2 Explain the Importance of Incidence Response 3.3 Explain Incidence Response Plan	Explain Incident Response and its importance Explain an Incidence Response Plan	PC loaded with Presentation Package Multimedia projector Virtual Machine with OS installed	Demonstrate how to plan for an incidence response	Guide students on how to plan for an Incidence response	Describe how to plan for an Incidence response
GENERAL OBJECTIVE: 4.0 Understand how to Analyze Network Traffic						
5-7	3.1 Describe network traffic 3.2 Explain how to monitor network 3.3 Describe how to Analyse network traffic 3.4 Explain network Intrusion Detection 3.5 Explain how to use Snort, Wireshark, PRTG	Explain Network Monitoring Explain Network Traffic Analysis and how to Analyse Network Traffic Explain Network Intrusion Detection Explain how to use Snort to detect intrusion Explain how to carryout	Marker and White Board. PC loaded with Power Point connected to a Multimedia projector PRTG, nmap, Wireshark, snort Software	Analyse network for traffic Use Wireshark to Analyse network Use Snort to Analyse Network Use PRTG to monitor network	Guide Students on how to install Wireshark, Snort and PRTG Guide Students on how to Analyse and Monitor Network Traffic for intrusion using Snort	What is network intrusion detection How do you carry out penetration test.

	3.6 Carryout Penetration Testing on network and systems using nmap, PRTG	Penetration test using nmap, PRTG and wireshark			Guide Students on how to Analyse and Monitor Network Traffic using wireshark and PRTG Guide students on how to carryout penetration testing	
GENERAL OBJECTIVE: 5.0 Understand how to Identify System Vulnerabilities						
8-9	4.1 Explain Vulnerability Assessment 4.2 Explain Vulnerability Assessment 4.3 Explain the Importance of Vulnerability Assessment 4.4 Explain the Types of Vulnerability Assessment 4.5 Explain how to use OpenVAS 4.6 Explain how to Identify System Vulnerabilities with OpenVAS 4.7 Explain how to Carryout	Explain Vulnerability Assessment Explain the Importance of Vulnerability Assessment Explain the Types of Vulnerability Assessment Explain how to use OpenVAS Explain how to Identify System Vulnerabilities with OpenVAS	Marker and White Board. PC loaded with Power Point connected to a Multimedia projector OpenVAS Software	Use OpenVAS to identify system vulnerability using OpenVAS	Guide students on how to use OpenVAS Guide students on how to identify system vulnerabilities using OpenVAS	Networked PCs with simple drawing tools Practical Manual/ Workbook

	a Manual Vulnerability Assessment and Analysis					
	General Objective: 6.0 Understand how to use PowerShell to Analyze a System					
10-11	Explain Windows PowerShell Explain how to work with Powershell Explain how to carryout Log Analysis with Powershell Analyse Windows Firewall Using Powershell Explain Powershell Module	Explain Windows PowerShell Explain how to work with Powershell Explain how to carryout Log Analysis with Powershell Analyse Windows Firewall Using Powershell Explain Powershell Module	Marker and White Board. PC loaded with Power Point connected to a Multimedia projector	Use Powershell to analyse logs Use Powershell to analyse firewalls	Guide students on how to work with Powershell Guide Students on how to carryout Log Analysis	
	General Objective: 7.0 Understand Denial of Service (DDoS) Attack, SQL Injection Attack and how to Recover from it					
12-13	Explain Denial of Service (DoS) Attack Explain how to carry out a DDoS Attack Explain how to recover from DDoS Attack Explain SQL Injection Attack Explain how to carryout	Explain Denial of Service (DoS) Attack Explain how to carry out a DDoS Attack Explain how to recover from DDoS Attack Explain SQL Injection Attack Explain how to carryout	Marker and White Board. PC loaded with Power Point connected to a Multimedia projector Network Simulator	Carryout DDoS attack and Recover from it Carryout SQL Injection Attack and recover from it	Guide students to know how to Carryout DDoS Attack and recover from it Guide students to know how to Carry out an SQL Injection Attack and recover from..	Explain how to recover from an DDoS attack

	SQL injection attack Explain how to Recover from DDos and SQL injection Attack Explain How to Carryout Penetration Testing and Ethical Hacking	SQL injection attack Explain how to Recover fromSQL injection Attack Explain How to Carryout Penetration Testing and Ethical Hacking				
	Assessment Criteria					
	Course work 20%	Course test	Practical 20%	Other (Examination/project/portfolio) % 60%		

HND SOFTWARE LABORATORY

S/N	Description of Item	No Required			
1.	**Computer systems**	**30 all networked**			
2	**Server**	**1**			
3	**Printers**	**2 (1 coloured and 1 black and white)** **All networked**			
3.	**UPS**	**30**			
4.	**Over Head Projector**	**1**			
5.	**Generator 3.5KVA/ 5 KVA Solar Inverter**	**1**			
6.	**Software** i) Operating system (Windows, Linux, Unix etc) ii) Python iii) PHP iv) Visual BASIC v) Text Editors (eg ATOM, Sublime text etc vi) JAVA Script vii) Network Simulators (NS2, CISCO packet Tracer etc) viii) ArgoUML	**1 each**			

	ix) Magic Draw x) Codelobster xi) JAVA (JDK) xii) Crimson Editor xiii) C Compiler **xiv)** Error Diagnostic Package **xv)** SQL **xvi)** Visio **xvii)** Axure RP **xviii)** Rapid UI etc. **xix)** Open VAS, Wireshark, nmap, nessus, acunetix, etc. **xx)** XAMPP, any RDBMS **xxi)** Virtualization software **xxii)**				
7.	Packages i) Android Studio etc. ii) Office Suites iii) CorelDraw iv) Adobe suite v) Simulation packages vi) AutoCAD vii) SPSS, R etc **viii)** Matlab, weka, tanagra etc.	**1 each**			

Hardware Workshop list of minimum equipment

S/N	Description of Item	No Required			
1.	Digital Multimeter	30			
2.	Set of Screw Drivers	30			
3.	Soldering iron	30			
4.	Oscilloscope	2			
5.	Vero/Bread Board	30			
6.	Error Diagnostic Package	30			
7.	Logic Probe	5			
8.	Cleaning Kit	5			
9	Lead sucker	30			
10	Network tool kits	10			
11	Blower	5			
12	Circuit Magnifier	30			
13	Descrete components (diode, capacitors, resistors etc)	Assorted			
14	Computer components (Old and New)	Assorted			

LIST OF PARTICIPANT

CURRICULUM REVIEW WORKSHOP FOR NATIONAL DIPLOMA/HIGHER NATIONAL DIPLOMA (ND/HND) COMPUTER SCIENCE AT DELTA STATE POLYTECHNIC, OZORO
21st TO 27th APRIL, 2019

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