NATIONAL BOARD FOR TECHNICAL EDUCATION

CURRICULUM AND COURSE SPECIFICATIONS

FOR

NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY

APRIL, 2018

GENERAL INFORMATION

1.0 CERTIFICATION AND TITLE OF THE PROGRAMME:

The certificate to be awarded and the programme title shall read: "**NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY**"

2.0 GOALANDOBJECTIVES:

The National DiplomaProgramme in **Cement Engineering Technology** is designed to produce diplomates with skills and knowledge to be able to function as technicians in the Cement industry.

On completionof this programme, thediplomate should be able to:

i. Identify the basic raw materials for cement manufacturing.
ii. Assist in carrying out basic operations and processes in cement manufacturing.
iii. Monitor basic processes in cement manufacturing production.
iv. Assist in carrying out routine maintenance and repair of cement production lines.
v. Apply general safety rules, health and environmental management in cement production.
vi. Assist in carrying out basic quality control measures in cement production.
vii. Work not only in cement, but also in ceramic, construction and related industries.
viii. Set up and manage an entreprise

3.0 ENTRY REQUIREMENTS:

The general entry requirement for the National DiplomaCement Engineering Technology programme is satisfactory performance in the UTME, five credit passes at not more than two sittings inSenior Secondary School Certificate (SSCE),NTC/NBC and General Certificate of Education (GCE) Ordinary level.. The relevant subjects are: English Language, Mathematics, Physics, Chemistry and one other subject from Metal Work, Wood Work, Technical Drawing, Basic Electronics/Basic Electricity, Economics/Commerce, Statistics,Further Mathematics, Computer Studies/ICT, Geography, Biology/Agricultural Science.

4.0 CURRICULUM

4.1 The curricula of all ND programmes consist of four main components. These are:

i. General Studies/Education courses
ii. Foundation courses
iii. Professional courses
iv. Supervised Industrial Work Experience Scheme (SIWES)

4.2 The General Education Component shall include courses in:

- Art and Humanities – English Language, Communication, History; and Social Studies – CitizenshipEduaction (the Nigerian Constitution) Political Science, Sociology, Philosophy, Geography and Entrepreneurship Studies

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

4.3 Foundation Courses include courses in Mathematics, Pure Science, Technical Drawing, Descriptive Geometry, etc. The number of hours will be between 10 -15% of the total contact hours.

4.4 Professional Courses are courses which give the student the theory and practical skills he needs to practice his field of calling at the technician level. These may account for between 60-70% of the contact hours

4.5 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 in paragraph 10.0

5.0 Curriculum Structure:

The structure of the ND Programme consists of four semesters of classroom, laboratory and workshop activities in the institution and a semester (3-4 months) of students' industrial work experience scheme (SIWES). Each semester shall be of 17 weeks duration made up as follows:

- 15 contact weeks of teaching, i.e. recitation, practical exercises, quizzes, tests, etc; and
- 2 weeks for examinations and registration

SIWES shall take place at the end of the second semester of the first year.

6.0 PROJECT

Project shall be submitted at the end of the second semester of the final year.

7.0 ACCREDITIATION

The programme shall be by the accredited NBTE before the diplomats can be awarded the diploma certificate
Details about the process of accrediting a programme are available from the Executive Secretary ,National Board for Technical Education, Plot B Bida Kaduna, Nigeria.

8.0 Conditions for the Award of the ND:

Institutions offering accredited programmes will award the National Diploma to candidates who successfully completed the programme after passing prescribed course-work, examinations, diploma project and the supervised industrial work experience. Such candidates should have completed a minimum of between 90 and 100 semester credit units. National Diploma Certificates shall be awarded based on the following:-

i. Grading of Courses: Courses shall be graded as follows:

MARKED RANGE	LETTER GRADE	WEIGHTING
75% and above	A	4.00
70% – 74%	AB	3.50
65% – 69%	B	3.25
60% – 64%	BC	3.00
55% – 59%	C	2.75
50% – 54%	CD	2.50
45% – 49%	D	2.25
40% – 44%	E	2.00
Below 40%	F	0.0

ii. Classification of Diplomas: Diploma Certificate shall be awarded based on the following classifications:

Distinction - CGPA 3.50-4.00
Upper Credit - CGPA 3.00-3.49
Lower Credit - CGPA 2.50-3.00
Pass - CGPA 2.00-2.49

9.0 GUIDANCE NOTES FOR TEACHERS OF THE PROGRAMME:

9.1 The curriculum is drawn in unit course. 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

completedto an institution of same standard.

9.2 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 technician operative skills, which can be used for employment purposes.

9.3 As the success of the credit unit system depends on the articulation of programmes between the institution and industry, the Curriculum content has been written in behavioral objectives, so that it is clear to all the expected performance of the student who successfully completed some of the courses or the diplomates of the programme. There is a slight departure in the Presentation of the performance based curriculum which requires the conditions under which the performances 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 follow that with the criteria for determining an acceptable level of performance. Departmental submission on the final curriculum should be vetted by the Academic Board of the institution. 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.

9.4 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 50:50 or 60:40 or the reverse

10.0 GUIDELINES ON SIWES PROGRAMME:

For the smooth operation of the SIWES the following guidelines shall apply

10.1 Responsibility for placement of students

a)Institutions offering the ND programme shall arrange to place the students in industry by April 30 of each year. Six copies of the list showing where each student has been placed shall be submitted to the Executive Secretary, NBTE who shall in turn, authenticate the list and forward it to the Industrial Training Fund, Jos.

b) The placement Officer should discuss and agree with industry on the following:
   i. A task inventory of what the students should be expected to experience during the period of attachment. It may be wise to adopt the one already approved for each field
   ii. The industry-based supervisor of the students during the period, likewise the institution based supervisor.
   iii. The evaluation of the student during the period. It should be noted that the final grading of the student during the period of the attachment should be weighted more on the evaluation by his industry-based supervisor.

10.2 Evaluation of students during the SIWES

In the evaluation of the student, cognizance should be taken of the following items:

a) Punctuality
b) Attendance
c) General Attitude to Work

d) Respect for Authority
e) Interest in the Field/Technical area
f) Technical competence as a potential technician in his field

10.3 Grading of SIWES

To ensure uniformity of grading scales, the institution should ensure that the uniform grading of student's work which has been agreed to by polytechnics is adopted.

10.4 The Institution Based Supervisor

The Institution-based supervisor should initiate the log book during each visit. This will enable him to check and determine to what extent the objectives of the scheme are being met and to assist students having any challenge regarding the specific assignments given to them by their industry-based supervisor (s)

10.5 Frequency of Visit

Institutions should ensure that students placed on attachment are visited within one month of their placement. Other visits shall be arranged so that:

1) There is another visit six weeks after the first; and
2) A final visit in the last month of the attachment

10.6 Stipends for Students on SIWES

The rate of stipend payable shall be determined from time to time by the Federal Government after due consultation with the Federal Ministry of Education, the Industrial Training Fund and the NBTE

10.7 SIWES as a Component of the Curriculum

The completion of SIWES is important in the final determination of whether the student is successful in the programme or not.

Failure in the SIWES is an indication that the student has not shown sufficient interest in the field or has no potential to become a skilled technician in his field. The SIWES should be graded on a fail or pass basis. Where a student has satisfied all other requirements but failed SIWES, he may only be allowed to repeat another four months SIWES at his own expense

TABLE OF CONTENTS

LOGIC AND LINEAR ALGEBRA.....

TECHNICAL DRAWING .....

BASICWORKSHOP TECHNOLOGY AND PRACTICE.....

MECHANICS AND PROPERTIES OF MATTER AND HEAT ENERGY.....

GENERAL PRINCIPLE OF CHEMISTRY ……

INTRODUCTION TO COMPUTING----------

INTRODUCTION TO MINING----------

INTRODUCTION TO CEMENT AND CEMENT RAW MATERIALS----------

NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY

SEMESTER 2.....

COMMUNICATION IN ENGLISH I----------

INTRODUCTION TO STATISTICS----------

INTRODUCTION TO COMPUTER AIDED DESIGN AND DRAFTING----------

INTRODUCTION TO ENTREPRENEURSHIP----------

ALGEBRA AND ELEMENTARY TRIGONOMETRY----------

ELECTRICAL ENGINEERING SCINECE I…….....

SCIENCE AND PROPERTIES OF MATERIALS.....

SAFETY AND ENVIRONMENTAL CONTROL IN CEMENT INDUSTRY .....

FUNDAMENTALS OF THERMODYNAMICS ----------

INTRODUCTION TO KILN OPERATIONS AND CONTROL ----------

NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY

SEMESTER 3.....

USE OF ENGLISH II----------

RESEARCH METHODS----------

PRACTICE OF ENTREPRENEURSHIP----------

CALCULUS----------

ELECTRONICS AND INSTRUMENTATION.....

FLUID MECHANICS----------

PRINCIPLES OF UNIT OPERATIONS I .....

CEMENT PLANT SERVICES AND MAINTENANCE .....

GEOLOGY AND MINING OF CEMENT RAW MATERIALS.....

RAW MIX DESIGN AND CHEMISTRY OF CEMENT----------

MATERIAL AND ENERGY BALANCE .....

NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY

SEMESTER 4.....

CURRICULUM TABLE FOR NATIONAL DIPLOMA (ND) IN CEMENT ENGINEERING TECHNOLOGY

ND – 1 Semester One

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1	GNS 101	Use Of English I	2	-	-	2	2
2	GNS 111	Citizenship Education I	2	-	-	2	2
3	MTH 111	Logic and Linear Algebra	2	-	-	2	2
4	MEC 102	Technical Drawing	1	-	2	3	3
5	MEC 113	Basic Workshop Technology and Practice	1	-	3	4	4
6	BPH 111	Mechanics and Properties of Matter and Heat Energy	2	-	3	5	5
7	STC 111	General Principles of Chemistry	2	-	3	5	5
8	ICT 101	Introduction to Computing	1	-	2	3	3
9	MPE 105	Introduction to Mining	1	-	2	3	3
10	CET 111	Introduction to Cement Raw Materials and Processes.	2	-	0	2	2
			16	**-**	**15**	**31**	**31**

ND -1 **Semester Two**

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1	GNS 102	Communication in English I	2	-	-	2	2
2	STA 111	Introduction to Statistics	2	-	-	2	2
3	ICT 201	Introduction to Computer Aided Design and Drafting	1	-	2	3	3
4	EEd 126	Introduction to Entrepreneurship	1	-	2	3	3
5	MTH 113	Algebra and Elementary Trigonometry	2	-	-	2	2
6	EEC 115	Electrical Engineering Science	2	-	2	4	4
7	CEC 104	Science and Properties of Materials	2	-	3	5	5
8	CET 121	Safety and Environmental Control in Cemet Industry	2	-	-	2	2
9	CET 122	Fundamentals of Thermodynamics	2	-	2	4	4
10	CET 123	Introduction to Kiln Operations and Control	2	-	-	2	2
	Total		**18**	**-**	**11**	**29**	**29**

ND - 2 **Semester Three**

S/N	COURSE CODE	COURSE TITLE	L	T	P	CU	CH
1	GNS 201	Use of English II	2	-	-	2	2
2	GNS 228	Research Methods	2	-	-	2	2
3	EEd 216	Practice of Entrepreneurship	1	-	2	3	3
4	MTH 114	Calculus	2	-	-	2	2
5	EEC 211	Electronics and Instrumentation	2	-	2	4	4
6	MEC 214	Fluid Mechanics	2	-	2	4	4
7	CET 211	Principles of Unit Operations I	2	-	2	4	4
8	CET 212	Cement Plant Services and Maintenance	1	-	2	3	3
9	CET 213	Geology and Mining of Cement Raw Materials	1	-	2	3	3
10	CET 214	Raw Mix Design and Chemistry of Cement	1	-	1	2	2
11	CET 215	Materials and Energy Balance	1	-	-	1	1
			17	**-**	**13**	**30**	**30**

ND – 2 **Semester Four**

	COURSE						

S/N	CODE	COURSE TITLE	L	T	P	CU	CH
1	GNS 202	Communication in English II	2	-	-	2	2
2	MTH 112	Trigonometry and Analytical Geometry	2	-	2	2	2
3	MAR 224	Introduction to Engineering Management	2	-	-	2	2
4	MEC 221	Strength of Materials	2	-	2	4	4
5	CET 221	Principles of Unit Operations II	2	-	2	4	4
6	CET 222	Heat and Mass Transfer	2	-	2	4	4
7	CET 223	Electrical Machines and Industrial Drives	2	-	-	2	2
8	CET 224	Introduction to Industrial Automation	1	-	-	1	1
9	CET 225	Pyro-Processing and Clinker Formation	2	-	-	2	2
10	CET 226	Quality Control in Cement Manufacture	1	-	-	1	1
11	CET 227	Final Year Project	-	-	3	3	3
			18	**-**	**11**	**29**	**29**

SEMESTER ONE ND 1

PROGRAMME: GENERAL STUDIES	**CODE:** GNS I01	**CREDIT HOURS:** 2 HR
COURSE TITLE: USE OF ENGLISH LANGUAGE I	**PRE-REQUISITE**	**THEORETICAL:2 HOURS/WEEK**
Year: 1 Semester: 1		**PRACTICAL:-**
GOAL: This course is designed to provide the student with the language skills which will enable him to cope effectively with the challenges of his course, to use English Language effectively in the practice of his chosen profession as well as interact with others in the society.		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1. Know the nature of language. 2. Understand the basic rules of grammar. 3. Learn the essential qualities of paragraphs, 4. Acquire appropriate study skills. 5. Appreciate literary works in English.		

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE: Use of English Language I	**CODE:** GNS 101	**Credit Unit:** 2.0	**CONTACT HOURS:** 2

GOAL: This course is designed to provide the student with the language skills which will enable him to cope effectively with the challenges of his course, to use English Language effectively in the practice of his chosen profession as well as interact with others in the society.

GENERAL OBJECTIVE 1.0: Develop appropriate study skills.

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
Wk	**Specific Learning Outcome**	**Teachers' Activities**	**Learning Resources**	**Specific Learning Outcome**	**Teachers' Activities**	**Evaluation**
1-3	**Study Skills** 1.1 Explain the necessity for acquiring good note taking/ making techniques. 1.2 List the methods of note-taking/ making. 1.3 Use the dictionary correctly. 1.4 List information sources in the Library. 1.5 Identify good reading habits. 1.6 Explain the different methods of reading, viz., scan, skim etc.	➢ Define note taking/making. ➢ Explain the importance of note taking/making. Discuss different methods of note taking/making. Explain the use of dictionary. Expose students to sources of library information. Explain good reading habits. Enumerate the different methods of reading.	Marker Board Marker Textbooks Projector Dictionary Reference Books, Library	Demonstrate good note taking skills in English. List the methods of note taking/making in English. Use the dictionary correctly . Locate information in the sources listed in 1.4 above. Practice good reading habits. ➢ Explain the different methods of reading. ➢ Use the different methods of reading explained in 1.6 above.	Guide, supervise and correct students' activities.	Class work, Assignment and Test.
	GENERAL OBJECTIVE 2.0 Know the nature of Language					

4-5	**Language** 2.1 Define the concept of language. 2.2 List the characteristics of language. 2.3 Explain the four language skills, viz., speaking, listening, writing, reading. 2.4 State the functions of language. 2.5 List the uses of English Language in Nigeria, e.g. as the language of research, government, commerce etc.	Explain the concept of language. List and explain the characteristics of language. Explain the four language skills in their appropriate order. Explain the functions of language. Explain uses of English Language in Nigeria.	Textbooks Overhead Projector Tape recorder CD etc	Explain the concept of Language. State the characteristics of language. Apply the four language skills in their order. State the functions of Language. State the uses of English Language in Nigeria.	Guide, supervise and correct students' activities.	Class work, assignment, test.
	GENERAL OBJECTIVE 3.0 Understand the basic rules of grammar					
	Grammatical Conventions 3.1 Define grammar 3.2 List parts of speech. 3.3 Explain the use of parts of speech in sentences. 3.4 List punctuation marks.	Explain grammar. Explain parts of speech. Analyse the use of parts of speech in sentences. Explain punctuation marks.	Textbooks Overhead Projector Tape recorder CD etc.	Define grammar. Enumerate parts of speech. Identify parts of speech in sentences. Use parts of speech appropriately in sentences. List punctuation marks.	Guide, supervise and correct students' activities.	Class work, assignment, test.

	3.5 Enumerate the uses of punctuation marks. 3.8 Explain affixation.	Explain the uses of punctuation marks. Define Affixation.		➢ Enumerate the uses of punctuation marks. ➢ Punctuate given sentences paragraphs and passages. ➢ Identify prefixes and suffixes. ➢ Form words with suffixes and affixes.		"
	GENERAL OBJECTIVE 4.0 Know the essential qualities of paragraphs.					
	Paragraphing 4.1 Define a paragraph. 4.2 Name the parts of a paragraph, viz., topic sentence, development, and conclusion/ transition. 4.3 List the thematic qualities of a paragraph, viz unity, coherence and emphasis. 4.4 Enumerate methods of	Explain paragraphing. Explain the parts of a paragraph. Explain the thematic qualities of paragraph.	Textbooks Overhead Projector Tape recorder CD/DVD etc.	➢ Define paragraph. ➢ Identify the number of paragraphs in a given passage. Identify the parts of a paragraph in a passage. Identify the thematic qualities of a paragraph. List methods of paragraph development.	Guide, supervise and correct students' activities.	Class work, Assignment, Test

	paragraph development viz: Example, definition, comparison, contrast etc.	Explain methods of paragraph development.		Write specific paragraphs to illustrate 4.2 and 4.4.		
	GENERAL OBJECTIVE 5.0 Appreciate literary works in English.					
	Literature in English 5.1 Define Literature. 5.2 Trace the development of literature. 5.3 List the functions of Literature. 5.4 Differentiate between the literary genres. 5.5 Enumerate the terminology of prose fiction, e.g., plot setting, characterization etc. 5.6 Explicate a novel.	Explain the concept of Literature. Explain the development of Literature. Explain the functions of Literature. Explain the genres of Literature. ➢ Explain the terminology of prose. Present questions in a given novel and assign characters to the students.	Textbooks Projector Marker Board Marker Internet Tape recorder CD/DVD etc.	Define Literature. Trace the development of Literature. List some functions of Literature. Differentiate between the literary genres. ➢ List the terminology of prose. ➢ Answer questions on a given novel. ➢ Role play the characters in the novel.	Guide, supervise and correct students' activities.	Class work, Assignments, Test

Assessment:

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)

Examination	Final examination (written) to assess knowledge and understanding	60
Test	At least Two (2) progress tests for feedback.	20
Practical	At least Five (5) works to be assessed by the teacher	20
Total		100

Programme: NATIONAL DIPLOMA IN CEMENT ENGINEERINGTECHNOLOGY	**Course Code: GNS 111**	**Credit Hours: 2**
Course: Citizenship Education I	**Pre-Requisite: -**	**Theoretical: 2 Hours/Week**
Year: 1 Semester: 1		**Practical: 0 Hours/Week**

Goal: The Course is designed to enable Student to acquire knowledge of Government, Governance, constitution, fundamental human rights, and the Rule of Law in order to enable them appreciate their roles as citizens as well as the role of government in ensuring good governance.

GENERAL OBJECTIVES

On completion of this course, the Student should be:

1.0. To understand Citizenship Education as a course of study.
2.0. To understand the rights of citizens.
3.0. Understanding the constitution.
4.0. Understanding the major organs of government.
5.0. Understand national identity
6.0. Understand the concept of power and authority

Programme: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY						
Course: **Citizenship Education I**			Course Code: GNS111			CH/CU Hours: 2
Goal: The Course is designed to enable Student to acquire knowledge of Government, Governance, constitution, fundamental human rights, and the Rule of Law in order to enable them appreciate their roles as citizens as well as the role of government in ensuring good governance.						
General Objective 1.0:Understanding Citizenship Education						
Course Specification: THEORETICAL CONTENT						
	THEORETICAL CONTENTS		**PRACTICAL CONTENTS**			
WEEK/S	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1	1.1. Explain Citizenship Education.	Discuss citizenship Education.	Marker board, marker, textbook	Know what Citizenship Education is all about.	Define Citizenship Education.	Internet, Newspapers, section of library, magazine, selected novels.
2-4	1.2. Who is a Citizen? Define. 1.3. Explain the difference between a citizen and a Non-citizen.	Define who a Citizen is. Differentiate a Citizen of Nigeria and a non-citizen.	Marker board, marker, same textbook.	Explain Citizenship of a county Differentiate between a Citizen and non-citizen.	Define who a citizen is. Go round to monitor the students.	Text book library, internet CD-Rom
	1.4.Identify the qualities of a good Citizen	Discuss the qualities of a good Citizen	Maker board, maker, same textbooks	State the good quality of a citizen	Mention the quality of a good citizen	Text book library, internet CD-Rom

	1.5. Explain the duties and obligations of a citizen	Mention the duties and obligations of a citizen	Maker board, maker, same textbooks	Know duties and obligations of a citizen to the country	Make necessary correction to students s response while asking them questions	Text book library, internet CD-Rom
	1.6.Mention the benefits of being a Citizen	State the benefits of being a citizen	Maker board, maker, same textbooks.	Mention the benefits of being a citizen	Make the students know their benefits and their rights as a citizen	Text book library, internet CD-Rom
	1.7. Identify the types of Citizenship and Evaluate the merits and de-merits of each.	Explain the types of Citizenship State the merits and de-merits of each type of Citizenship.	Maker board, maker, same textbooks.	Explain the types of Citizenship State the merits and de-merits of each type of Citizenship.	Make the students identify the type of citizenship and know the merits and de-merits of each type.	Text book library, internet CD-Rom
	1.8. Explain the methods of acquiring citizenship.	Explain the ways of acquiring citizenship of a country.	Maker board, maker, same textbooks.	Mention the ways of acquiring citizenship of a country	Make necessary corrections to students response while asking them to explain the genuine methods of acquiring citizenship of a country	Text book library, internet CD-Rom
GENERAL OBJECTIVE: 2.0: Understanding The Rights Of Citizens						
4-7	2.1. Explain the Fundamental Human Rights of a Citizen. 2.2.Explain the Responsibilities and Duties of Government tothe Citizens 2.3.Explain the methods used by the Government in protecting the Fundamental Human Rights as contained in the Constitution.	Explain the Fundamental Human Rights. Explain the responsibilities and duties of government to them as a citizen. Explain the method in which the Government used in protecting Fundamental Human rights as it is in the constitution. Explain the limitations to the Fundamental Human Rights they know.	Maker board, maker, text book Board, marker, same textbooks. . Board, marker, same textbooks.	Know the rights of Citizen Demonstrate with examples in the institution and outside the institution. Know the rights of the citizen being protected by the Government Know the limitations to the Fundamental Human Rights.	Monitor the students' activities while asking them questions. Goround to monitor the student's activities. Asking them questions and correcting them where necessary.	Text book library, internet CD-Rom

	2.4. Explain the limitations of Fundamental Human Rights. 2.5 Explain the benefits Citizens derive by being responsible and law abiding.	Discuss the benefit of being a responsible and law abiding citizen of a country.		Know the benefit for being a responsible and law abiding citizens		
GENERAL OBJECTIVE: 3.0: UNDERSTANDING THE CONSTITUTION						
7-9	3.1 Define Constitution.	Explain the advantages of Constitution.	Board, Marker, the 1999 Constitution of the Federal Republic of Nigeria.	Point out the relevance of the Constitution.	Explain Constitution.	Text book library, internet CD-Rom
	3.2 List the types of Constitution.	Explain the different types of Constitution.	Board, Marker, the 1999 constitution.	Give examples of how the Constitution was cited in cases.	Explain the different types of Constitution.	Text book library, internet CD-Rom
	3.3 Highlight the history of the Nigerian Constitution.	Explain how the Constitution came to be.	Board, Marker, text book.	Point out and explain the different Constitutions Nigeria had before the 1999 Constitution.	Explain the different types of Constitution.	Text book library, internet CD-Rom
	3.4 Define Supremacy.	Explain the Supremacy of the Constitution above other laws.	Board, Marker, The Constitution.	Explain the supremacy of the Constitution.	Explain the supremacy of the Constitution.	Text book library, internet CD-Rom
	3.5 Define the Rule of Law.	Explain the Rule of Law.	Board, Marker, text book	Give examples and cite cases where the Rule of Law was used to determine cases.	Explain the Rule of Law.	Text book library, internet CD-Rom
General Objective: 4.0. : Understanding The Major Organs of Government						
10	4.1 Describe the three organs of government	Describe the major organs of government.	Marker Board, marker, textbooks	Explain The Major Organs Of	State the role of each arm of	Text book library,

				Government	government	internet CD-Rom
	4.2 Analyse the functions of the executive, legislature and judiciary.	Explain the duties of each arm of government	Publication	Outline the duties of each organ of government	Mention the three Arms of Government	Text book library, internet CD-Rom
	4.3 Explain the process of selecting and appointing members of the executive, legislature and judiciary.	Discuss the processes of election.	Books	Analyse the process of election and selection	Understand election process in Nigeria.	Text book library, internet CD-Rom
	4.4 Examine the relationship among the three organs of government.	Explain inter- governmental relations.	Publications	Explain the relationship among the three arms of government	Explain IGR in Nigeria	Text book library, internet CD-Rom
	4.5 Outline the principles of separation of powers and checks and balances in government.	Discuss checks and balances in government.	Marker Board and marker	State how the principles are applied in government.	Analyze these principles.	Text book library, internet CD-Rom
	4.6 Explain how checks and balances are applicable in government	Give examples of how checks and balances are applied in government.	Text book library, internet CD-Rom	Explain separation of powers & checks and balances.	State how checks and balances are applied.	Text book library, internet CD-Rom
GENERAL OBJECTIVES: 5.0: Understand National Identity						
	5.1 Introduction Explain the need for national identity.	Text books, marker.	Books	State the importance of national identity.	Write a test on national identity.	Text book library, internet CD-Rom
	5.2 The meaning of national identity.	Explain National identity	Handouts	Discuss national identity	State the importance of national identity	Text book library, internet CD-Rom
	5.3 Explain the need for national identity	Discuss national identity	Handout, books	Explain national identity	Outline the need for national identity	Text book library, internet CD-

						Rom
	5.4 Analyse the ways of preserving Nigerian national identity	State why we should identify with the nation	Handouts and materials	List why we should identify with the nation.	Outline the need for national identity.	Text book library, internet CD-Rom
	5.5 Outline the reasons why we should identify with the nation.	State the reasons for identifying with national identity	Textbooks	Outline the reasons for identifying with national identity	Name the reasons for identifying with national identity	Text book library, internet CD-Rom
	5.6 Examine the role and significance of national symbols such as the national anthem, national flag, coat of arms.	Explain importance of national symbols.	Slides ICT	Listen to students explain role of national symbols.	Explain each of the national symbols.	Text book library, internet CD-Rom
	5.7 Highlight cultural diversity and national Integration in Nigeria.	Discuss link between cultural diversity and national identity.	Handouts	Explain cultural diversity and national identity.	Define cultural diversity and national identity.	Text book library, internet CD-Rom
GENERAL OBJECTIVE: 6.0 Understand The Concept of Power And Authority						
11-12	6.1 Explain the concept of power and Authority	Explain the concept of power and Authority	Publications, Marker Board	Discuss power and Authority	Individual student should define power and authority	Text book library, internet CD-Rom
	6.2 Distinguish between power and Authority	Differentiate between the two concepts	Books	Define the two concepts	Explain power and authority	Text book library, internet CD-Rom
	6.3 Explain Abuse of Power	Discus Abuse of Power and their remedies	Handouts	Demonstrate Abuse of Power	Explain how power can be misused or abused	Text book library, internet CD-Rom
	6.4 Prescribe Remedies Against Abuse of Power	Enumerate and explain them	Books	Discuss the use and abuse of power	Explain how power can be abused	Text book library, internet CD-Rom
	6.5 Distinguish between	Emphasis on the Role of	Handouts	Define leadership	Differentiate	Text book

	leadership and Followership	leaders and followers		and Followership	between leadership and Followership	library, internet CD-Rom
	6.6 Evaluate the Role of leaders and Followers in Nation-Building	Explain the duties of leaders and followers	Books/manuals	Define the role of leaders and followers	Outline the role of leader and followers	Text book library, internet CD-Rom
	6.7 Explain the influence of Leadership in Nation-Building	Discuss influence of leadership in nation building	Marker Board /marker	Explain the Role and influence of leadership	Discuss influence of leadership	Text book library, internet CD-Rom

Assessment:

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

PROGRAMME: NATIONA DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: LOGIC AND LINEAR ALGEBRA	**COURSE CODE: MTH 111**	**UNIT: 2**	**CONTACT HOURS: THEORETICAL: 2HOURS/WEEK**
SEMESTER: 1	**PRE-REQUISITE: -**		**PRACTICAL: 0 2HOURS/WEEK**

Goal: To enable students develop precise, logical and abstract thinking and the ability to recognize, formulate, and evaluate problems in their areas of specialization

General Objectives

On completion of this course the students will be able to:

1. Understand basic rules of mathematical logic and their application in mathematical proofs.
2. Know the concept of Permutation and Combination.
3. Compute the Binomial expansion of algebraic expressions.
4. Understand Algebraic operations on matrices and determinant.

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE: LOGIC AND LINEAR ALGEBRA	**CODE: MTH 111**	**UNIT: 2**	**CONTACT HOURS/CU: 2**
			THEORETICAL: 2 Hours/Week
Year: 1 Semester: 1	**PRE-REQUISITE: -**		**PRACTICAL: 0 Hours/Week**
GOAL: To enable students develop precise, logical and abstract thinking and the ability to recognize, formulate, and evaluate problems in their areas of specialization			
GENERAL OBJECTIVE 1.0: UNDERSTAND BASIC RULES OF MATHEMATICAL LOGIC AND THEIR APPLICATION IN MATHEMATICAL PROOFS			
THEORETICAL CONTENTS	**PRACTICAL CONTENTS**		

WEEK/S	SPECIFIC LEARNING OUTCOMES FOR STUDENTS	TEACHER'S ACTIVITY	RESOURCES	SPECIFIC LEARNING OUTCOME	TEACHER'S ACTIVITY	RESOURCES
1-4	1.1 Define the essential connectives such as conjunction, disjunction, negation, implication and bi- implication.	Explain the concepts of the essential connectives such as conjunction, disjunction, negation,	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Define the concepts; essential connectives, negation, conjunction, disjunction, implication and bi-implication.	Correct any error in the students' definitions and concepts.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
	1.2 Illustrate the essential connectives defined in 1.1 above 1.3 Describe grouping and parenthesis in logic 1.4 Explain Truth tables. 1.5 Define tautology. 1.6 Illustrate types of tautology. 1.7 Define universal quantifier and existential quantifier 1.8 Translate sentences into symbolic form using quantifiers. 1.9 Define the scope of a quantifier. 1.10 Define "bound" and "free" variables.	Illustrate the essential connectives define in 1.1 above; Describe grouping and parenthesis in logic; Explain and draws Truth tables for different combinations of propositions. Define and identify tautology. Illustrate types of tautology Use of quantifier in translating sentences into symbolic form; Explain the concept of bound and free variables.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Describe grouping and parenthesis in logic. Draw truth tables Truth tables. Define and identify tautology. Illustrate types of tautology. Define universal quantifier and existential quantifier Translates some given sentences into symbolic form.	Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.

GENERAL OBJECTIVE 2.0: KNOW THE CONCEPT OF PERMUTATION AND COMBINATION						

5	2.1 Define permutation. 2.2 Give illustrative examples on permutation. 2.3 State and prove the fundamental principles of permutation and give examples. 2.4 Derive the formula ${}^{n}\mathbf{P}_{r} = \frac{n!}{(n-r)!}$	Define and explains permutation. Give illustrative examples on permutation. State and prove the fundamental principles of permutation and give examples. Explain the derivation of the formula; ${}^{n}\mathbf{P}_{r} = \frac{n!}{(n-r)!}$	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Define permutation. Solve some examples on permutation. State and prove the fundamental principles of permutation and solve further examples. Derive the formula ${}^{n}\mathbf{P}_{r} = \frac{n!}{(n-r)!}$	Correct any error in the students' definitions and concepts. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
7	2.1 Define combination and give illustrative examples. 2.2 Derive the formula ${}^{n}\mathbf{C}_{r} = \frac{n!}{(n-r)!r!}$. 2.3 Solve problems of combination with restrictions on some of the objects. 2.4 Solve problems of combination of "n" different objects taken any number of it at a time.	Define combination and gives illustrative examples. Demonstrate the derivation of the formula ${}^{n}\mathbf{C}_{r} = \frac{n!}{(n-r)!r!}$. Solve problems of combination with restrictions on some of the objects. Explain solution of problems of combination of "n" different objects taken any number of it at a time.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Define combination and give examples. Derive the formula ${}^{n}\mathbf{C}_{r} = \frac{n!}{(n-r)!r!}$. Solve problems of combination with restrictions on some of the objects. Solve problems of combination of "n" different objects taken any number of it at a time.		Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
GENERAL OBJECTIVE 3.0: COMPUTE THE BINOMIAL EXPANSION OF ALGEBRAIC EXPRESSIONS						

8	3.1 Explain with illustrative examples, the method of Mathematical Induction. 3.2 State and prove binomial theorem for positive integer index.	Give detailed explanation with illustrative examples, the method of mathematical Induction. State binomial theorem and show the proof for positive integer index.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	State the method of Mathematical Induction. State and prove binomial theorem for positive integer index.	Correct any error in the students' definitions and concepts. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
9	3.1 Describe with examples, the properties of binomial expansion.	State and explain with examples, the properties of binomial expansion.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	State the properties of binomial expansion.		Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
10	3.2 State the binomial theorem for a rational number. 3.3 State the properties of binomial coefficients.	State the binomial theorem for a rational number. State the properties of binomial coefficients.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	State the binomial theorem for a rational number. State the properties of binomial coefficients.		Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
11	3.5 Apply binomial expansion in approximations (simple examples only).	Demonstrate the application of binomial expansion in approximations (simple examples only).	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Apply binomial expansion in approximations (simple examples only).		Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
GENERAL OBJECTIVE 4.0: UNDERSTAND ALGEBRAIC OPERATIONS ON MATRICES AND DETERMINANT.						

12	4.1 Define Matrix. 4.2 Define the special matrices; zero matrix, identity matrix, square matrix, triangular matrix, symmetric matrix, skew-symmetric matrix, diagonal matrix, etc.	Define Matrix and explains the special matrices; zero matrix, identity matrix, square matrix, triangular matrix, symmetric matrix, skew-symmetric matrix, diagonal matrix, etc.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Define Matrix. Define the special matrices; zero matrix, identity matrix, square matrix, triangular matrix, symmetric matrix, skew-symmetric matrix, diagonal matrix, etc. State examples of each of the	Correct any error in the students' definitions and concepts. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
13	4.3 State examples of each of the matrices in 4.2 above. 4.4 State the laws of addition and multiplication of matrices. 4.5 Illustrate the commutative, associative and distributive nature of the law stated in 4.4 above. 4.6 Define the transpose of a matrix. 4.7 Define the determinant, minors and cofactors of a matrix. 4.8 Determine the determinant, the minors and cofactors of 2x2 and 3x3 matrices.	Give examples of each of the matrices in 4.2 above. State the laws of addition and multiplication of matrices. Illustrate the commutative, associative and distributive nature of the law stated in 4.4 above. Define the transpose, the determinant, minors and cofactors of a matrix. Determine determinant, the minors and cofactors of 2x2 and 3x3 matrices.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	State the laws of addition and multiplication of matrices. Illustrate the commutative, associative and distributive nature of the law stated in 4.4 above. Define the transpose of a matrix. Define the determinant, minors and cofactors of a matrix. Determine the determinant, the minors and cofactors of 2x2 and 3x3 matrices.		

14-15	4.3 State and prove the theorem "that if two rows or two columns of a matrix are identical, then the value of its determinant is zero". 4.4 State and prove the theorem "that if two row or two columns of a matrix are interchanged, the sign of the value of its determinant is changed". 4.5 State and prove the theorem "if any one row or one column of a matrix is multiplies by a constant, the determinant itself is multiplied by the constant". 4.6 State and prove the theorem "if a constant times the element of a row or a column are added to the corresponding element of any other row or column, the value of the determinant itself is multiplied by the constant". 4.7 State five examples of each of the theorems in 4.9-4.12 above. 4.8 Obtain the adjoin of a matrix. 4.9 Obtain the inverse of a matrix. 4.10 State the linear transformation on the rows and columns of a matrix. 4.11 Apply Crammers rule in solving simultaneous linear equation. 4.12 Apply linear transformation in solving simultaneous linear equation.	Demonstrate the proof of the theorems given in 4.9-4.12. Use examples and verify each of the theorems referred to above. Guide the students in obtaining the adjoin of a matrix. Guide the students on obtaining the inverse of a matrix. Present the linear transformation on the rows and columns of a matrix. Demonstrate the application of Crammer's rule in solving simultaneous linear equation. Demonstrate the application of linear transformation in solving simultaneous linear equations.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Prove the theorems given in 4.9, 4.10, 4.11 and 4.12. Verify the theorems referred to in 4.9-4.12 above. Obtain the adjoin of a matrix. Obtain the inverse of a matrix. State the linear transformation on the rows and columns of a matrix. Apply Crammers rule in solving simultaneous linear equation. Apply linear transformation in solving simultaneous linear equation.		

Assessment:

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

Examination	Final examination (written) to assess knowledge and understanding	60
Test	At least Two (2) progress tests for feedback.	20
Practical	At least Five (5) works to be assessed by the teacher	20
Total		100

PROGRAMME: NATIONA DIPLOMA INCEMENT ENGINEERING TECHNOLOGY	**Course Code: MEC 102**	**Contact Hours: 1-0-2**
Subject/Course: Technical Drawing		**Theoretical: 1 hours/week**
Year: 1 Semester: 1	**Pre-requisite: -**	**Practical: 2 hours /week**

Goal: To enable students to acquire knowledge of Technical Drawing and apply same in solving problems in their areas of specialization.

General Objectives

1. Know different drawing instruments, equipment and materials used in technical drawing.
2. Know Graphical Communication.
3. Know the construction of simple geometrical figures and shapes.
4. Know Isometric and Oblique Projections.
5. Know single orthographic projections.
6. Understand the intersections of regular solids.

Course: Technical Drawing		Course Code: MEC 102		Contact Hours: 1-0-3		
				Theoretical: 1 hours/week		
	Year: One Semester: One	Pre-requisite: -		Practical: 2 hours /week		
	Theoretical Content			Practical Content		
Goal: To enable students to acquire knowledge of Technical Drawing and apply same in solving problems in their areas of specialization						
	General Objective 1: Know different drawing instruments, equipment and materials used in technical drawing.					
Week/s	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1 – 2	1.1Identify the different types of drawing instruments, equipment and materials. 1.2 State the uses of the various instruments, equipment and materials. 1.3 State the precautions necessary 1.4 Use each of the items in 1.1 above. 1.5 Maintain the various instruments andequipment.	• Show the students all drawing instruments: Drawing set; T-Square; Drawing board; Set squares; Types of pencils (H to B). • Explain the uses of drawing instruments.	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	Use each of the items in 1.1. Maintain the various instruments and equipment	Carryout the use of the items in 1.1. Carryout the maintenance of the various instruments and equipment.	Black board ruler (1m) Black board Tee-Square Black board compass Blackboard protector Adjustable set-square 60 set square 45 set square French curve set Templates Complete drawing table.
	General Objective 2: Know Graphical Communication					

	2.1 Explain graphics and different types of graphic presentation. 2.2 Illustrate the various convention present in graphical productions of construction lines, finished lines, hidden and overhead details projections, centre lines, break lines, dimensioning of plane, elevation and sections of objects. 2.3 State the various standards of drawing sheets. 2.4 Print letters and figures of various forms and characters. 2.5 Illustrate conventional signs, symbols and appropriate lettering characters.	▪ Explain technical lettering in capital and small letters, using, free hand and using letter stencils. ▪ Identify the various standard sheets A0 –A4	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic board, flip charts, etc.	Layout of drawing sheets with the following (a) Margins (b) Title block etc Illustrate in drawing the various types of lines based on BS 308 1972 Part 2. Set drawing area on A1 paper with a title block and the boarder lines. Draw conventional signs and symbols	Carryout layout of drawing sheets Carryout drawing of various types of lines based on BS 308 1972 Demonstrate drawing area on A1 paper with a title block and the boarder lines. Carryout drawing of conventional signs and	Black board ruler (1m) Black board Tee-Square Black board compass Blackboard protector Adjustable set-square 60 set square 45 set square French curve set Templates Complete drawing table

					symbols.	
	General Objective 3: Know the construction of simple geometrical figures and shapes.					
3 – 6	3.1 Explain the purpose of geometrical construction in wing.	▪ Discuss the various types of information required for writing technical report. ▪ Use questions and answer technique ▪ Give examples ▪ Give assignments	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪
	General Objective 4: Know Isometric and Oblique Projections.					
7 - 10	4.1 Mention main sources of data. 4.2 Discuss techniques of data collection: • Laboratory. • Field survey/measurement. • Questionnaire. • Oral interviews.	▪ Guide student on techniques involved in sourcing data ▪ Use questions and answer technique ▪ Give examples ▪ Give assignments	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic	▪	▪	▪

			board, flip charts, etc.			
	General Objective 5: Know single orthographic projections.					
11 - 12	5.1 Explain how to present data in a manner suitable for writing technical report in the following form: Tables, Graphs, Charts, bars. 5.2 Input information into computer. 5.3 Print out results.	▪ Guide student on techniques involved in presenting information/ data ▪ Use questions and answer technique ▪ Give examples ▪ Give assignments	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪
	General Objective 6: Understand the intersections of regular solids.					
13 - 15	6.1 Explain interpretation or intersections of solids. 6.2 Draw the lines of intersections of the following regular solids and planes in both first and third angles. a. Two square-prisms meeting at right angles. b. Two dissimilar square prisms meeting at an angle.	Ask students to give examples of intersection of solids Ask students to construct: a.Two square-prisms meeting at right angles b. Two dissimilar square prisms merely	Recommended textbooks. Marker Board, dust, Marker, lecture notes, drawing sets	▪	▪	▪

	c. Two dissimilar square prisms meeting to an angle d. A hexagonal prism meeting a square prism at right angles. e. Two dissimilar cylinders meeting at an angle. f. Two dissimilar cylinders meeting at right angle, their centres not being in the same vertical plane.	at " c. Two dissimilar square prisms meeting 60 d. An hexagonal prism meeting a square prism e. Two dissimilar cylinders meeting at an anglef. Two dismal cylinders meeting at right angle, then centres at long in the same vertical place. g. As in 6.2				

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERINGENGINEERING			
COURSE TITLE: BASIC WORKSHOP TECHNOLOGY & PRACTICE I	**COURSE CODE: MEC 113**	**UNIT: 3**	**CONTACT HOURS: 3HOURS/WEEK**
			THEORETICAL: 1HOUR/WEEK
SEMESTER: 1	**PRE-REQUISITE : NONE**		**PRACTICAL:2HOURS/WEEK**

Goal: The course is designed to enable the student to understand the use of basic workshop tools and machines, and the hazards in a marine workshop environment.

General Objectives:

On completion of this module, the student/cadets should be able to:

1. Know safety precautions.
2. Understand to use and maintain various bench tools.
3. Understand the Use of simple measuring and testing equipment.
4. Understand drilling Operations
5. Understand reaming operations.
6. Understand Tapping Operations
7. Know various metals joining operation.
8. Know how to Cut and joint metal by gas welding.
9. Know various gas welding operations.
10. Know various metal arc welding operations

COURSE TITLE: BASIC WORKSHOP TECHNOLOGY & PRACTICE I	COURSE CODE: MEC 113	UNIT: 3	CONTACT HOURS: 3HRS/WEEKS
			THEORETICAL: 1HOURS/ WEEK
SEMESTER 1	PRE-REQUISITE : None		PRACTICAL: 2HOUR/ WEEK

Goals: The course is designed to enable the student to understand the use of basic workshop tools and machines, and the hazards in a marine workshop environment.

	GENERAL OBJECTIVE 1.0: Know Safety precautions.					
	THEORETICAL CONTENT			PRACTICAL CONTENT		
WEEK/S	SPECIFIC LEARNING OUTCOME	TEACHERS ACTIVITY	RESOURCE	SPECIFIC LEARNING OUTCOME	TEACHERS ACTIVITY	RESOURCE
1-3	1.1 State safety precautions 1.2 Explain protective wears 1.3 List all safety rules and regulation.	Discuss safety precautions observed in the workshop. List the protective wears in the workshop. Discuss safety rules in the workshop	Recommended textbooks, Dusters, White and magnetic board, Projectors.	Demonstrate the safety precautions. Operate safety equipment e.g. fire extinguishers, Use of protective wears Observe all safety rules and regulations	Discuss some unsafe acts and condition in the workshop Demonstrate the safety protective wears and equipment.	Boiler suits, overalls, aprons safety goggles, safety boots/shoes, safety hand gloves, fire extinguishers, nose masks, ear muffs, hard hats, non-slip mats, safety posters, Water hose and Sand buckets
	General Objective 2.0: Understand to use and maintain various bench tools.					
4-5	2.1 Explain bench work and fittings. 2.2 Describe the classification of fitting tools 2.3Define Marking out 2.4 Explain the tools use for marking out 2.5 Differentiate between Hand and power tools	Explain bench work and fittings as used in the workshop.	Recommended textbook, Markers, White and magnetic board, Projectors Dusters,	Use marking-out tools on the bench correctly Produce simple objects using bench/hand tools such as files, chisels, scrapers, saws etc. Maintain files, dividers, saws, gauges try squares, bevel edge square etc.	Demonstrate the differences between Hand tools and power tools List out marking out tools used on the bench typical workshop practical exercises. Explain the use of this tools and their care	Work bench, Bench vice, Hammers, Set of drills, Steel rule, Scribers Scribing blocks, callipers, gauges, Surface plate Dividers, punches, Files, Chisels, Scrapers, Hack saw,
	General Objective 3.0: Understand the use of simple measuring and testing equipment.					

6-7	3.1 Explain the classification of measurement. 3.2 Describe the tools used in 3.1 3.3 Highlight the differences between measurement and dimensions. 3.4 Know how to read the Vernier caliper and micrometer screw gauge.	Describe the measuring equipment used in the workshop.	Recommended textbooks, Markers, Dusters, White and magnetic board, Projectors, videos, diagram pictures,	Perform simple measuring exercises using steel rules, Vernier callipers and micrometers. Carry out exercises involving flatness squareness, straightness and surface finish test. Perform taper measurement on jobs using Vernier protractor and sine bars. Inspect jobs using simple comparators	Differentiate the differing between measuring and testing in the workshop. Demonstrate on the use of measuring instruments	Micrometers - Vernier callipers, screw gauge, Steel rule
	General Objective: 4.0: Understand Drilling Operation.					

8-9	4.1 Describe drilling operations 4.2 Discuss the nomenclature of a twist drill 4.3 Explain the types of drilling machine. 4.5 Mention all actives to be carried out using drilling machine.	Calculate the speeds of various sizes of drills using appropriate formulae n = v x 1000/[p x d] v = cutting speed d = dia of drill in (mm) n = no. of revs/min. Explain indication of the nomenclature of a twist drill. clearance angle, rake angle, point angle etc.	Multimedia, White and magnetic board, Projectors, videos, diagram pictures, markers, recommended textbooks.	Demonstrate the Operation different types of drilling machine .	Differentiate between drilling and boring operations Demonstrate indication of the nomenclature of a twist drill. a. clearance angle b. rake angle c. point angle etc. Calculate the speeds of various sizes of drills using appropriate formulae n = v x 1000/[p x d] v = cutting speed d = dia of drill in (mm) n = no. of revs/min.	Radial drilling machine Bench drilling machine Pillar drilling machine
	General Objective: 5.0: Understand Reaming Operations.					
10	5.1 Describe reaming operations 5.2 Explain the steps necessary for reaming operations	Differentiate between drilling and reaming in the workshop.	Recommended textbook, White and magnetic board, Projectors, videos, diagram pictures, Chalkboard, recommended textbooks.	Carry out reaming operations:- i. on the bench ii. On drilling/lathe Select correct speeds for reaming small and large holes.	Demonstrate to the cadets/students to do reaming operation on a practical workshop exercise as figure Drill ream small; and large holes using correct speeds and feed and appropriate lubricants.	Hand reamers Machine reamers Tap wrench, Jacobs chuck and key Medium size Lathe
	General Objective: 6.0: Understand Tapping Operation.					

11	6.1 Define tapping operations 6.2 Describe the types and forms of tapping operations.	Differentiate between tapping, drilling and reaming in the workshop	White and magnetic board, Projectors, videos, diagram pictures, Chalkboard, recommended textbooks.	Select correct tapping drill size Select correct taps Carry out tapping operation (i) on the work bench (ii) on drilling (iii) on lathe machine	Demonstrate the purpose of tapping operation Calculate tapping drill size using appropriate formulae Demonstrate how taps are characterized . pitch of the thread b. number of starts c. profile of the thread d. direction of the thread	Taps and wrenches _ Drill chuck and key _ Lathe machine - medium size _ Bench drilling machine _ Pillar drilling machine _ Cutting fluid or lubricants
	General Objective: 7.0: Know Various Metals Joining Operation.					
12-13	7.1 Define metal joining 7.2 Describe the types of metal joining 7.3 State all the conditions necessary for metal joining. 7.4 Explain how to correct taps 7.5 Explain out soft soldering.	Discuss the various metal joining methods Distinguish between soldering and brazing Discuss the importance of using flux. Explain the various forms of metal joining Bolts and nuts, spanner, bending machine, hammer, cutting snips or hand shears.	Recommended textbooks, White and magnetic board,.	Fabricate metal container by Knock-up joining Join metals by the grooving technique Carry out soft soldering	Demonstrate to the students the various metal joining operations Fabricate metal container by Knock-up joining Join metals by grooving technique. Show the correct tapping drill size	Projectors, videos, diagram Pictures, Markers.
	General Objective 8.0 Know Various gas Welding Operations.					

14	8.1 Describe GAS welding operations 9.2 Explain the components of oxy-acetylene gas welding	List out all the component parts of an OXY-acetylene welding plant and identify them.	White and magnetic board, Projectors, videos, diagram pictures, Chalkboard, recommended textbooks.	Fabricate metal container by Knock-up joining Join metals by the grooving technique Carry out soft soldering	Demonstrate the various metal joining operations Fabricate metal container by Knock-up joining Join metals by grooving technique.	Blow lamps Soldering iron Soldering flux Safety welding goggles Oxygen gas cylinder Acetylene gas cylinder Regulators, clips, nozzles Hoses, flash gas lighter Welding nozzles Gas welding set Chipping hammer Wire brush Flame cutting blow pipe (nozzle) Gas welding set.
	General Objective: 9.0: Know Various Arc Welding Operations.					
15	9.1 Describe arc welding 9.2 List the types welded joint 9.3 State the polarity of arc welding. 9.4 list metal arc welding equipment. 9.5 Explain the following: (i) metallic inert-gas arc-welding (ii) Carbon Arc- Welding (iii)Submerged Arc-Welding	Explain various welding techniques	Recommended textbooks, White and magnetic board, Chalkboard, recommended textbooks.	Regulate current and determine polarity for metal arc welding Determine polarity and select current Perform various arc-welding joints by down and up operation. Select and prepare metal edges for various thickness and technique welding	Distinguish between down welding and up welding operation Demonstrate the Performance of down and up welding operation Prepare appropriate metal edges for various metal thickness	Electric arc welding Machine, Face shield, Welding table, Welding chipping, hammer, Wire brush, Hand gloves, Leather apron's, Hand grinder , Pedestal grinding machine

Assessment:

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

Total		100

PROGRAMME: ND CEMENT ENGINEERING TECHNOLOGY	COURSE CODE: BPH 111	UNIT: 2	TOTAL CONTACT HOURS: 5
COURSE TITLE: Mechanics and Properties of Matter and Heat Energy			THEORETICAL:2 Hours/Week
SEMESTER: 1	Pre-requisite: -		PRACTICAL:3 Hours/Week

GOAL: This course is designed to develop the student's understanding and application of basic concepts in mechanics and properties of matter and heat energy.

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

1.0 Understand the various fundamental and derived units.

2.0 Understand vectors and scalars and their applications.

3.0 Understand the basic concept of motion.

4.0 Understand the laws of motion

5.0 Understand the concept of work, energy and power.

6.0 Understand frictional forces and their effects.

7.0 Know the conditions for equilibrium of a stationary body under the action of coplanar forces.

8.0 Understand the principles of simple machines and their uses.

9.0 Understand circular motion.

10.0 Understand the behaviour of fluids at rest.

11.0 Understand the phenomenon of surface tension in liquids.

12.0 Understand the concept of elasticity

13.0 Understand the concept of viscosity

14.0 Understand the concept of temperature and its measurement

15.0 Understand the phenomenon of expansion and its effects.

16.0 Understand the concept of heat as a form of energy

17.0 Understand the three states of matter and change of state.

18.0	Understand the behaviour of gases in terms of atomic or molecular motions.
19.0	Understand the modes of heat transfer

PROGRAMME: ND CEMENT ENGINEERING TECHNOLOGY		COURSE CODE: BPH 111		UNIT: 5	TOTAL CONTACT HOURS: 5 HRS/WEEK	
COURSE TITTLE: **Mechanics and Properties of Matter and Heat Energy**					THEORETICAL: 2 HOURS/WEEK 2HRS	
SEMESTER 1		PRE-REQUISITE:-			PRACTICAL: 3HOURS/WEEK	
GOAL: This course is designed to develop the student's understanding and application of basic concepts in mechanics and properties of matter and heat energy.						
GENRAL OBJECTIVE 1.0: Understand the various fundamental and derived units						
THEORETICAL CONTENTS				**PRACTICAL CONTENTS**		
WEEK/S	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
	1.1 Identify the fundamental quantities e.g. mass, time, temperature and charge 1.2 List the S.I. units in which the fundamental quantities are measured 1.3 State the dimensions of fundamental units. 1.4 Express derived quantities in terms of fundamental quantities. 1.5 Check physical laws e.g. V= U + at, 1.6 Identify dimensionless quantities. 1.7 Measure small distance using micrometer gauge and vernier calipers. 1.8 Measure volumes of liquids and irregular solids by displacement method using measuring cylinder. 1.9 Measure masses using beam and lever balances.	Explain to the students activities 1.1-1.9 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

1.0 **GENERAL OBJECTIVE 2.0:** Understand vectors and scalars and their application						
	2.1 Define vector and scalar quantities 2.2 List vector and scalar quantities. 2.3 Illustrate vector and scalar graphically including addition and subtraction. 2.4 Define unit vectors i, j and k 2.5 Represent vectors in terms of unit vectors A=ix + jy 2.6 Define dot product of two vectors A and B 2.7 Define cross product of two vectors A and B 2.8 Express 2.6 and 2.7 above in terms of unit vectors. 2.9 Resolve a vector into rectangular components. 2.10 Define resultant force 2.11 State the law of parallelogram of forces.	Explain to the students activities 2.1-2.11 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 3.0: Understand the basic concept of motion						
	3.1 List various types of motion 3.2 Define speed, velocity and acceleration (instantaneous uniform average). 3.3 Distinguish between:- i. Distance and displacement	Explain to the students activities 3.1-3.3 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet	-	-	-

	ii. Speed velocity					
4.0 **GENERAL OBJECTIVE 4.0:** Understand the laws of motion						
	4.1 State Newton's third law. 4.2 State the law of conservation of linear momentum. 4.3 Deduce the law of conservation of linear momentum the Newton's third law 4.4 Distinguish between elastic and inelastic collision. 4.5 Define coefficient of restitution 4.6 Demonstrate the laws of motion using trolleys. 4.7Demonstrate the conservation of linear momentum the collision of two trolleys. 4.8Calculate the final momentum and velocities of in Elastic and Inelastic collisions.	Explain to the students activities 4.1-4.8 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 5.0: Understand the concept of work, energy and power						
	5.1Define work, (F.S), energy and power (F.V). 5.2State the units in which 5.1 above are measured 5.3Define the units in 5.2 above 5.4 Relate work done to changes in kinetic Energy and potential Energy 5.5Calculate work done as area under force display graph 5.6Identify other forms of energy. 5.7State the law of conservation	Explain to the students activities 5.1-5.12 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	of energy. 5.8Explain conversion and conservation of all forms of energy 5.9Apply the law of conservation of energy of freely bodies and perfectly elastic collisions. 5.10List the power of machines and appliances. 5.11Derive an expression for the Kinetic energy of a body 5.12Explain what is meant by conservation of energy system of particles not acted upon by an external force					
GENERAL OBJECTIVE 6.0: Understand frictional forces and their effects						
	6.1 Explain the phenomenon of friction 6.2State the advantages and disadvantages of friction 6.3State the laws of friction. 6.4Distinguish between static and dynamic friction 6.5Define coefficient of static and dynamic friction bet two solid surfaces. 6.6Determine experimentally the coefficient of friction inclined plane and a scale pan 6.7State ways of reducing friction between solid surface relative motion 6.8List the applications in practical situations. 6.9Calculate the velocities of solid bodies moving in	Explain to the students activities 6.1-6.9 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	horizontal and inclined planes where friction is not negligible.					
GENERAL OBJECTIVE 7.0: Know the conditions for equilibrium of a stationary body under the action coplanar forces						
	7.1Define moment of a force (tongue) about a point r x f, and couple. 7.2Define center of gravity of a body. 7.3Explain the terms stable, unstable and neutral equilibrium. 7.4Calculate the center of gravity of composite bodies. 7.5Distinguish between stable, unstable and neutral equilibrium (with examples) 7.6State the conditions of static equilibrium 7.7State the principles of triangle of forces and Lami's theorem. 7.8Calculate the equilibrium position of that plate cut in the shape of square, circle, rectangle, etc. When the dimensions are given. 7.9Calculate the equilibrium position of compound bodies. 7.10State the conditions which are satisfied when a body remains in equilibrium under the action of three non parallel forces. 7.11Apply principles of equilibrium to a beam balance. 7.12Define sensitivity of a beam balance. 7.13Determine an unknown mass using pivoted meter rule. 7.14Determine the center of gravity of an irregular plate.	Explain to the students activities 7.1-7.15 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	7.15Verify experimentally the triangle law of forces					
GENERAL OBJECTIVE 8.0: Understand the principles of simple machines and their uses						
	8.1Explain the concept of simple machines 8.2List examples of simple machines. 8.3Define effort, load, mechanical advantages, velocity ratio and the efficiency of a machine. 8.4Relate the terms in 8.3 above to various types of machines. 8.5Determine the force ratio, velocity ratio and efficiency of simple machines (by demonstration). 8.6Calculate the mechanical advantage, velocity ratio and efficiency of machines.	Explain to the students activities 8.1-8.6 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 9.0: Understand circular motion						
	9.1Define the terms angular displacement angular acceleration, tangential velocity and radian. 9.2Derive expressions for angular velocity and it acceleration 9.3Differentiate between:- Linear displacement and angular display Linear velocity and angular velocity Linear acceleration and angular acceleration Radial acceleration and tangential acceleration 9.4Define centripetal and centrifugal forces. 9.5Explain how centrifuge works.	Explain to the students activities 9.1-9.11 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	9.6List examples of bodies performing circular most 9.7Calculate the distance travelled and velocities on horizontal and circular motion. 9.8Explain the reason for banking of roads. 9.9Solve numerical problems involving banked track 9.10Demonstrate circular motion in both horizontal and circles using a stone tied to a string. 9.11Measure relative density using hydrometers.					
GENERAL OBJECTIVE 10.0: Understand the behaviour of fluids at rest						
	10.1Define density and relative density of fluids. 10.2Derive an expression for the pressure exerted by of a fluid 10.3Describe manometers and barometers (simple and fortin barometers.) 10.4Measuring pressure using manometers and barometer 10.5State Pascal's law of transmission of pressure in 10.6Describe the principle of hydraulic press. 10.7State Archimedes' principles. 10.8Verify experimentally the principle in 10.7 above 10.9State the law of floatation. 10.10Measure relative density of a liquid by applying principles mentioned in 10.7 above. 10.11Measure relative density using hydrometers. 10.12Calculate separately the	Explain to the students activities 10.1-10.14 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	following parameters for partially or wholly immersed bodies in a liquid by applying the law of floatation and Archimedes principles. The tension of the string Volume of body immersed Specific gravity of the body Relative density of the liquid 10.13Measures the relative density of a liquid using a U-tube. 10.14Construct and calibrate a simple hydrometer					
GENERAL OBJECTIVE 11.0: Understand the phenomenon of surface tension in liquids						
	11.1Explain the phenomenon of surface tension. 11.2Define and state unit of surface tension. 11.3Explain surface tension in terms of molecular interactions. 11.4Define angle of contact. 11.5Explain capillarity qualitatively. 11.6List various applications of surface tension and capillarity. 11.7Explain the effect of temperature on surface tension	Explain to the students activities 11.1-11.7 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 12.0: Understand the concept of elasticity						
	12.1Explain elasticity 12.2Define stress and strain 12.3State Hooke's law 12.4Verify Hooke's law experimentally. 12.5Determine the elastic constant of a spring 12.6Draw the load extension curve and indicate elastic limit. 12.7Define Young's modules. 12.8Derive the expression for	Explain to the students activities 12.1-12.8 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	the energy stored in an elastic spring or string.					
GENERAL OBJECTIVE 13.0: Understand the concept of viscosity						
	13.1Explain viscosity 13.2Compare viscosity with solid friction. 13.3Define the coefficient of viscosity. 13.4Explain the motion of a ball bearing falling through a viscous fluid. 13.5Define terminal velocity. 13.6List applications of viscosity.	Explain to the students activities 13.1-13.6 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 14.0: Understand the concept of temperature and its measurement						
	14.1Define temperature using concept of thermal equilibrium 14.2Define temperature in terms of thermometric p length of liquid column, pressure of a gas under pressure, resistance of a wire, e.m.f. of thermocouple from a hot body. 14.3Define temperature scale (Celsius scale, Kelvin ideal gas scale). 14.4Convert Celsius to Kelvin scale. 14.5compare the ideal gas scales and other scales. 14.6List the basic seven fixed points on the intermediate temperature scale 14.7Identify the different types of thermometers:- Liquid in glass thermometers (choice of liquid) Resistance thermometer. Thermocouple.Pyrometers	Explain to the students activities 14.1-14.11 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	Gas thermometer. Clinical thermometers. Minimum and maximum thermometers. 14.8Describe the appropriate uses of thermometers. In above. 14.9List the limitations of various types ofthermometer 14.10Construct and calibrate a liquid in glass thermometer resistance thermometer. 14.11Convert temperature from Fahrenheit scale to Celsius thermodynamic scales and vice visa using the appropriate formulae.					
GENERAL OBJECTIVE 15.0: Understand the phenomenon of expansion and its effects						
	15.1Explain the effect of heat on solids, liquids and gases 15.2Define linear, superficial and cubical expansivities. 15.3State the relationship between the expansivities. 15.4Distinguish between real and apparent expansions . 15.5Determine experimentally linear expansivity of a solid in the form of a rod. 15.6Determine experimentally the cubical expansivity of liquid using a specific gravity bottle 15.7Calculate the increase in volume, length and area expansion of solids using the formulae:- L1 = Lo (I + & t) A1 = Ao (I + & t) V1 = Vo (I + & t) where L1 A1 V1 are new length, area	Explain to the students activities 15.1-15.7 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	and volume respectively Lo, Ao, Vo are original length, Area and Volume respectively: α = linear of expansivity β = cubical expansivity = superficial expansivity t = temperature change.					
GENERAL OBJECTIVE 16.0: Understand the concept of heat as a form of energy						
	16.1Define heat energy 16.2Distinguish between heat energy and temperature 16.3Define heat capacity and specific heat capacity. 16.4Determine specific heat capacity of solids and liquids experimentally. 16.5State Newton's laws of cooling. $\frac{dQ}{dt}$ = Ks (Q θr) where S is the area of body's surface.$\theta$is temperature of its surrounding. Q denotes heat lost from the body. 16.6Verify Newton's law of cooling experimentally 16.7Explain cooling corrections in measurements of quantify of heat. 16.8Apply these corrections (16.7 above) in heat experiments. 16.9Determine the specific heat capacity of liquids using Newton's law of cooling. 16.10Calculate the heat capacity of different solids and liquids from experimental results.	Explain to the students activities 16.1-16.10 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 17.0: Understand the three states of matter and change of state.						
	17.1Define melting point and boiling point	Explain to the students activities 17.1-17.10	Instructional materials Flip charts			

	17.2Determine experimentally melting point boiling points of various substances e.g. naphthalene. 17.3Explain the effect of: Pressure on boiling and freezing points. Impurities on boiling point and freezing point 17.4Explain latent heat of fusion and vaporization. 17.5Define specific latent heat of fusion of ice. 17.6Determine specific latent heat of fusion of ice. 17.7Determine specific latent heat of vaporization other liquids. 17.8Calculate the heat capacity, specific heat can specific latent heat of fusion of solids given necessary 17.9Calculate the specific latent heat of vaporization given necessary parameters. 17.10 Compare results from 17.7 and 17.9 above.	Prepare detailed lecture notes and relevant diagrams with video clips	Projectors Video Internet			
GENERAL OBJECTIVE 18.0: Understand the behaviour of gases in terms of atomic or molecular motion						
	18.1Define atom, molecule, Avogadro constant, relative molar mass, mole, molar mass, molar volume and 18.2Differentiate between:- Number of moles; number of molecules, Avogadro's constant.Number of moles; mass of the gas and module 18.3State the assumptions of the kinetic theory of gas. 18.4Explain Brownian motion. 18.5Explain Maxwell distribution of velocity	Explain to the students activities 18.1-18.14 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	18.6Explain the most probable speed, the mean speed mean square speed. 18.7Derive the expression for the pressure exerted by gas.As P = 1/3 $1/c$ 2where e = density c = mean square velocity. 18.8Relate the kinetic energy of a gas to its temperature 18.9Derive the equation of state of an ideal gas using the kinetic theory. 18.10Deduce other gas laws from the equation of Boyle's law and Charle's law. 18.11Verify the gas laws experimentally. 18.12Distinguish between real and ideal gas. 18.13Deduce Van der Waal's equation of state of real gas 18.14Calculate the volume of gases.					
GENERAL OBJECTIVE 19.0: 0 Understand the modes of heat transfer						
	19.1 Explain the terms: Conduction, convection and radiation of heat energy 19.2 Explain 19.1 above in terms of molecular theory. 19.3 Define and give examples of good and bad conductors of heat energy. 19.4 Demonstrate convection current in water. 19.5 Demonstrate that black bodies are better	Explain to the students activities 19.1-19.6 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	absorbers of radiation energy than polished or shiny surfaces. 19.6 List some applications of heat transfer e.g. thermos flaks green house land and sea breezes etc.					

Assessment:

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

PROGRAMME: ND CEMENT ENGINEERING TECHNOLOGY	**COURSE CODE: STC 111**	**UNIT: 5**	**TOTAL CONTACT HOURS: 5**
COURSE TITLE: General Principle of Chemistry			**THEORETICAL:2 Hours/Week**
SEMESTER: 1	**Pre-requisite: -**		**PRACTICAL:3 Hours/Week**
GOAL: This course is designed to develop the student's understanding and application of general principle of chemistry			
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand atoms molecules, composition and structure 2.0 Understand the arrangement of elements in the periodic table 3.0 Understand chemical thermodynamics 4.0 Understand the properties and reactions of acids, bases and salts. 5.0 Understand the fundamental concept of oxidation and reduction reactions. 6.0 Understand surface phenomena and colloidal systems 7.0 Understand chemical equilibrium			

PROGRAMME: ND CEMENT ENGINEERING TECHNOLOGY		COURSE CODE: STC 111		UNIT: 5	TOTAL CONTACT HOURS: 5 HRS/WEEK
COURSE TITTLE: **General Principle of Chemistry**					THEORETICAL: 2 HOURS/WEEK 2HRS
SEMESTER 1		PRE-REQUISITE:-			PRACTICAL: 3HOURS/WEEK
GOAL: This course is designed to develop the student's understanding and application of general principle of chemistry					
GENRAL OBJECTIVE 1.0: Understand atoms molecules, composition and structure					
THEORETICAL CONTENTS				**PRACTICAL CONTENTS**	
WEEK/S	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
	1.1 Explain the experimental basis of atomic theory using Bohr's theory of hydrogen atom and many electrons atoms. 1.2 Describe atomic spectra particularly the H atom emission spectrum. 1.3 Describe atomic spectra particularly the H atom hydrogen atom in the Bohr model. 1.4 Relate these Energy States to the observed emission spectra. 1.5 Explain the limitations of the Bohr model. 1.6 Describe the wave-particle duality of electrons energy. 1.7 State the different main energy levels of an atom, namely K, L. M… 1.8 Correlate the energies of the electron in the K,L,M,N,…shells with the values of the principal quantum no n= 1,2,3,4,…… 1.9 Relate the lines of the hydrogen emission	Explain to the students activities 1.1-1.21 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet	View the visible emission spectra of several metals and some of their compounds Interpret the mass spectrum of representative elements such as Oxygen, Carbon, Chlorine etc.	Guide and supervise laboratory technicians and students	Direct vision spectroscope Bunsen burner, Nichrome Wire fixed to a cook handle, concHCl, solid chlorides of : barium, calcium, potassium, sodium and strontium beakers and watch glasses

	spectrum to electronic energy level. 1.10State Hund's rule, Heisenberg uncertainty principle Pauli exclusion principle 1.11 Explain 1.10 above in relation to the concept of orbitals including subsidiary energy levels (s,p,d,f orbitals). Explain the significance e of the four quantum numbers 1.12Sketch the s and p orbitals. 1.13 Describe the determination of relative atomic and molecular masses. 1.14 Explain isotopes and their use Describe the use of mass spectrometer as a means of proving the existence of isotopes. 1.15 Define the following:: (i) Atomic number, (ii) Mass number, (iii) Atomic mass, Based on 12C. 1.16 Explain valency and chemical bonding. 1.17 Explain the octet and duplet rules. 1.18 Distinguish between the following types of bonds: ionic: covalent; metallic, co-ordination bond. 1.19 Explain energy considerations in ionic bonding and lattice energy. 1.20Explain the formation of			Separate a mixture of sand and salt and relate the results to the different types of bonding in each. Prepare iron sulphide from iron and sulphur	Provide sepectra and guide students through their interpretation Guide students	Representative mass spectra iron, Sulphur, Bunsen burner, glassware, magnets

	covalent bonds, bond length and bond energy, electronegativity and bond polarity. 1.21 Explain Van der Waal's forces					
2.0 GENERAL OBJECTIVE 2.0 Understand the arrangement of elements in the periodic table						
	2.1 Discuss the development of the periodic table. 2.2 Describe building up periods I and II 2.3 Describe building up period III 2.4 Describe electron configurations within groups 2.5 Describe the first d-orbital transition series; building up to period IV 2.6 Discuss the non-metallic elements 2.7 Discuss the Noble Gases 2.8 Write down electronic configuration for the first twenty elements of the periodic table 2.9 Relate electron configuration to the position in the periodic table 2.10 Describe trends in the Periodic Table such as atomic size, ionisation energy, electron affinity, reactivity.	Explain to the students activities 2.1-2.11 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet	Investigate the reactivity of group 2 metals (i) Mg, Ca, Sr and Ba with water. (ii) Mg and Ca with dilute HCl reactivity of transition metals- the copper envelope	Guide the students	Mg, Ca, Sr Ba, water, dilute hydrochloric acid test tubes etc Copper foil, tongs, Bunsen burner.

	2.11 Describe diagonal relationships					
GENERAL OBJECTIVE 3.0: Understand chemical thermodynamics						
	3.1 Describe thermodynamic systems e.g. open system closed system, isolated system 3.2 Explain thermodynamic functions enthalpy entropy, free energy. 3.3 Explain the first and second laws of thermodynamics and their significance. 3.4 Explain thermo chemistry as heat effects that accompany chemical reactions	Explain to the students activities 3.1-3.4 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet	Measure heat of reaction by simple experiments e.g. heat of neutralization NaOH, HCl of a acid and strong base.	Guide students.	Chemicals calorimeter Glassware etc.
GENERAL OBJECTIVE 4.0: Understand the properties and reactions of acids, bases and salts.						
	4.1 Define an acid and a base according to Arrhenius, Bronsted - Lowry and Lewis concepts. 4.2 Identify acids and bases in chemistry equations. 4.3 Explain the meaning of the terms conjugates acid and conjugate base. 4.4 Distinguish between a strong and weak acid or base. 4.5 Write the expression for the dissociation constant for an acid HA (aq)	Explain to the students activities 4.1-4.24 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet	Carry out acid base titration by using conductance meter Identify indicators and use indicators in acid base titration	Guide students.	Chemicals Conductance meters pH meters colour charts indicators burettes glassware

	4.6 Give the equation for the degree of dissociation and concentration, M. (mole dm^3) for a dilute solution of a weak acid. 4.7 Explain Ostwald's Dilution law and dissociation constant, K. 4.8 Calculate the degree of dissociation of a weak acid given the molarity and dissociation constant. 4.9 State the value of the ionic product of water. 4.10 Explain the concept of hydrogen on concentration and pH. 4.11 Calculate the pH value of an acid or base given the hydrogen ion concentration. 4.12 Identify various . 4.13 types of indicators and the use in the measurement of pH. 4.14 Define the terms, pka and pkb 4.15 State the Henderson Hasslebachequation . 4.16 Use the Henderson Hassleback equation.			Measure the pH of solutions by using colour charts, indicators and pH meter Determine experimentally the strengths of acids and bases in relation to structure e.g. in the series CH3COOH, HCL, NH4, OH, NaOH Measure pKa of a weak acid via	Guide students	test tubes chemicals and burette for back titrations.

	4.17 Mention where the pH = of the acid , the acid is 50% that, for a weak acid in a solution ionised. 4.18 Define the terms, buffer solution and buffer capacity. 4.19 Explain the effectiveness of a buffer solution 4.20 Describe buffers in Biochemistry and Medicine (e.g. blood, and biochemical experiments). 4.21 Explain the hydrolysis of salts. 4.22 Explain common ion effect. 4.23 Explain the solubility product and its application in quantitative and volumetric analysis. 4.24 Calculate the value of the solubility product given the solubility of sparingly soluble salt.			titration Titrate a weak acid by using a strong base. Plot the results and observe the region of buffering and the end point. Calculate the solubility product of silver acetate in water and solutions of varying concentrations of sodium nitrate		
GENERAL OBJECTIVE 5.0: Understand the fundamental concept of oxidation and reduction reactions.						
	5.1 Explain: - Oxidation reaction - Reduction reaction 5.2 Explain the oxidation and reduction reactions in terms of electron transfer	Explain to the students activities 5.1-5.7 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet	Carry out redox titration's by using potassium permanganate	Supervise students in the laboratory	Titration apparatus and chemicals

	5.3 List some oxidizing and reducing agents. 5.4 State the periodicity of oxidation state of the elements 5.5 State half ionic equation involving in oxidation reaction. 5.6 State half ionic equation to illustrate reduction 5.7 Balance simple redox equation's					
GENERAL OBJECTIVE 6.0: Understand surface phenomena and colloidal systems						
	6.1 Explain Surface Phenomena and Colloidal Systems. 6.2 Explain the following surface phenomena (a) colloidal gels (b) surface tension © absorption, (d) emulsion (e) gels (f) flotation (g) chromatography 6.3 Differentiate between adsorption and absorption 6.4 Define Ion-Exchange 6.5 Distinguish between cation and anion exchange processes. 6.6 Describe the applications of ion-exchange	Explain to the students activities 6.1-6.6 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet	Purify hard water using ion- exchange chromatography Chromatography of leaves	Guide students	Ion- exchange chromatography. finely cut leaves, chromatography paper, propanone, beaker, lid, glass rod or pencil
GENERAL OBJECTIVE 7.0: Understand chemical equilibrium						
	7.1Explain chemical equilibrium 7.2 State the factors affecting chemical equilibrium 7.3 Explain reversible reaction in relation to chemical	Explain to the students activities 7.1-7.7 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet	Investigation of the effect of concentration changes on chemical equilibria	Guide students	test tubes, gloves, potassium chromate, sulphuric acid,

	7.4 Explain Le Chatellier's principle Define equilibrium constant 7.5 Define equilibrium constant 7.6 Explain the law of mass action 7.7 Calculate concentrations present in equilibrium mixture at given temperature starting from any given amounts of reactants and products.					NaOH, potassium or ammonium thiocyanate, iron III chloride ammonium chloride, glass rod, teat pipettes

Assessment:

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

PROGRAMME: ND CEMENT ENGINEERING TECHNOLOGY	**COURSE CODE: ICT 101**	**UNIT: 3**	**TOTAL CONTACT HOURS: 3**
COURSE TITLE: Introduction to Computing			**THEORETICAL:1Hours/Week**
SEMESTER: 1	**Pre-requisite: -**		**PRACTICAL:2 Hours/Week**
GOAL: This course is designed to develop the student's understanding and application of general principle of Computing			
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand the basic components of the computer and how it has evolved 2.0 Know how data is stored and applications of various operating systems 3.0 Understand the operation of Windows operating system and application packages 4.0 Understand file Management and software package			

PROGRAMME: ND CEMENT ENGINEERING TECHNOLOGY			COURSE CODE:ICT 101	UNIT: 3	TOTAL CONTACT HOURS: 3 HRS/WEEK	
COURSE TITTLE: **Introduction to Computing**					THEORETICAL:1 HOURS/WEEK	
SEMESTER 1			PRE-REQUISITE:-		PRACTICAL: 2HOURS/WEEK	
GOAL: This course is designed to develop the student's understanding and application of general principle of Computing						
GENRAL OBJECTIVE 1.0: Understand the basic components of the computer and how it has evolved						
THEORETICAL CONTENTS				**PRACTICAL CONTENTS**		
WEEK/S	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
	1.1 Define what is meant by a computer 1.2 Explain briefly the history of computer development. 1.3 State the uses of computer and understand the impact of the PC on computer technology 1.4 Differentiate between hardware and software 1.5 Explain the input-processoutput algorithm with the following in mind: -Central processor -Input Mechanism -Output Mechanism	Relate the present idea of computer to other equipment and items that assess man to perform tasks faster Trace the historical evolution of Computers Assess the impact of computers to every day living Conduct the students through the various parts of the computer and how data is managed by the various parts in the system	Maximum of 4 students to a Computer system Maximum of 4 computers to a printer except when a Network is in use Papers and computer accessories Magic Board Multimedia projector system			
GENERAL OBJECTIVE 2.0 Know how data is stored and applications of various operating systems						
	2.1 Understand the application of the following: • RAM • ROM • Fixed discs • Removable • 2.2 Understand the concept of an operating system i. PC-	Explain the need for data storage Dismantle a computer system and show the students the RAW card, the Hard disk and the processors Explain the concept of an operating system	Instructional materials Flip charts Projectors Video Internet			

	DOS/MS DOS ii. Windows iii. Linux iv. Unix					
GENERAL OBJECTIVE 3.0: Understand the operation of Windows operating system and application packages						
	3.1 Access computers correctly through Windows Operation system 3.2 Understand the steps for opening and closing windows 3.3 Understand the application of program Manager 4.4 know the uses and application of the various windows bars 3.5 Understand how to move from one window to another and how to operate them concurrently 3.5 Understand file management and how to mange files 3.6 Know the step in creating files and folders 3.7 Understand file manipulation(moving copying saving deleting etc) 3.8 Understand the use of Print Manager 3.9 Understand the concept of the following software package • MS Office • Lotus Smart suite • MS Encarta	Discuss the advantage of Windows Operating System Explain the Windows Menu and tools. Each student must be given an opportunity to start a computer, open/close the window operating system, understand the program manager and move around in the windows environment Explain the process of creating a file, manipulating the file and use of the print manager Assess the student Load MS Office with the student and explain the various packages that make up MS office. Load MS Encarta and discuss its use with the student Assess the student	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 4.0: Understand file Management and software package						
	4.1 Demonstrate ability in the use of a word processing packages such as MS Word or Word Perfect and covering the following:	Demonstrate the installation of MS Word	Instructional materials Flip charts Projectors Video Internet			

	-Entering text -Formating text (emboldening,, font size, italising, etc) - Creating and saving text files - Importing objects 9. Spelling and grammar checking - Creating and manipulating tables, text boxes equations - Printing and file export	Identify the different features of the software Ask students to type a short document and save it Ask students to edit a document and carry out a spell check Demonstrate the use of tables				

Assessment:

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

	Programme: ND Cement Engineering Technology	**Course Code: MPE 105**		**Contact Hours: 3**
	Subject/Course: Introduction to Mining Technology			**Theoretical: 1 hours/week**
	Year: ND 1 Semester:1st	**Pre-requisite:**	**-**	**Practical: 2 hours/week**

General Objectives

1. Understand technical terminology used in mining
2. Understand elementary principles of prospecting and exploration
3. Understand factors involved in exploitation *of* mineral deposits
4. Know the types of mining methods
5. Know basic principles *of* rock drilling in mining operations
6. Know rock drilling equipment and their application
7. Know the types of mining explosives and their accessories
8. Know methods *of* priming explosive cartridges
9. Understand the mining laws and regulations vis-a-vis handling explosives

	Course: Introduction to Mining Technology		**Course Code: MPE 105**		**Contact Hours: 3**	
					Theoretical:1 hours/week	
	Year: ND 1 Semester: 1st		**Pre-requisite:**	**-**	**Practical:2 hours/week**	
	Theoretical Content			**Practical Content**		
	General Objective 1.0: Know technical terminology used in mining					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
1	1.1 Define geological terminologies, such as ore, lode, ore-shoot, vein, Bedded deposits, massive deposits, placer, deposits, folds, faults, etc. 1.2 Define the following mining terminologies; mining, prospecting, exploration, development, exploitation prospecting lease, mining lease, hanging-and footwall, shaft, drift, level drift, winze, tunnel, stope back, adit, cross cut.	1. Develop instructional manual for teaching this course. 2. Explain geological and mining terminologies, 3. Sketch cross-sections and longitudinal sections of ore deposits and label them. 4. Illustrate diagrammatically a 3D view of a typical mine showing all the features therein	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.	Sketch cross-sections and longitudinal sections of ore deposits and label the relevant terms in 1.2 above	• Develop practical manual for laboratory/workshop exercises in this course. • Prepare practicals as indicated in the manual	Practical Guide/Manual. Drawing paper, pencils, ink, eraser, drawing board
	General Objective 2.0: Know the elementary principles of prospecting and exploration					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
2	2.1 Explain, (a) types of prospecting (b) methods of prospecting (c) types of sampling (d) methods of sampling	1. Describe prospecting and exploration methods 2. Identify the prospecting and exploration equipment	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.	• Using electronic media, appreciate the pre-mining, development and reclamation stages of mineral exploitation. • Submit report on experiences above.	Anchor the film/slide presentation of the development/exploitation stages in mine development	Practical Manual. Overhead Projector, Computer/Laptop System, Slide, Internet/YouTube, CD/DVD Documentaries.
	General Objective: 3.0 Know the factors involved in exploitation of mineral deposits					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning**	**Teachers Activities**	**Resources**

				Outcome:		
3-4	1.1 Explain the factors influencing the methods of development; (a) size (b) shape (c) dip and strike (d) grade of deposits determined by drilling (e) faults and folds (f) Water bearing strata, etc. . 1.2 Explain environmental and economic factors, e.g. (a) location of the deposit (b) infrastructural facilities (c) Politics (f) economics.	1. Enumerate the factors involved in exploitation of mineral deposits 2. Discuss in details; technical, economic and other factors to be considered in the exploitation of mineral deposit. 3. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint, Projector, Screen, Magnetic Board, etc.			
	General Objective:4.0 Know the types of mining methods					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
5	4.1 Classify mining methods in the following general terms (a) Surface mining (b) Underground mining (c) Open-cut (d) Opencast mining (e) Placer-mining 4.2 Explain each method in 4.1 above 4.3 State the mining methods applicable to: (a) Coal deposits in Enugu and Okaba (b) Tin deposits in Jos and Cornwall U.K. (c) Iron deposits in Itakpe and Kiruna Sweden (d) Pb/Zn in Obi and Alkaleri 4.4 Differentiate between placer mining and other forms of surface mining. 4.5 Differentiate between	1. Classify and explain mining methods 2. Give an overview of all mining methods with emphasis to their selection in terms of technical as well as economic consideration, to be considered in applying a particular in favour of another, with examples from Nigerian mining industry 3. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.	Carryout field trip/excursion to quarries, mines, prospecting/exploration outfits etc.	Anchor field excursions.	Practical Manual. Journals. e-media, Internet etc.

	underground methods of mining metalliferrous and non-metalliferous deposits 4.6 List advantages and disadvantages of surface and underground workings in the following respects. (a) environmental (b) economic (c) safety, etc.					
	General Objective: 5.0 Know basic Rock drilling principles in mining operations					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
6	5.1 Define drilling 5.2 Describe the mechanics of rock fragmentation 5.3 Explain the need for the removal of rock chippings by: (a) air flushing (b) water flushing.	1. Describe rock drilling principles in mining Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 6.0:Know Rock drilling equipment and their application					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
7-8	6.1 Classify rock drilling equipment according to working principles (a) percussive (b) rotary (c) rotary-percussive drilling. 6.2 List different types of rock drilling equipment in use (a) open cast work, (b) underground coal mining, and (c) undergroundmetalliferous mining.	1. List and explain rock drilling equipment and their application 2. Explain different types of drilling and where they are applied 3. Illustrate diagrammatically drilling equipment and 4. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.	Carry out practical on drilling operations.	• Explain safety precautions in drilling. • Guide on the conduct of practicals.	Variety of rock drilling machines.

	6.3 State essential features of equipment listed in 6.2 6.4 List and describe various types of drill-bits, ego chisel, cross and x-bits, button, retro and retrac, drag, rolling cutter, and cone bits. 6.5 Demonstrate the use of drill-bits in 6.4 in rock drilling.					
	General Objective 7.0: Know the types of mining explosives and their accessories					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
9-10	7.1 Explain the following properties of explosives; detonation velocity, detonation pressure, energy, strength, water resistance, sensitivity fume charac-teristics, flammability. 7.2 Tabulate principal types of explosives in relation to their essential ingredients and application. (a) straight dynamite (b) ammonia dynamite (c) straight gelatin (d) ammonia gelatin (e) blasting gelatin (f) granulated dynamite (g) permissible explosive for coal mines h) explosives not containing nitroglycerine (i) Ammonium nitrate, nitro starch and chlorate classes. 7.3 List and describe blasting accessories such as safety fuse, igniter *cord*, detonating cord, electric detonators, plain detonators, delay and relay. 7.4 Identify the accessories in	• Explain the types of mining explosives and their accessories • Enumerate properties of explosives in tabular presentation • List types of explosives and their composition • Enumerate blasting accessories and their functions • Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			

	7.3 above 7.5 State the uses of accessories in 7.3					
	General Objective 8.0 Know Methods of priming explosive cartridges					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
11-12	8.1 Define the term priming 8.2 Explain safe method of priming with cap and fuse. 8.3 Explain with sketches, cap and fuse assembly 8.4 Identify the tools required for priming; (pricks, crimper). 8.5 Explain with sketches, the methods for priming explosive cartridge. 8.6 Demonstrate the methods with dummy caps and cartridges. 8.7 Explain recommended methods of firing explosives.	1. Define and explain methods of priming explosive cartridges 2. Demonstrate activities as in 8.2 to 8.4 3. Carry out as in 8.5 4. Asses the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 9.0 :Understand mining laws and regulations as regard to handling of explosives					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
13-14	9.1 Explain the mining laws regarding explosives handling, transportation and storage 9.2 State procedures of explosive transportation to the mine. 9.3 Explain the construction and features of explosive carriers. 9.4 Describe explosive handling care within the mine and quarry. 9.5 Explain the methods of disposal of damaged explo-	1. Cite relevant areas of Nigerian Mining and Minerals Act and regulations concerning explosives handling 2. Explain safety approaches to handling, care and application of explosives in mines and quarries 3. Assess the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			

	sives and blasting caps.					

Assessment:

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

	Programme: ND Cement Engineering Technology	**Course Code: CET 111**		**Contact Hours: 2**
	Subject/Course:Introduction to Cement Raw Materials and Processes.			**Theoretical: 2hours/week**
	Year: ND 1 Semester:1st	**Pre-requisite:**	**-**	**Practical: 0hour/week**
COURSE MAIN/GOAL: The course is designed to enable students to acquire basic knowledge of cement and its raw materials, uses and effects on the environment.				

General Objectives: On completion of the course the student should:

1-0 Know the history and importance of cement

2-0 Know the types of cement, raw materials and its components

3-0 Understand the chemical composition and physical properties ofportlandcement

4-0 Know types of cement manufacturing processes.

5-0 Understand the manufacturing process of cement.

6-0 Understand the effects of cement productionto the environment and pollution control.

7-0 Know diagrammatic flow of basic cement operations.

	Course: Introduction to Cement Raw Materials and Processes.		**Course Code: CET 111**		**Contact Hours: 3**	
					Theoretical: 1 hours/week	
	Year: ND 1 Semester: 1st		**Pre-requisite:**	**-**	**Practical: 2 hours/week**	
	Theoretical Content			**Practical Content**		
	GOAL: The course is designed to enable students to acquire basic knowledge of cement and its raw materials, uses and effects on the environment.					
	General Objective 1.0: Know the history and importance of cement					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
1-2	1.1 Define cement 1.2 Differentiate between hydraulic and non-hydraulic cements. 1.3 Explain brief history of hydraulic and non-hydraulic cements. 1.4 Discuss ancient use of cements. 1.5 Discuss post-roman use of cements. 1.6 Explain the importance of cement in construction.	Explain to the students activities 1.1-1.6.	Instructional Manual, Video clips Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.	Demonstrate the mode of action of hydraulic and non-hydraulic cements.	Guide the students to carryout the practical exercise	Water, Sand , Cement, Coarse Aggregate and Cement.
	General Objective 2.0: Know the types of cement, raw materials and its components					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

3-5	2.1 Explaintypes of cement using the standards available. 2.2 Explain the following types of hydraulic binders; • Hydraulic lime • Natural cements • Portland cement • Portland-limestone cements • Blended cements • Pozzolan-lime cements • Masonry cements • Aluminous cements • Sulphate resistant cement • White Portland cement • Low heat cement. • Oil well cement etc. 2.3Explain the following typical cement raw materials: • Limestone, chalk, marble etc ($CaCO_3$) • Sand, shale, clay etc (SiO_2) • Clay, marl, shale etc (Al_2O_3) • Iron ore, mill scale, laterite etc (Fe_2O_3) 2.4Explain the following components of limestone: • Calcareous Component • Argillaceous Component.	Explain to the students activities 2.1-2.4. Explain to students using NIS 444-1:2018 types of cement.	Instructional Manual, Video clips Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, NIS 444-1:2018 ASTM-C150 etc.	• Identify the different types of hydraulic binders listed in 2.2 • Identify the cement raw materials listed in 2.3	Guide the students to carryout the practical exercises.	Samples of various types of hydraulic binders Samples of Limestone, chalk, marble, Sand, shale, clay, marl, shale, Iron ore, mill scale, laterite etc.
	General Objective: 3.0 Understand the Chemical Composition and Physical Properties of Portland Cement					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
6-8	3.1 Explain the physical properties of Cement:	Explain to the students activities 3.1-3.4	Instructional Manual, Video clips	Carryout simple tests to determine some of the physical properties of	Guide the students to carryout the practical exercise.	Samples of cement, water, Coarse

	• Fineness • Soundness • Strength • Setting. 3.2 State the chemical composition of cement: ($CaCO_3$, SiO_2,Al_2O_3, $CaSO_4.2H_2O$and Fe_2O_3) 3.3 Explain the chemical composition of clinker • Tricalcium silicate ($3CaO.SiO_2$), (50-70%) – Alite • Dicalcium silicate ($2CaO.SiO_2$), (15-30%) – Belite • Tricalcium aluminate ($3CaO.Al_2O_3$), (5-10%) - Aluminate • Tetracalciumaluminoferrite ($4CaO.Al_2O_3.Fe_2O_3$), (5-15%) – Ferrite. 3.4Explainthe nomenclature for cement.		Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.	cement.		Aggregate, vicat apparatus, glass wares, weighing balance, crushing machine,
	General Objective: 4.0 Know Types of cement production processes.					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
12	4.1 Explain types of cement processes • Wet Process • Dry Process • Semi wet/dry process 4.2 Differentiate among the three processes in 4.1 4.3 State the merit and demerits of each in 4.1	Explain to the students activities 4.1-4.3	Instructional Manual, Video clips Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.	• Undertake a tour to the cement manufacturing plant • Write a report on the types of cement manufacturing rocesses	Organize an industrial visit to cement manufacturing visit Guide the students observe stages of cement manufacturing	Cement manufacturing plant

	General Objective:5.0 Understand the manufacturing processes of cement.					
	Specific Learning Outcome:	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
9-11	5.1 List the four manufacturing processes of cement. 5.2 Explain cement manufacturing processes: • Mixing of raw material i. Crushing ii. Stacking (Storage and homogenization) iii. Grinding and drying of raw materilas • Pyro- processing • Grinding of clinker • Storage and packaging 5.3 Explain the use of the following equipment in cement manufacturing. i. Crusher ii. Stackers iii. Grinding mills iv. Cyclone preheater v. Rotary Kilns vi. Coolers vii. Dedusting equipment viii. Conveyors ix. Packers etc.	Explain activities 5.1-5.3to the students. Explain the following pyro processing stages; • Pre heating • Decarbonisation, • Sintering, • Cooling	Instructional Manual, Video clips Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.	• Undertake a tour to the cement manufacturing plant with a view to identifying all the cement manufacturing processes. • Write a report on the stages of cement manufacturing	Organize an industrial visit to cement manufacturing Guide the students observe stages of cement manufacturing	Cement manufacturing plant
	General Objective 6.0: Understand the effects of cement production to the environment and pollution control.					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
13-15	6.1 List environmental effects of cement	Explain to the students activities 6.1-6.4	Instructional Manual, Video clips	• Carryout thermal decomposition of limestone	Guide students to carryout the experiments	

	manufacturing. 6.2 Explain the following pollutants from cement factories: • Particulates (dust) • Gaseous pollutants i. Carbon monoxide ii. Sulfur Oxide iii. Nitrogen Oxide iv. Dioxin. v. Carbon dioxide. 6.3 Explain the adverse effect of each of the pollutants in 6.2 6.4 Explain the following pollution control measures in cement production : • Use of electrostatic precipitator (ESP). • Battery cyclone. • Use of bag filters (Bag house). • Operations control. • Gas analysers		Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.	• Carryout combution of each of the following fuels, gas,coal and LPFO. • Observe the deposition of particulate of of cement dust on the environment.	Organize an industrial visit to cement manufacturing environment.	
	General Objective 7.0: Know diagrammatic flow of basic cement operations.					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
	2.1 Explain basic stages in cement operations. 2.2 Describe basic symbols of equipment and operations in the cement industry. 2.3 Explain open and close circuits. 2.4 Illustrate diagrammatically the flow of basic cement operations in 7.1.	Explain activities 7.1 – 7.4 to the students.	Instructional Manual, Operation flow charts of a cement industry, Video clips Recommended textbooks, e-Books, lecture notes, Marker			

			Board, PowerPoint Projector, Screen, etc.			

Assessment:

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

SEMESTER TWO ND 1

PROGRAMME: GENERAL STUDIES	**COURSE CODE:** GNS 102	**CREDIT HOURS:** 2
COURSE: Communication in English 1	**PRE-REQUISITE: 101**	**THEORETICAL: HOURS/WEEK** 30Hours
ND I Semester 2		

COURSE MAIN AIM/GOAL: This course is designed to enable students acquire the necessary communication skills, know the techniques of correspondence and comprehend written materials.

GENERAL OBJECTIVES: On completion of this course, the student should:

1.0 Understand the concept of communication.
2.0 Know how to make oral presentations.
3.0 Know the essential elements of correspondence.
4.0 Apply the rules of comprehension and interpretation

COURSE: Communication in English I					**CH/CU HOURS:** 2	
GOAL: This course is designed to enable students acquire the necessary communication skills, know the techniques of correspondence and comprehend written materials.						
GENERAL OBJECTIVES: 1.0: Understand the concept of communication						
COURSE SPECIFICATION: THEORETICAL CONTENT						
	THEORETICAL CONTENT		**PRACTICAL CONTENT**			
WEEK	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCE**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**EVALUATION**
	Communication: 1.1 Define communication. 1.2 Analyse the process of communication. 1.3 Enumerate the purposes of communication. 1.4 Explain the relationship between communication and language. 1.5 Explain the impact of interference on communication at various levels, e.g., phonological, syntactic etc. 1.6 Define code-mixing, code-switching and dissonance in communication.	Explain Communication. Describe the process of communication. Enumerates the purposes of communication. Explain the relationship between communication of language. Discuss the impact of interference on communication at various levels e.g. phonological syntactic etc. Explain code mixing, code switching and dissonance in communication.	Textbooks Projects DVD/CD Players Marker Board& Marker Internet	Define Communication Analyse the process of communication. Mention the purposes of communication. Identify the relationship between communication and language. Highlight the impact of interference on communication at various levels. Discuss with relevant examples code, mixing, code switching and dissonance in communication	Guide, supervise and correct students' activities.	Class work, Assignments and Test
GENERAL OBJECTIVES: 2.0: Know how to make oral presentations.						
	Oral Presentations: 2.1 Label a diagram of the organs of speech.	Draw and label a diagram	Charts, pictures, DVD/CD	Draw and label the organs of	Guide, supervise and	Class work

	2.2 Describe the functions of the organs in 2.1 above in speech production. 2.3 Identify the phonemes of English. 2.4 Pronounce correctly by making distinctions between the different sound contrasts in the consonantal and vowel systems of English. 2.5 Explain the principles of effective speaking, viz, correct use of stress, rhythm, and intonation patterns.	of the organs of speech. Explain the functions of the organs of speech in speech production. Explain the phonemes of English. Pronounce and differentiate between the different consonant and vowels sounds. Enumerate the principles of effective speaking by exposing students to the correct use of stress, rhythm and intonation patterns.	player textbooks, Marker Board marker, projector, CD/DVD Internet	speech . Explain the functions of the organs of speech. Pronounce correctly all the phonemes of English. Pronounce and make distinctions between the different consonant and vowels sounds of English. ➢ State the principles of effective speaking. ➢ Read fluently. ➢ Make short speeches.	correct students' activities.	Assignments and Test.
GENERAL OBJECTIVES: 3.0: Know the essential elements of correspondence						
	Correspondence: 1.1 List the various types of correspondence e.g. letter (informal, semiformal & formal) memo, circular etc 1.2 Differentiate between informal, semi-formal, formal, semi-formal and	Explain the various types of correspondence, letters, memo, circular, notices. Explain informal, semi-	Textbooks Projects DVD/CD Players Marker Board&Marker Internet Samples of letters, memo, circulars etc.	Write letters, memos, circulars, notices etc.	Guide, supervise and correct students' activities.	Class work Assignments and Test

	formal letters. 1.3 Explain the various parts of a letter. 1.4 Explain the style suitable for formal and informal letters.	formal and formal letter. Explain the various parts of a letter: writer's address, date, recipient's address, salutation, subject, body, complimentary close, signature, full name of writer, designation (recently, phone number, email). Discuss the style suitable for formal and informal letters.		Write informal semi-formal and formal letters. Write letters paying attention to the various parts of the formal letter. Write formal and informal letters paying attention to style.		
GENERAL OBJECTIVES: 4.0: Apply the rules of comprehension and interpretation						
	4.1 Identify main ideas in a given passage.	Explain main ideas from given passages.	Textbooks, CD/DVD Players, Projectors, Marker Board marker Internet.	➢ Identify main ideas from given passages. ➢ Differentiate the main idea from the details in a given passage. ➢ Use main idea to anticipate specific details in a given passage. ➢ Identify relationship patterns of ideas in a given passage. Draw conclusions from given passages.	Guide, correct and assess students' work.	Class work Assignments and Test

	4.2 Draw conclusions from available information.	Explain how students can draw conclusions from available information.				

Department/Programme: ND Cement Engineering Technology	**Course Code: STA 111**	**Contact Hours: 2 – 0 - 0**
Subject/Course: Introduction to Statistics		**Theory: 2 hours/week**
Year: ND I Semester: 2nd	**Pre-requisite: -**	**Practical: 0 hours/week**

General Objectives:

1. Understand statistics and all that it stands for.
2. Understand the different methods of data collection and their limitations.
3. Know the different forms of data presentation
4. Understand the use and the importance of some measures of central tendency in summarizing data.
5. Understand the use and importance of measures of dispersion in summarizing data
6. Know the different types of random variables
7. Understand the basic principles of probability
8. Understand some basic probability distributions and how to identify each distribution
9. Understand the principles of correlation of two variables and the regression of one variable on another.

PROGRAMME: National Diploma In Cement Engineering Technology

COURSE: Introduction to Statistics		COURSE CODE: STA 111		CONTACT HOURS: 2 – 0 - 0		
Course Specification: Theoretical Contents						
WEEK	**Special Learning Outcomes**	**Teachers Activities**	**Resources**	**Special Learning Outcomes**	**Teachers Activities**	**Resources**
	General objectives 1.0: Understand statistics and all that it stands for.					
1	1.1 Define statistics 1.2 Explain with approximate illustrations, the use of statistics in Government, Biological Sciences, Physical Science. Business and Economics.	Lecture Give students assignments	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪
	General Objective 2.0: Understand the different methods of data collection and their limitations.					
2-3	2.1 State the method of collecting data 2.2 Describe the two main methods of collecting primary data: a) Established published sources b) "Ad-hoc" basic or experimentation 2.3 State the merits and demerits of the methods of collecting primary data 2.4 Explain the concept of data "editing" and its application in editing primary and secondary data. 2.5 Describe the sources of error in data collection	Illustrate with good examples activities in 2.1 to 2.5. Assess the student	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪

	General Objectives 3.0: Know the different forms of data presentation					
4-5	3.1 Explain the objectives of classification of a mass of raw data 3.2 Prepare a frequency distribution from a given data 3.3 Explain the usefulness of diagrams in presenting statistical data 3.4 Construct bar chart, pie chart, histogram, frequency polygon and cumulative frequency polygon for a given set of data 3.5 Outline the merits and demerits of each diagram in 3.4 above.	Lecture Give sample charts Give studentsassignments	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪
	General Objective 4.0 Understand the use and the importance of some measures of central tendency in summarizing data.					
6-7	4.1 Define Arithmetic mean, Geometric Mean, Median, Mode and harmonic Mode and harmonic mean 4.2 Compute the measurer in 4.1 above given: i. ungrouped ii. grouped data 4.3 Explain the uses of Geometric means 4.4 Calculate: Quantiles Deciles Percentiles given a set of data	Illustrate with good examples activities in 4.1 to 4.4. Assess the student	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪

	List the merits and demerits of all the above measured of central tendency.					
	General Objective 5.0: Understand the use and importance of measures of dispersion in summarizing data					
8	5.1 State the importance of measures of dispersion 5.2 Defined and calculate the: mean deviation, Semi interquartile range Variance and standard deviation 5.3 Describe the application of the measures of dispersion defined in 5.2 above. 5.4 Calculate these standard error of the sample mean for given data	Illustrate with good examples activities in 5.1 to 5.4. Assess the student	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪
	General Objective: 6.0 Know the different types of random variables					
9	6.1 Define a random variable 6.2 Explain the concept of randomness 6.3 Define discrete and continuous variables 6.4 State examples of discrete and continuous variables	Illustrate with good examples activities in 6.1 to 6.4. Assess the student	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪
	General Objective 7.0: Understand the basic principles of probability					

10	7.1 Define probability 7.2 Explain probability using the relative frequency approach 7.3 State the laws of probability 7.4 Solve simple problems by applying the laws of probability 7.5 Define conditional probability for two events.	Illustrate with good examples activities in 7.1 to 7.5. □ Assess the student	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪
	General Objectives 8.0: Understand some basic probability distributions and be label to identify each distribution					
11-13	8.1 State the probability distribution of a random variable 8.2 Define mathematical expectation of discrete and continuous random variable 8.3 Define expectations of functions of discrete random variable 8.4 Define the binomial distribution 8.5 Define conditional probability for two events 8.6 Calculate the means and variance under the Binomial and the poison distributions 8.7 Define Normal distribution 8.8 Approximate probabilities for given continuous random variables using normal distribution 8.9 Explain the characteristics of Binomial	Illustrate with good examples activities in 8.1 to 8.16. □ Assess the student	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪

	distribution 8.10 Apply Binomial distribution of samples with replacement 8.11 Solve given problems applying binomial distribution 8.12 Describe normal distribution curve and the empirical distribution rule 8.13 Explain the characteristics of Normal distribution. Calculate the probability given the deviation from the mean 8.14 Calculate the deviation given the means, standard deviation and a particular observation 8.15 Calculate the area under the curve at different point from either side of the mean. 8.16 Apply Normal distribution curve to simple problems					
	General Objectives 9.0: Understand the principles of correlation of two variables and the regression of one variable on another.					
14 - 15	9.1 Define correlation 9.2 State the types of correlation 9.3 Describe the methods of studying correlation i. Scatter diagram (graphic method) ii. Karl Pearson's coefficient of correlation iii. Spearman's rank correlation	Lecture Give sample Charts Give students assignments	Instructional Manual. Recommended textbooks, e-books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, flip charts, etc.	▪	▪	▪

	9.4 Calculate Pearson's and Spearman's correlation coefficients 9.5 Define regression equation of the form Y=a+bxusing free-hand method and method of least squares.					

Assessment:

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

	Programme: ND Cement Engineering Technology	**Course Code: ICT 201**		**Contact Hours: 3**
	Subject/Course: Computer Aided Design and Drafting			**Theoretical: 1 hours/week**
	Year: ND I Semester: 2nd	**Pre-requisite:-**	**-**	**Practical:2 hours/week**

General Objectives

1.0: Understand the use of Computer in the Design and Drafting Process

2.0: Understand how to construct simple geometric shapes

3.0: Understand the different edit boxes

4.0: Understand how to use edit commands

5.0: Understand how to create layers

6.0; Understand how to create linear and aligned dimensions

	Course: Computer Aided Design and Drafting		**Course Code: ICT 201**		**Contact Hours :3HRS/WEEK**	
					Theoretical: 1 hr/wk	
	Year: ND 1 Semester:2nd		**Pre-requisite:-**		**Practical:2hrs/wk**	
	THEORITICAL CONTENT			**PRACTICAL CONTENT**		
Week	**General Objective 1.0:** Understand the use of Computer in the Design and Drafting Process					
	Specific Learning Outcome:	**Teacher Activities**	**Resources**	**Specific Learning Outcome:**	**TeachersActivities**	**Resources**
1-4	1.1 Know the advantages and disadvantages of computer in the design process 1.2 Explain the links between CAD and CAM 1.3 Understand the Principles of Operation capabilities and system requirements of Auto CADD 1.4 Install the Auto CADD software correctly. 1.5 Identify the main parts of the screen of Auto CAD 14 or Later versions 1.6 Explain the functions of the above 1.7 Explain the different input methods: Keyboards, mouse, digitizers, and scanners. 1.8 Discuss the different coordinate systems 1.9 Demonstrate the use of the HELP Menu in solving problems when using the Package	Explain advantages and disadvantages of computer in the design process. Explain the links between CAD and CAM Identify the main parts of the screen of Auto CAD 14 Explain the function of the above. Explain and use the different input methods Explain differences between Cartesian and polar coordinates systems Demonstrate the above options on the computer screen Construct lines at set lengths and angles using above coordinate systems. Use snap points to construct lines. Explain the use of snap points and ortho - commands	Complete computer sets 1 Computer to 2 Students 1 Large Format Printer or Plotters in a Network 1 Digitizer to 2 Students			

	1.10 Use the OSNAP facility to select options 1.11 Use layer control to change the layers in a drawing 1.12 Use Cartesian and Polar coordinates to draw lines 1.13 Prepare and change the size of the drawing field 1.14 Know how to save drawings on demand and also how to set up the auto-save feature					
	General Objective 2.0: Understand how to construct simple geometric shapes					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
5-7	2.1 Know how to hatch the shapes drawn and change the hatch pattern and scale 2.2 Explain how to draw circles, ellipses and arcs to given dimensions 2.3 Explain how to construct polygons and squares to given dimensions 2.4 Produce a simple drawing - Drawing 1	Hatch the shapes drawn Change the hatch pattern and scale. Draw circles, ellipses and arcs to given dimensions. Construct polygons and squares to given dimensions.	Complete computer sets 1 Computer to 2 Students 1 Large Format Printer or Plotters in a Network 1 Digitizer to 2 Students			
	General Objective 3.0: Understand the different edit boxes					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
8-9	3.1 Explain the different edit boxes,	Explain the different edit boxes. Ask students to use them.	Sets of personal computers, Recommended			

	how to use them and their attributes 3.2 Explain how to select the shapes using edit boxes. 3.3 Use array command to draw both polar and rectangular arrays 3.4 Explain how to use the offset command	Explain their attributes. Draw both polar and rectangular arrays using array command Draw using the offset command.	textbooks, Manuals, etc.			
	General Objective 4.0: Understand how to use edit commands					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
10-11	4.1 Explain how to use edit commands 4.2 Demonstrate how to move objects accurately using both snap commands and coordinates 4.3 Demonstrate how to copy objects from one position to another accurately using snap and coordinate entry. 4.4 Demonstrate how to erase objects 4.5 Demonstrate how to trim objects 4.6 Demonstrate how to fillet and chamfer angles	Copy objects from one position to another accurately using snap and coordinate entry. Erase objects. Trim objects Fillet and chamfer angles	Sets of personal computers, Recommended textbooks, Manuals, etc.			
	General Objective 5.0: Understand how to create layers					
12	5.1 Demonstrate how to create layers. 5.2 Demonstrate how to change colour of layers	Create layers • Ask students to change colour of layers Change the line type of a layer	Sets of personal computers, Recommended textbooks, Manuals, etc.			

	5.3 Demonstrate how to change the line types of a layer. 5.4 Demonstrate how to move objects from one layer to another 5.5 Demonstrate how to switch layers on and off 5.6 Understand the use of layers and how they help in the construction and understanding of a draw	Move objects from one layer to another Switch layers on and off Use layers to construct drawings.				
	General Objective 60: Understand how to create linear and aligned dimensions					
12	6.1 Explain how to create linear and aligned dimensions 6.2 Understand how to create angular dimensions 6.3 Demonstrate how to add to tolerances to dimensions 6.4 Demonstrate how to create leader lines. 6.5 Demonstrate how to add single line and multiple line texts to drawings 6.6 Demonstrate how to edit dimensions and text	Create linear and aligned dimensions. Create angular dimensions Add tolerances to dimensions Create leader lines. Add single line and multiple line text to drawings. Edit dimensions and text.	Sets of personal computers, Recommended textbooks, Manuals, etc.	Create the title block for a drawing Write letters and numbers on drawings Draw circles be able to erase parts of lines or circles Produce a simple drawing with correct details in terms of title block etc Select parts of a drawing in order to do further work. Move, Copy and Rotate drawing parts. Produce a full drawing with title blocks from a real engineered object. Show all the views. Produce a fully dimensioned drawing of a component appropriate to the engineering	Ask each student to carry out his/her own drawing Let each student carry out his/her own drawings. Ask each student to carry out his/her own drawing Ask each student to carry out a drawing that is specific to his/her department.	Sets of personal computers,

				Specification of the department.		

Assessment:

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

PROGRAMME: ND CEMENT ENGINEERING TECHNOLOGY	COURSE CODE: EEd 126	UNIT: 3	TOTAL CONTACT HOURS: 3
COURSE TITLE: Introduction to Entrepreneurship			**THEORETICAL:1Hours/Week**
SEMESTER: 2	**Pre-requisite: -**		**PRACTICAL:2Hours/Week**
GOAL: This course is designed to develop the student's understanding and application of general principle of Entreprenuership Development			
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand the basic concept of entrepreneurship 2.0 Understand the historical perspective of entrepreneurship development 3.0 Know how to plan a business enterprise/project 4.0 Know how to operate simple stock keeping records 5.0 Know how to prepare and operate cash flow on spreadsheets 6.0 Understand employment issues 7.0 Understand the Nigerian Legal System 8.0 Comprehend the nature of contract and tort 9.0 Understand Agency and Partnership			

PROGRAMME: ND CEMENT ENGINEERING TECHNOLOGY		COURSE CODE: EEd 126		UNIT: 3		TOTAL CONTACT HOURS: 3 HRS/WEEK
COURSE TITTLE **Introduction to Entrepreneurship**						THEORETICAL:1 HOURS/WEEK 2HRS
SEMESTER 2		PRE-REQUISITE:-				PRACTICAL: 2HOURS/WEEK
GOAL: This course is designed to develop the student's understanding and application of general principle of Entreprenuership Development						
GENRAL OBJECTIVE 1.0: Understand the basic concept of entrepreneurship						
THEORETICAL CONTENTS				**PRACTICAL CONTENTS**		
WEEK/S	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1	1.1 Define entrepreneurship, entrepreneur, small business and self- employment. 1.2 State the entrepreneurship philosophy identify entrepreneurial characteristics. 1.3 Identify entrepreneurial characteristics. 1.4 Define development enterprise.	Explain to the students activities 1.1-1.4 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 2.0 Understand the historical perspective of entrepreneurship development						
2	2.1 Historical perspective. 2.2 Trace the origin of entrepreneurship. 2.3 Explain organizational structure. 2.4 Explain the role of an entrepreneur. 2.5 Explain the reasons for business failure.	Explain to the students activities 2.1-2.5 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 3.0: Know how to plan a business enterprise/project						
3-5	3.1 Define the concepts: planning, business enterprise and project. 3.2 Explain the importance of planning to a business enterprise. 3.3 Analyse the skills and Techniques of starting and	Explain to the students activities 3.1-3.5 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	managing small business successfully. 3.4 Prepare and present project proposal. 3.5 Manage a small business profitably					
GENERAL OBJECTIVE 4.0:. Know how to operate simple stock keeping records						
6	4.1 Ordering spare parts/materials 4.2 Receipt of parts/materials 4.3 Storage of parts/materials 4.4 Issue of parts/materials	Explain to the students activities 4.1-4.4 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 5.0: Know how to prepare and operate cash flow on spreadsheets						
7-8	1.1 Need for different records (capital, revenue, credit transaction, tax) 1.2 Formatting spreadsheet 1.3 Operating spreadsheet	Explain to the students activities 5.1-5.3 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 6.0: Understand employment issues						
9	6.1 Define the terms: education, training and development. 6.2 Retate education, training and development to employment. 6.3 Distinguish between skills and employment. 6.4 Explain the role of the private sector in employment generation. 6.4 Identify the forms and informal sectors 6.5 Explain the issues of: (i) Rural youth and employment (ii) Urgan youth and	Explain to the students activities 6.1-6.5 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	employment					
GENERAL OBJECTIVE 7.0: Understand the Nigerian Legal System						
10	7.1 Explain the nature of law. 7.2 Analyse the sources of Nigerian laws. 7.3 Evaluate the characteristics of Nigerian Legal System.	Explain to the students activities 7.1-7.3 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 8.0: Comprehend the nature of contract and tort						
11-12	8.1 Define contract. 8.2 Explain types of contracts 8.3 State the basic requirements for a valid contract. 8.4 Analyse contractual terms. 8.5 Examine vitiating terms. 8.6 Explain breach of contract and remedies. 8.7 Define Tort. 8.8 Explain types of Tort. 8.9 Discuss tortuous liabilities and remedies	Explain to the students activities 8.1-8.9 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			
GENERAL OBJECTIVE 9.0: Understand Agency and Partnership						
13	9.1 Define agency 9.2 Explain creation of Agency 9.3 Explain authority of the agent. 9.4 Analyse the rights and duties of principal agent and third parties. 9.5 Explain termination of agency and remedies 9.6 Define partnership. 9.7 Examine creation of partnership. 9.8 Explain relations of partners to one another and to persons dealing with them	Explain to the students activities 9.1-9.9 Prepare detailed lecture notes and relevant diagrams with video clips	Instructional materials Flip charts Projectors Video Internet			

	9,9Analyse dissolution of partnership and remedies.					

Assessment:

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

PROGRAMME: ND CEMENT ENGINEERING TECHNOLOGY	**COURSE CODE: MTH 113**	**UNIT:**	**TOTAL CONTACT HOURS: 2**
COURSE TITLE: ALGEBRA & ELEMENTARY TRIGONOMETRY			**THEORETICAL:2 Hours/week**
YEAR/SEMESTER: ND I /2	**Pre-requisite: -**		**PRACTICAL: 0 Hours/week**

GOAL: To enable the students acquire basic knowledge of algebra and trigonometry and apply same in solving problems in their areas of specialization

GENERAL OBJECTIVES: On completion of this course, the student will be able to:

1.0 Understand the laws of indices and their application in simplifying Algebraic expressions.
2.0 Understand the theory of logarithms and surds and their applications in manipulating expressions.
3.0 Understand principles underlying the construction of charts and graphs.
4.0 Know the different methods of solving quadratic equations.
5.0 Understand Permutation and Combination.
6.0 Understand the set theory.
7.0 Understand the properties of arithmetic and geometric progressions.
8.0 Understand the binomial and its application in the expansion of expressions
9.0 Understand the basic concepts and manipulation of vectors and complex number and their applications to the solution of engineering problems.
10.0 Understand the definition, manipulation and application of trigonometric function.
11.0 Understand the concept of equations and methods solving different types of equations and apply same to engineering problem.

PROGRAMME: **ND BOAT/SHIPBUILDING TECHNOLOGY**						
COURSE: ALGEBRA AND ELEMENTARY TRIGONOMETRY				**CODE: MTH 113**		**CH/CU: 2**
GOAL: To enable the students acquire basic knowledge of algebra and trigonometry and apply same in solving problems in their areas of specialization.						
COURSE SPECIFICATION: THEORY/PRACTICAL CONTENT						
GENERAL OBJECTIVE 1.0: Understand The Laws of Indices And Their Applications In Simplifying Algebraic Expressions**.**						
	THEORETICAL CONTENTS			**PRACTICAL CONTENTS**		
WEEK/S	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OBJECTIVES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1	1.1 Define indices. 1.2 State the laws of indices 1.3 Solve simple problems using the laws of indices.	Define indices. State the laws of indices. Solving simple problems using the laws of indices.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Define indices. Establish the laws of indices. Solve simple problems using the laws of indices.	Illustrate with example and Supervise the students' work. Explain laws of indices.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
GENERAL OBJECTIVE 2.0: Understand Theory of Logarithms, Surds And Their Applications In Manipulating Expression						
2-3	2.1 Define logarithms. 2.2 State the basic laws of logarithms. 2.3 Solve simple logarithms problems. 2.4 Define natural logarithms and common logarithms. 2.5 Define characteristics and mantissa 2.6 Read the logarithmic table for given numbers 2.7 Simplify numerical expressions using logarithms tables	Definite of logarithms. Explain the basic laws of logarithms. Find simple logarithms problems Define natural logarithms and common logarithms. Explain characteristics and mantissa. Demonstrates the use of the logarithm table	Recommended textbooks, Marker Board, Lecture notes logarithm table, multimedia projector, and computer.	Define logarithm. State the basic laws of logarithms. Solve simple logarithm problem. Define natural logarithm and common logarithm. Define characteristic and mantissa Read the logarithmic table for given numbers Simplify numerical	Observe, instruct and guide the students in the exercises. Supervise the students' work. Correct any error in the students' definitions and concepts. Illustrate with examples.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.

	2.8 Apply logarithm in solving non-linear equations. 2.9 Define surds 2.10 Reduce a surd into its simplest form 2.11 Solve simple problems on surds	Explains the use of the logarithm table in simplifying numerical expressions. Defines surds. Demonstrates the reduction of surds into its simplest form. Solve simple problems on surds.		expressions using logarithms tables Apply logarithms in solving non-linear equations. Define surds Reduce a surd into its simplest form Solve simple problems on surds		
GENERAL OBJECTIVE 3.0: Understand Principles Underlying The Construction Of Charts And Graphs						
4	3.1 Construct graphs of functions such as $y = ax^n + b$ for n=1,2. $y = ax^k$ 3.2 Apply knowledge from 3.1 in the determination of laws from experimental data.	Describe how to construct graphs of functions such as, $y = ax^n + b$ for n = 1, 2. $y = ax^k$ Demonstrate with relevant examples how to determine laws from experimental data.	Recommended textbooks, Marker Board, graph book, Lecture notes, multimedia projector, and computer.	Construct graphs of functions such as Apply knowledge from 3.1 in the determination of laws from experimental data.	Supervise the students' work. Correct any error in the students' definitions and concepts	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
GENERAL OBJECTIVE 4.0: Know The Different Methods of Solving Quadratic Equations.						
5	4.1 Solve quadratic equations by factorization. 4.2 Solve quadratic equations by method of completing squares. 4.3 Solve quadratic equations by general formula. 4.4 Determine the roots of given quadratic equations. 4.5 Form quadratic	Explain how to solve quadratic equations using factorization method. Explain how to solve quadratic equations by method of completing and by general formula. Demonstrate formulation of quadratic equations from given roots.	Recommended textbooks, Marker Board, graph book, Lecture notes, multimedia projector, and computer.	Solve quadratic equations by factorization. Solve quadratic equations by method of completing squares. Solve quadratic equations by general formula. Form quadratic equations from given roots.	Supervise the students' work. Correct any error in the students' definitions and concepts	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.

	equations from given roots.					
GENERAL OBJECTIVE 5.0: Understand Permutations And Combinations.						
6	5.1 Define permutation. 5.2 State examples of permutations. 5.3 Establish the theorem $^nP_r = \frac{n!}{(n-r)!}$ 5.4 Define combination 5.5 State examples of combination. 5.6 Establish the theorem $^nC_r = \frac{n!}{(n-r)!r!}$ 5.7 Establish $^nC_r = {}^nC_{n-r}$	Define permutation. Illustrate permutation with examples. Establish the theorem $^nP_r = \frac{n!}{(n-r)!}$ Give the definition of combination Illustrate the idea of combination with examples. Establish the theorem $^nC_r = \frac{n!}{(n-r)!r!}$ Show that $^nC_r = {}^nC_{n-r}$	Recommended textbooks, Marker Board, graph sheets, Lecture notes, multimedia projector, and computer.	Define permutation. State examples of permutations. Establish the theorem $^nP_r = \frac{n!}{(n-r)!}$ Define combination. State examples of combination. Establish the theorem $^nC_r = \frac{n!}{(n-r)!r!}$ Establish $^nC_r = {}^nC_{n-r}$	Correct any error in the students' definitions and concepts. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
GENERAL OBJECTIVE 6.0: Understand Set Theory						
7	6.1 Define sets, subsets, and null sets 6.2 Define union, intersection and	Define of sets, subsets, null sets, union, inter-section and complement of sets.	Recommended textbooks, Marker Board, graph book, Lecture notes, multimedia projector, and computer.	Define sets, subsets, and null sets Define union, intersection and completion of sets.	Correct any error in the students' definitions and concepts. Illustrate with examples.	Recommended textbooks, Marker Board, Lecture notes, multimedia

	complement of sets. 6.3 Draw Venn diagrams to demonstrate the concepts in 6.2 above. 6.4 Calculate the size or number of elements in a given set. 6.5 Solve word problems on set.	Demonstrate representation of sets using Venn diagrams.		Draw Venn diagrams to demonstrate the concepts in 6.2 above. Calculate the size or number of elements in a given set. Solve word problems on set.	Observe, instruct and guide the students in the exercises. Supervise the students' work.	projector, and computer.
GENERAL OBJECTIVE 7.0: Understand The Properties of Arithmetic And Geometric Progression.						
8-9	7.1 Define arithmetic progressions (A.P) 7.2 Obtain the formula for nth term and the first n terms of an A.P 7.3 Solve problems on A.P 7.4 Define a geometric progression (G.P) 7.5 Obtain the formula for the nth term and the first n terms of a geometric progression. 7.6 State examples of 7.5 above. 7.7 Define Arithmetic Mean (A.M) and Geometric Mean (G.M) 7.8 Define convergence of series. 7.9 Define divergence of series.	Define arithmetic progressions (A.P) Obtain the formula for nth term and the first n terms of an A.P Describe how to solve problems on A.P Define a geometric progression (G.P) Explain how to obtain the formula for the nth term and the first n terms of a geometric progression. Define Arithmetic Mean (A.M) and Geometric Mean (G.M) Define convergence of series. Define divergence of series	Recommended textbooks, Marker Board, graph sheets, Lecture notes, multimedia projector, and computer.	Define arithmetic progressions (A.P) Obtain the formula for nth term and the first n terms of an A.P Solve problems on A.P Define a geometric progression (G.P) Obtain the formula for the nth term and the first n terms of a geometric progression. • Define Arithmetic Mean (A.M) and Geometric Mean (G.M.) • Define convergence of series. • Define divergence of series.	Correct any error in the students' definitions and concepts. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.
GENERAL OBJECTIVE 8.0: Understand The Binomial Theorem And Its Application In The Expansion Of Expressions.						

10-11	8.1 Explain the method of mathematical induction. 8.2 State and prove the binomial theorem for a positive integral index. 8.3 Expand expressions of the forms $(x+y)^2$, $(x\pm1)^5$, applying binominal theorem. 8.4 Find the coefficient of a particular term in the expansion of simple binomial expressions. 8.5 Find the middle terms in the expansion of binomial expression. 8.6 State the binomial theorem for a rational index. 8.7 Expand expressions of the form: $(1+x)^{-1}$, $(1\pm x)^{1/2}$, $(1\pm x)^{-1/3}$ applying binomial theorem 8.8 Expand and approximate expressions of the type $(1.001)^n$, $(0.998)^n$, $(1+x)^{1/2}$, $(1\pm x)^{1/3}$ to a stated degree of accuracy	Explain the method of mathematical induction. State and prove the binomial theorem for a positive integral index. Show the expansion of expressions of the forms $(x+y)^2$, $(x\pm1)^5$, etc and applying binominal theorem. Find the coefficient of a particular term in the expansion of simple binomial expressions. Show how to find the middle terms in the expansion of binomial expression. State the binomial theorem for a rational index. Demonstrate the expansion of expressions of the form: $(1+x)^{-1}$, $(1\pm x)^{1/2}$, $(1\pm x)^{-1/3}$ applying binomial theorem. Guide the student to expand and approximate expressions of the type	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Explain the method of mathematical induction. State and prove the binomial theorem for a positive integral index. Expand expressions of the forms $(x+y)^2$, $(x\pm1)^5$, etcand applying binominal theorem. Find the coefficient of a particular term in the expansion of simple binomial expressions. Find the middle terms in the expansion of binomial expression. State the binomial theorem for a rational index. Expand expressions of the form: $(1+x)^{-1}$, $(1\pm x)^{1/2}$, $(1\pm x)^{-1/3}$ applying binomial theorem Expand and approximate expressions of the type $(1.001)^n$, $(0.998)^n$, $(1+x)^{1/2}$, $(1\pm x)^{1/3}$ to a stated degree of accuracy	Correct any error in the students' definitions and concepts. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.

		$(1.001)^n, (0.998)^n,$ $(1+x)^{1/2}, (1\pm x)^{1/3}$ to a stated degree of accuracy				
GENERAL OBJECTIVE 9.0: Understand The Basic Concepts And Manipulation Of Vectors And Their Applications To The Solutions of Engineering Problems**.**						
12-13	9.1 State the definitions and representations of vectors. 9.2 Identify vector quantities. 9.3 Define a position vector. 9.4 Define unit vector 9.5 Explain scalar multiple of a vector 9.6 List the characteristics of parallel vectors 9.7 Compute the modulus of any given vector up to 2 and 3 dimensions. 9.8 State the parallelogram law for addition and subtraction of vectors 9.9 Apply the parallelogram law in solving problems. 9.10 Explain the concept of components of a vector and the meaning of orthogonal components. 9.11 Resolve a vector into its orthogonal components. 9.12 List characteristics of coplanar localized vectors. 9.13 Define the resultant or	State the definitions and representations of vectors. Define a position vector. Define unit vector Explain scalar multiple of a vector. List the characteristics of parallel vectors Demonstrate computation of the modulus of any given vector up to 2 and 3 dimensions. State the parallelogram law for addition and subtraction of vectors Apply the parallelogram law in solving problems. Explain the concept of components of a vector and the meaning of orthogonal components.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	State the definitions and representations of vectors. Identify quantities that may be classified as vector. Define a position vector and a unit vector Explain scalar multiple of a vector List the characteristics of parallel vectors Compute the modulus of any given vector up to 2 and 3 dimensions. State the parallelogram law for addition and subtraction of vectors, and apply it to solve problems. Explain the concept of components of a vector and the meaning of orthogonal Components. Resolve a vector into its orthogonal components. List characteristics of	Correct any error in the students' definitions and work. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.

	composition of coplanar vectors. 9.14 Compute the resultant of coplanar forces acting at a point using algebraic and graphical methods. 9.15 Apply the techniques of resolution and resultant to the solution of problems involving coplanar forces. 9.16 Apply vector techniques in solving problems involving relative velocity. 9.17 State the scalar product of two vectors. 9.18 Compute the scalar product of given vectors. 9.19 Define the cross product of the vector product or two vectors. 9.20 Calculate the direction ratios of given vectors. 9.21 Calculate the angle between two vectors using the scalar product.	Resolve a vector into its orthogonal components. List characteristics of coplanar localized vectors. Define the resultant or composition of coplanar vectors. Compute the resultant of coplanar forces acting at a point using algebraic and graphical methods. Apply the techniques of resolution and resultant to the solution of problems involving coplanar forces. Apply vector techniques in solving problems involving relative velocity. State the scalar product of two vectors. Compute the scalar product of given vectors. Define the cross product of the vector product or two vectors. Calculate the direction ratios of given vectors.		coplanar localized vectors. Define the resultant or composition of coplanar vectors and compute the resultant of coplanar forces acting at a point using algebraic and graphical methods. Apply the techniques of resolution and resultant to the solution of problems involving coplanar forces. Apply vector techniques in solving problems involving relative velocity. State and compute the scalar product of two vectors. Define the cross product of the vector product or two vectors. Calculate the direction ratios of given vectors and the angle between two vectors using the scalar product		

		Calculate the angle between two vectors using the scalar product.				
GENERAL OBJECTIVE 10.0 Know The Concept To Solve Linear Simultaneous Equation With Two Unknown Variables						
14	10.1 Explain the concept of equation. 10.2 List different types of equations; linear, quadratic, cubic, etc. 10.3 State examples of linear simultaneous equations in two unknowns and simultaneous equations with at least one quadratic equation. 10.4 Apply algebraic and graphical methods in solving two simultaneous equations involving a linear equation and a quadratic equation. 10.5 Define a determinant of nth order. 10.6 Apply determinants of order 2 and 3 in solving simultaneous linear equation.	Explain the concept of equation. List different types of equations; linear, quadratic, cubic, etc. Give examples of linear simultaneous equations in two unknowns and simultaneous equations with at least one quadratic equation. Apply algebraic and graphical methods in solving two simultaneous equations involving a linear equation and a quadratic equation. Define a determinant of nth order. Apply determinants of order 2 and 3 in solving simultaneous linear equation.	Recommended textbooks, Marker Board, graph sheets, Lecture notes, multimedia projector, and computer.	Explain the concept of equation. List different types of equations; linear, quadratic, cubic, etc. Give examples of linear simultaneous equations in two unknowns and simultaneous equations with at least one quadratic equation. Apply algebraic and graphical methods in solving two simultaneous equations involving a linear equation and a quadratic equation. Define a determinant of nth order. Apply determinants of order 2 and 3 in solving simultaneous linear equation.	Correct any error in the students' definitions and work. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.

GENERAL OBJECTIVE 11.0 Understand The Concept Of Trigonometric Functions And Apply Them In Solving Problems.						

15	11.1Define the basic trigonometric ratios, sine, cosine and tangent of an angle. 11.2Derive the other trigonometric ratios; cosecant, secant and cotangent using the basic trigonometric ratios in 11.1 above. 11.3 Derive identities involving the trigonometric ratios; $Cos^2\theta+Sin^2\theta = 1$, $Sec^2\theta = 1 + tan^2\theta$, etc. 11.4 Derive compound angle formulae for sin (A+B), Cos (A+B) and Tan (A+B).	Define the basic trigonometric ratios. Derive the reciprocal of basic trigonometric ratios. Derive special identities involving the trigonometric ratios. Derive compound angle formulae for sine, cosine and tangent.	Recommended textbooks, Marker Board, graph sheets, Lecture notes, multimedia projector, and computer.	Define the basic trigonometric ratios. Derive the reciprocal of basic trigonometric ratios. Derive special identities involving the trigonometric ratios. Define the basic trigonometric ratios. Derive the reciprocal of basic trigonometric ratios. Derive special identities involving the trigonometric ratios. Derive compound angle formulae for sine, cosine and tangent.	Correct any error in the students' definitions and work. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA INCEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: ELECTRICAL ENGINEERING SCIENCE.	**COURSE CODE: EEC 115**	**UNIT: 4**	**CONTACT HOURS: 4**
			THEORETICAL:2 Hours/Week
SEMESTER: 2	**PRE-REQUISITE**		**PRACTICAL:2 Hours/Week**

Goal: The course is intended to provide the student with basic knowledge of Electrical Engineering Science.

GENERAL OBJECTIVES On completion of this course, the student will be able to:

1.0 Understand the elementary idea of current flow.
2.0 Know the application of ohm's law.
3.0 Understand the application of Kirchhoff's law.
4.0 Understand the concept of power and energy.
5.0 Understand the effect of electric current.
6.0 Understand the principles of Electromagnetic Induction.
7.0 Understand the basic phenomenon of electrostatics.
8.0 Know the basic A.C theory.

COURSE TITLE:ELECTRICAL ENGINEERING SCIENCE			COURSE CODE:EEC 115			CONTACT HOURS: 4 THEORETICAL: 2 Hours/Week
SEMESTER: 2			PRE-REQUISITE: -			PRACTICAL:2 Hours/Week
Goal: The course is intended to provide the student with basic knowledge of Electrical Engineering Science.						
	GENERAL OBJECTIVE: 1.0 Understand The Elementary Idea of Culture of Current Flow.					
THEORETICAL CONTENT			**PRACTICAL CONTENTS**			
Wk/S	**Specific Learning Outcome**	**Teachers Activities**	**Resource**	**Specific Learning Outcomes**	**Teachers Activities**	**Resource**
1	1.0 State the Composition of an atom their corresponding charges. 1.1 Define electric Current as the drift of electrons in the direction. 1.2 Explain the concept of resistance and potential difference and electromotive force. 1.3 State the unit of current, resistance, potential difference and electromotive force 1.5 Define the unit of current resistance, potential difference an electromotive force.	State the Composition of an atom their corresponding charges. Explain the concept of resistance and potential difference and electromotive force.	Marker Board, maker, overhead projector Sketches Laboratory & laboratory equipment	Determine the unit of current resistance, potential difference an electromotive force.	Carryout practical experiment to determine the unit of current resistance, potential difference an electromotive force.	Sketches Laboratory & laboratory equipment
	GENERAL OBJECTIVE: 2.0: Know The Application of Ohm's Law**.**					

2	2.1 State ohm's law. 2.2 Verify ohm's law by experiment 2.3 Solve problems applying ohm's law to basic electrical circuits. 2.4 Determine the equivalent resistance of a number of resistances in series and parallel. 2.5 Solve problems on series, parallel and combination	Explain the concept of Ohm's law	Marker Board, maker, overhead projector.	Verify ohm's law by experiment Determine the equivalent resistance of a number of resistances in series and parallel.	Carryout experiment to determine the equivalent resistance of a number of resistances in series and parallel	Laboratory & laboratory equipment
	GENERAL OBJECTIVE: 3.0 Understand The Application Of Kirchhoff's Law**.**					
3	3.1 State Kirchhoff's 1st and 2nd law. 3.2 Solve simple problems involving Kirchhoff's 1st and 2nd law.	Explain the concept of Kirchhoff's Law	Marker Board, maker, overhead projector	-	-	-
	GENERAL OBJECTIVE: 4.0 Understand The Concept Of Power And Energy**.**					
4	4.1 Define power and energy. 4.2 State the relationship between power and time, current, voltage and resistance. 4.3 Write formula for energy using the relationship between power and time, current, voltage and resistance. 4.4 Solve problems on relationship between power and time, current, voltage and resistance and Write formula for energy	Explain the concept of Power And Energy	Marker Board, maker, overhead projector.	-	-	-

	using the relationship between power and time, current, voltage and resistance.					
	GENERAL OBJECTIVE: 5.0Understand The Effect Of Electric Current**.**					
5	5.1 State the three effects of electric current. 5.2 Explain how heat energy is produced by passage of current through a resistor (conductor). 5.3 Determine energy dissipated as heat. 5.3 State practical application of the heating effect of electric current. (cooker, electric iron, electric furnaces, thermocouple) 5.4 Verify the heating effect of electric current experimentally. 5.5 Explain how chemical reaction occurs when current passes through an electrolyte. 5.6 Explain Faraday's law of electrochemical equivalent. 5.7 Solve problems involving faraday's law of electrochemical equivalent 5.8 Verify Faraday's law experimentally. 5.9 Explain the chemical reaction in electroplating electrolysis and the car Battery.	Explain the effect of electric current	Marker Board, maker, overhead projector.	Determine energy dissipated as heat Determine the heating effect of electric current experimentally. Determine Faraday's law experimentally Determine the direction of the force on conductor carrying current which is situated in the magnetic field.	Carryout experiment to determine energy dissipated as heat. Verify the heating effect of electric current experimentally Verify Faraday's law experimentally Perform experiment to determine the direction of the force on conductor carrying current which is situated in the magnetic field.	Laboratory & laboratory equipment Sample of the instrument is required

	5.10 Explain the magnetic effect of electric current. 5.11 Plot the magnetic field produced by a straight conductor, two parallel conductors, a solenoid, etc. 5.12 Explain the right hand grip-rule. 5.13 State the cork screw rule. 5.14 Determine the direction of line flux with the right hand grip rule, and cock screw rule. 5.16 Explain how force is exerted on a conductor carrying current which is situated in a magnetic field. 5.17 State the relationship between the force, the current and the flux. 5.18 Solve problems on the relationship between the force, the current and the flux. 5.19 Determine the direction of the force on conductor carrying current which is situated in the magnetic field. 5.20 Determine the direction of the force on conductor carrying current situated in magnetic field using the Fleming's left-hand rule. 5.21 Explain how magnetic effect is made use of					

	in the moving coil instrument, electric bell, motors, etc. 5.22 Explain how the magnetic effect is made use of in the moving coil instrument, electric bell, motors, etc. 5.23 Explain the detailed construction of how the magnetic effect is made use of in the moving coil instrument, electric bell, motors, etc.					
	GENERAL OBJECTIVE: 6.0 Understand The Principles Of Electromagnetic Induction					
6	6.1 Explain the principles of induction. 6.2 State Fleming's law. 6.3 Explain the principle of coil in the Car ignition system. 6.4 Explain the construction of the generator. 6.5 Determine the magnetic lines of flux.	Explain the principles of electromagnetic induction	Marker Board, maker, overhead projector	Determine the magnetic lines of flux	Perform experiment to determine the magnetic lines of flux	Laboratory & laboratory equipment Sample of the instrument is required
	GENERAL OBJECTIVE: 7.0 Understand The Basic Phenomenon Of Electrostatics					
7	7.1 Explain basic idea of electric charges. 7.2 Define the colours. 7.3 Explain the use of capacitor as an electrical charge storing device. 7.4 Describe the construction of a simple parallel plate capacitor. 7.5 Define capacitance. 7.6 State formula relating capacitance to area of	Discuss the basic Phenomenon Of Electrostatics	Marker Board, maker, overhead projector	Describe the construction of a simple parallel plate capacitor.	Carryout construction of a simple parallel plate capacitor	Laboratory & laboratory equipment Sample of the instrument is required

	plates, thickness of the dielectric. 7.7 State the relationship between charges applied, voltage and capacitance. 7.8 Solve problems on 7.7 and 7.8. 7.9 Derive expression for capacitors in series and parallel. 7.10 Solve problems on 7.10.					
	GENERAL OBJECTIVE: 8.0 Know The Basic A.C Theory					
8	8.1 Explain the A.C wave forms (sinusoidal, triangular, square, saw tooth, etc.) 8.2 Define the common AC frequency period, cycle, and instantaneous value from factor value. 8.3 Draw relationship between root mean square values, average value, and peak value, crest value and form factor. 8.4 Solve problems on 8.3. 8.5 Illustrate graphically the relationship between current and voltage in AC circuit containing resistance, capacitor and inductor both separately and combined. 8.6 Derive expression for series and parallel and complex impedance. 8.7 Define apparent power (A), reactive power (Q), and active power (P).	Discuss the basic A.C theory	Marker Board, maker, overhead projector	Illustrate graphically the relationship between current and voltage in AC circuit containing resistance, capacitor and inductor both separately and combined.	Demonstrate graphically the relationship between current and voltage in AC circuit containing resistance, capacitor and inductor both separately and combined.	Laboratory & laboratory equipment Sample of the instrument is required

	8.8 State that power factor is the ratio of active to apparent power. 8.9 Solve problems relating to 8.6,8.7,8.8					

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: SCIENCE AND PRPPERTIES OF MATERIALS	**Course Code:** CEC 104	**UNIT: 5**	**CONTACT HOURS: 5 HRS/WEEK**
			THEORETICAL: 2HOURS/WEEK
YEAR/SEMESTER:ND 1/ 2	**PRE-REQUISITE: NONE**		**PRACTICAL: 3HOURS/WEEK**

Goal :The course is designed to enable students to acquire basic knowledge of Propeerties of Materials

GENERAL OBJECTIVES

On completion of this course, the students will be able to:

1. Understand the internal structure of the atom**.**
2. Understand the microstructure of solids
3. Understand the macroscopic properties of materials
4. Know various types and properties of aggregates used in Civil Engineering
5. Know types and properties of other materials used in Civil Engineering Construction**.**
6. Know the types and properties of cement.
7. Understand the properties and uses of concrete.
8. Know Properties and Uses of Ferrocement

COURSE TITLE: SCIENCE AND PRPPERTIES OF MATERIALS	**COURSE CODE:** CEC 104	**UNIT:5**	**CONTACT HOURS: 5 HRS/WEEKS**
			THEORETICAL: 2HOURS/ WEEK
Goal : The course is designed to enable students to acquire basic knowledge of Propeerties of Materials			
YEAR/SEMESTER: ND I/ 2nd	**PRE-REQUISITE :-**		**PRACTICAL: 3 HOURS/ WEEK**

1. **General Objective 1.0:** Understand the internal structure of the atom

	THEORETICAL CONTENT			**PRACTICAL CONTENT**		
WEEK /S	**SPECIFIC LEARNING OUTCOME**	**TEACHERS ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOMES**	**TEACHERS ACTIVITIES**	**RESOURCES**
1	1.1 Define clearly the characteristics of electron, proton, and neutron. 1.2 Predict element positions in the periodic table. 1.3 Explain exceptions to rule of thumb. 1.4 Describe the duality concept clearly. 1.5 Describe clearly the Wave and Corpuscular models. 1.6 Explain De-Broglie's expressions. 1.7 Explain schrodinger's equation. 1.8 Derive Bohr's conc'usion. 1.9 Describe how Bohr's conclusion explains atomic equilibrum, excitation, ionization state. 1.10 Illustrate ionic, co-vallent and metallic bonds.	Explain to the students activities 1.1-1.10. Prepare detailed lecture notes and relevant diagrams with video clips.	Lecture notes, video clips and Multimedia	-	-	-
	General Objective 2.0: Understand the microstructure of solids					
2	2.1 Describe clearly the crystalline structure of metals, ceramics, etc. 2.2 Describe clearly the crystalline nature of	Explain to the students activities 2.1-2.9. Prepare detailed lecture notes and relevant	Lecture notes, video clips and Multimedia			

	polymer fibres. 2.3 Describe separate phases, alloys filled materials and composite materials. 2.4 Describe, in detail, the various methods of studying microstructures. 2.5 Illustrate these with diagrams. 2.6 Describe the behaviour of charge carriers. 2.7 Differentiate between majority and minority charge carriers. 2.8 Define charge density and temperature. 2.9 Define mobility, diffusion and conductivity.	diagrams with video clips.				
	General Objective 3.0: Understand the macroscopic properties of materials					

3	3.1 Explain the relationship between macroscopic properties and structural properties. 3.2 Distinguish between elastic and plastic deformation. 3.3 Define stress and strain . 3.4 State the relationship between stress and strain. 3.5 Define modulus of elasticity. 3.6 Determine 3.5 by experiment and from experimental data. 3.7 Define yield, plastic flow, creep. 3.8 Define conductors and semiconductors. 3.9 Describe dielectric, piezeoelectric, and magnetic properties of solids.	Explain to the students activities 3.1-3.9. Prepare detailed lecture notes and relevant diagrams with video clips.	Lecture notes, video clips and Multimedia			
	General Objective 4.0 Know various types and properties of aggregates used in Civil Engineering					
4-5	4.1 State Civil Engineering aggregates. 4.2 Describe various common quarrying methods. 4.3 Explain the properties of aggregate e.g porosity, absorption, void ratio, etc. 4.4 Describe tests for cleanliness, silt test. 4.5 Describe methods of moisture content determination and uses. 4.6 Describe grading methods. 4.7 Perform grading test. 4.8 Describe crushing strength tests.	Explain to the students activities 4.1-4.9. Prepare detailed lecture notes and relevant diagrams with video clips.	Lecture notes, video clips and Multimedia			

	4.9 Perform the crushing strength tests.					
	General Objective: 5.0: Know types and properties of other materials used in Civil Engineering Construction					
6-7	5.1 Describe the use and application of stones in construction works 5.2 Describe the use and application of earth, soil and laterite construction works. 5.3 Describe the production and usage of fired clay in construction works. 5.4 Describe the uses of binders in construction works 5.5 Describe use of plastics in construction works. 5.6 Describe types and properties of glass. 5.7 Describe use and application of tar, bitumen and ashphalt. 5.8 State types and properties of asbestos. 5.9 Define corrosion. 5.10 State effects of corrosion as well as methods of prevention.	Explain to the students activities 5.1-5.10. Prepare detailed lecture notes and relevant diagrams with video clips.	Lecture notes, video clips and Multimedia			
	General Objective: 6.0: Know the types and properties of cement.					

8	6.1 Distinguish between, the different types of cement. 6.2 Describe the methods of cement manufacture. 6.3 Describe the acceptability tests for cement, e.g fineness, setting time, soundness, etc. 6.4 Perform the acceptability tests for cement.	Explain to the students activities 6.1-6.4. Prepare detailed lecture notes and relevant diagrams with video clips.	Lecture notes, video clips and Multimedia			
	General Objective: 7.0: Understand the properties and uses of concrete.					

9-11	7.1 Describe, with illustrations, proper and improper storage of materials. 7.2 Describe concrete batching, mixing and transporting methods. 7.3 Describe standard tests for concrete e.g slumps tests, compaction factor, compressive strength test (cube, cylinder). 7.4 Perform standard tests in 7.3 7.5 Describe types of concrete pumps, placers, vibrators, etc. 7.6 Describe proper protection and curing of concrete. 7.7 Describe, with illustration, the bending and fixing of reinforcement. 7.8 Illustrate, with sketches, different types of joints in concrete. 7.9 Define proper concrete finishes. 7.10 State the effect of corrosion on metals with regard to structural stability. 7.11 State the causes of and methods of preventing corrosion.	Explain to the students activities 7.1-7.11. Prepare detailed lecture notes and relevant diagrams with video clips.	Lecture notes, video clips and Multimedia			
	General Objective: 8.0: Know Properties and Uses of Ferrocement					

12-13	8.1 Explain the meaning of ferrocement. 8.2 Distinguish between sandcrete, reinforced concrete and ferrocement. 8.3 Enumerate the uses of ferrocement in: a. Building construction; b. Underground construction works; c. Airport facilities; d. Road works; e. Water projects and f. Agricultural facilities. 8.4 Describe the properties of ferrocement such as: (a) tensile (b) flexural strength (c) compressive strength (d) impact and fatigue strength (e) water (or liquod) retaining capacity. Etc. 8.5 Enumerate the guidelines for the use of ferrocemente.g (a) Materials (b) Testing (c) Design (d) Construction. 8.6 Discuss the criteria of choice of micro-reinforcement in concrete composites. 8.7 Explain the use of ferrocement as a means of producing skinned elements in buildings e.g ribbed plates, floor slabs, walls, joints below floor slabs and walls etc. 8.8 Explain the properties of bamboo that make it useful in construction industry. 8.9 Describe the construction of the following with bamboo: a. split-bamboo piles (foundation)	Explain to the students activities 8.1-8.19. Prepare detailed lecture notes and relevant diagrams with video clips.	Lecture notes, video clips and Multimedia			

	b. bamboo floor c. bamboo reinforced earth walls d. bamboo roofs structures e.g. i. barrel vault ii. small geodesic dome iii. grid shell on a square base iv. irregularly shaped grid shells v. bamboo trusses vi. bamboo shingles with splint or string fixing vii. bamboo shingles as Spanish tiles					

PROGRAMME: ND CEMENT ENGINEERING TECHNOLOGY		
Course: Science and Properties of Materials	**Course Code: CEC 104**	**Contact Hours: 2 – 0 - 3**

Course Specification: Practical Content			
WEEK	**General Objective: Conduct Practicals to explain the theoretical Content**		
	Specific Learning Outcome	**Teachers Activities**	**Resources**
2	Carry out the following tests on a given cement sample: a. Consistency b. Initial and final setting time c. Soundness	▪ Technologist to prepare cement and concrete samples in the presence of the students and monitor students during the practical. ▪ He is to grade students reports and submit to lecturer. ▪ The course lecturer is to supervise the above activities and collate the results of the graded practical.	▪ Vicat apparatus Le Chatelier test apparatus, ▪ 150mm cube moulds, ▪ 150mm cylindrical , ▪ Engine oil ▪ Curing tank fall of water. ▪ DEMIC gauge
3 – 5	Perform the following tests on samples of concrete. a. Cast concrete cubes 12 in number and one cylindrical in shape. b. Cure in water c. Test 3 samples of cube after 7 days d. Test 3 samples of cube after 14 days e. Test 3 samples of cube after 28 days Compare results obtained with those specified in BS 12. Text the cylindrical concrete after 28 days and obtain the modulus of elasticity of concrete.		
6	Determine modulus of elasticity.		
7	Perform grading tests and crushing strength tests on concrete.		
8 – 9	Carry out field tests on soils and laterite.		
10 – 11	Carry out laboratory tests on soil and laterite.		
12	Carry out structural properties of ferrocementi.e tensile, cracking, in pact strength fatigue strength, compressive strength.		

13 – 15	Design and construct a structure with either ferrocement or bamboo.		

Assessment:

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

	Programme: ND Cement Engineering Technology	**Course Code: CET 121**		**Contact Hours: 2**
	Subject/Course: Safety and Environmental Control in the Cement Industry			**Theoretical: 2 hours/week**
	Year: ND I Semester: 2nd	**Pre-requisite:-**	**-**	**Practical: hours/week**

Goal: The course is designed to provide the students with knowledge of safety and environmental control in cement industry.

General Objectives

1.0: Know the legislations relevant to health and safety.

2.0: Understand the Mining and Petroleum Legislations.

3.0: Know the development of an effective safety policy.

4.0: Understand accident reporting and investigation.

5.0: Understand environmental control in the cement industry.

6.0: Understand air pollution.

7.0: Understand meteorological aspects of air pollutant dispersion.

8.0: Know air pollution control methods and equipment.

9.0: Undrstand solid waste management.

10.0: Understand noise pollution and control.

11.0: Understand radiation and heat control in the cement industry.

	Course: Safety and Environmental Control in the Cement Industry		**Course Code: CET 121**		**Contact Hours 2HRS/WEEK**	
					Theoretical: 1 hr/wk	
	Year: ND 1 Semester:2nd		**Pre-requisite:**		**Practical:2 hrs/wk**	
	THEORITICAL CONTENT			**PRACTICAL CONTENT**		
Week	**General Objective 1.0: Know the legislations relevant to health and safety**					
	Specific Learning Outcome:	**Teacher Activities**	**Resources**	**Specific Learning Outcome:**	**TeachersActivities**	**Resources**
1	1.1 Outline the main provisions of the health and safety act at work. 1.2 Outline the main provisions of the Factories Act Fire Precautions. 1.3 State the relevance of Common Law to health and safety at work. 1.4 Explain the general duties in respect of health and safety of employers and employees and others in work places, etc.	1. Develop instructional manual for teaching this course. 2. Outline the provisions of the health and safety act at work place. 3. State the relevance of common law to health and safety at work. 4. Narrate the general duties in respect of health and safety of employers and others in control of work places, employees, suppliers, etc.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 2.0: Understand the Mining and Petroleum Legislations					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
3	2.1 Outline the main provision of (a) Nigerian Minerals and Mining Act. (b) Petroleum Act.	1. Outline the main provisions of minerals, petroleum and quarries act. 2. Outline the main provisions of petroleum act. 3. Explain the difference between PA and the proposed PIB 4. Evaluate the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 3.0: Know the development of an effective safety policy					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**

4-5	3.1 Outline the principles of developing effective safety policy. 3.2 Explain the need for: a. Accident prevention b. Psychological basis for accident prevention. c. Economic basis for accident prevention 3.3 Categorize potential causes of physical injuries and occupational illness. 3.4 Describe possible preventive measures for 3.3 above 3.5 Explain personal safety considerations, working practice and hazards associated with the following: a. Personal protection equipment. b. Fire and explosion hazards. c. Special safety measures 3.6 Explain the role of management, supervisors, safety officers and operators in safety enforcement and compliance. 3.7 Enumerate sources of information and materials needed in case of emergency. 3.8 Explain rescue techniques.	1. Discuss the importance of an effective safety policy 2. Enumerate causes of work place accident, physical injuries and occupational illness. 3. Mention personal protective apparels used in mines, quarries, crushers, stackers, mills, kilns, coolers and packers 4. Highlight the importance of safety management policy. 5. Evaluate the students.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 4.0: Understand accident reporting and investigation					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
6-7	4.1 Classify accidents.	1. Classify accidents.	Instructional			

	4.2 State the procedure for reporting accidents to appropriate authorities. 4.3 List the main elements of oral and written reports of accidents and their purpose. 4.4 Use the reports of accidents in generating statistical data for prevention and control of accident (e.g. frequency rate).	2. State the procedure for reporting accidents. 3. List the main elements of oral and written reports of accidents and their purposes.	Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, Incident report book etc.			
	General Objective 5.0: Understand environmental control in the cement industry.					
8-9	5.1 Define pollution. 5.2 List the main sources of pollution in the mining andcement processing industry. 5.3 Describe disposal methods for liquid, solid and gaseous wastes from mining, cement and mineral processing industries. 5.4 Outline preventive methods adopted in the mining, cement and mineral processing Industries to check pollution. 5.5 Explain the importance of Environmental Impact Assessment (EIA) and Environmental Evaluation (EE). 5.6 Outline the main provision of relevant legislations (e.g. NESREA Act, Mineral Act, Petroleum Act, etc) on environmental	1. Explain the value of environmental control. 2. Explain proper process of waste disposal system. 3. Demonstrate how preventive methods in mining and minerals processing mitigate pollution. 4. Cite relevant areas from mining and mineral processing Act and latest mining regulations concerning effect of mining on the environment. 5. Explain types of pollution in the cement industry. 6. Assess the students	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			

	control.					
	General Objective 6.0: Understand air pollution					
10-11	6.1 Define air pollution. 6.2 State the composition of natural air. 6.3 State the types air pollutants. 6.4 Classify air pollutants: primary and secondary. 6.5 Explain the effect of air pollution on: human health, materials and vegetation. 6.6 Explain major environmental phenomenon: acid rain, global warming, greenhouse effect, ozone layer deplection etc. 6.7 Explain air quality standard. 6.8 State air pollution laws.	Explain 6.1-6.8.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, NESREA Act, Mineral Act, Petroleum Act etc.			
	General Objective 7.0: Understand Meteorological aspects of air pollutant dispersion.					
12	8.1 Explain meteorological parameters influencing air pollution. 8.2 Explain the following: • Turbulence effect • Topographical effect • Plume behavior • Looping • Trapping.	Explain 7.1-7.2.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 8.0: Know air pollutant control methods and equipment					
13	8.1 Explain natural and artificial purification processes of air. 8.2 Desribe the following air control equipment: • Gravitational settling chamber. • Cyclone.	Explain 8.1-8.3.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen,			

	• Scrubber • Pressure gauge • Bag house filter • Eletrostatic precipitator. 8.3 Describe the following processes for the control of gaseous pollutants: • Absorption • Adsorption • Condensation • Combustion		Magnetic Board, etc.			
	General Objective 9.0: Understand Solid Waste Management					
14	9.1 State sources of solid waste. 9.2 Classify solid waste. 9.3 Explain public health aspects of solid waste management. 9.4 Describe the following solid waste management methods: • Disposal methods: open dumping, sanitary land fill. • Incineration • Composting 9.5 Explain recovery and recycling of solid waste.	Explain 9.1-9.5.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			
	General Objective 10.0: Understand Noise Pollution and Control					
15	10.1Define noise pollution 10.2State sources of moise pollution. 10.3Explain the allowable limits of noise pollution for different areas. 10.4Explain the problems of noise pollution and measures to control them. 10.5Explain noise pollution	Explain 10.1-10.5.	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			

	control devices.					
	General Objective 11.0: Understand radiation and heat control in the cement industry.					
	11.1 Explain sources of radiation. 11.2 Explain sources of heat. 11.3 Explain problems associated with 11.1 and 11.2. 11.4 Explain control and safety measures to mitigate radiation and heat pollution.	Explain 11.1 – 11.4	Instructional Manual. Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			

Assessment:

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final examination (written) to assess knowledge and understanding	60
Test	At least Two (2) progress tests for feedback.	20
Assignment	At least Two (2) assignments.	20
Total		100

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY

COURSE TITLE: FUNDAMENTALS OF THERMODYNAMICS

COURSE CODE: CET122

CREDIT UNIT: 4

CONTACT HOUR: 4 HOURS/WEEK

GOAL: The course is designed to provide the students with knowledge on basic principles of thermodynamics in the cementindustry.

GENERAL OBJECTIVES

On completion of the course the student should:

1. Understand the basic principles of thermodynamics
2. Know the processes of thermodynamics.
3. Understand the first law of thermodynamics.
4. Know the applications of perfect gas laws to mixtures of gases and vapours.
5. Know different types of fuels and their composition.
6. Understand the second law of thermodynamics.
7. Know basic calculation in thermo-chemistry.

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY					COURSE CODE: CET 122	
					CONTACT HOURS: 4 HOURS/WEEK	
COURSE SPECIFICATION: FUNDAMENTALS OF THERMODYNAMICS					PRACTICAL CONTENTS:	
GOAL: The course is designed to provide the students with knowledge on basic principles of thermodynamics in the cement industry.						
WEEK	**SPECIFIC LEARNING OBJECTIVES**		**TEACHERS ACTIVITIES**		**LEARNING RESOURCES**	
	GENERAL OBJECTIVE: 1.0: Understand the basic principles of thermodynamics					
WEEK	**SPECIFIC LEARNING OBJECTIVE**	**TEACHER'S ACTIVITIES**	**LEARNING RESOURCES**	**SPECIFIC LEARNING OBJECTIVE**	**TEACHER ACTIVITIES**	**LEARNING RESOURCES**
1-2	1.1 Define thermodynamics. 1.2 List the different thermodynamic processes and their characteristics. 1.3 Explain internal energy of gases. 1.4 Derive the characteristic equation of ideal gases i.e. PV = MRT. 1.5 State the Zeroth law of thermodynamics..	Explain activities 1.1-1.5 to the students.	Video clips, Pictures, Power point slides,Marker Board, Recommended textbooks, Lesson notes, etc.	Determine temperature experimentally, when the thermometric property value at certain fixed points is given and scale of temperature is prescribed.	Guide the students to perform experiment to determine temperature when the thermometric property value at certain fixed points is given.	Immersion heaters, Thermometers.
	General Objective 2.0: Know the processes of thermodynamics.					
3-4	2.1 Explain the constant volume process 2.2 Show that the work done is equal to zero for non-flow processes 2.3 Explain constant pressure process. 2.4 Show that work done is equal	Explain activities 2.1-2.5 to the students.	Video clips, Pictures, Power point slides, Marker Board, Recommended textbooks, Lesson	-	-	-

	to change in internal energy and heat added. 2.5 Explain constant temperature process and determine the work done.		notes, etc.			
GENERAL OBJECTIVES: 3.0: Understand the first law of thermodynamics.						
WEEK	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**LEARNING RESOURCES**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER ACTIVITIES**	**LEARNING RESOURCE**
5- 6	3.1 Define: • Open and close systems. • Phaseequilibrium. • Isothermal and adiabatic processes. • Extensive and Intensiveproperties. • State function. • Path functions. • Internal energy. • Enthalpy 3.2 Define heat and work as applied to thermodynamic systems and the signs associated with them. 3.3 State the first law of thermodynamics for flow and non-flow system. 3.4 Define specific heat capacity at constant volume and constant pressure processes. 3.5 Calculateenergy of	Explain activities 3.1-3.6 to the students.	Video clips, Pictures, Power point slides, Marker Board, Recommended textbooks, Lesson notes, etc.	Determine specific heat capacities for solids and liquidsexperimentally.	Guide the students to perform the experiment to determine heat capacities for solids, and liquids.	Thermometer, Calorimeter

	conservation for batch and continuous processes.					
GENERAL OBJECTIVES: 4.0: Understand the application of perfect gas laws to mixtures of gases and vapours.						
9- 10	4.1 Define vapour pressure. 4.2 Distinguish between vapour and gas. 4.3 Define critical conditions (pressure, volume and temperature). 4.4 Convert partial pressure to mole fraction, volume percent or any. 4.5 Convert weight percent to volume percent. 4.6 Calculate average weight of gas mixtures. 4.7 Calculate the pressure, volume and temperature of gases using compressibility factors. 4.8 Convert gas composition from wet to dry bases and vice versa.	Explain activities 4.1-4.8 to the students.	Video clips, Pictures, Power point slides,Marker Board, Recommended textbooks, Lesson notes, etc.	Determine the composition of an exhaust gas. Determine CO, CO_2, NOx and SO_2 of air. Determine CO, CO_2, NOx and SO_2 of stack gases. Determine CO, CO_2, and HC of exhaust gases from vehicle.	Guide the students to conduct the practical.	High volume sampler. Slack monitoring kit. Portable emission analyzer. Orsat gas analyser
	General Objectives 5.0: Know different types of fuels and their composition					
WEEK	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**LEARNING RESOURCE**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**LEARNING RESOURCE**
7 - 8	5.1 Define Fuel. 5.2 List typical solid, liquid and gaseous fuels and their sources 5.3 State the chemical composition of fuels. 5.4 Define complete, incomplete and stoichiometric combustion.	Explain activities 5.1-5.7 to the students.	Video clips, Pictures, Power point slides, Marker Board, Recommended	Determine the calorific values of fuels.	Guide the students to perform experiment to determine the calorific values of fuels.	Bomb calorimeter

	5.5 Define air fuel ratio, rich and weak mixture, and mixture strength. 5.6 Evaluate the theoretical quantity of air required in combustion. 5.7 Define gross (higher) and net (lower) calorific values.		textbooks, Lesson notes, etc.			
GENERAL OBJECTIVES: 6.0: Understand second law of thermodynamics.						
11	6.1 Define the second law of thermodynamics. 6.2 Explain the thermodynamics basis for temperature scale. 6.3 Define spontaneous, reversible and irreversible changes, equilibrium and maximum work. 6.4 Explain the functions H, U, G, S and their properties (H= enthalpy, U = internal energy, G= Gibbs free energy and S= entropy).	Explain activities 6.1-6.4 to the students	Video clips, Pictures, Power point slides, Marker Board, Recommended textbooks, Lesson notes, etc.	-	-	-
GENERAL OBJECTIVES: 7.0:Know the basic calculation in thermo-chemistry.						
12- 14	7.1 Define heat of formation, reaction and combustion. 7.2 Calculate change in enthalpy of gas with temperature by interative and by using mean heat capacities. 7.3 Calculate heat of reaction and combustion from heat of formation and vice versa at 25^{o}C.	Explain activities 7.1-7.4 to the students. Illustrate with examples 7.2 – 7.4	Video clips, Pictures, Power point slides,Marker Board, Recommended textbooks, Lesson notes, etc.	Determine heat of reaction and solution experimentally. Determine heat of combustion.	Guide the students to perform experiment to determine heat of reaction. Guide the students to perform experiment to determine heat of solution.	Apparatus for heat of reaction, heat solution and heat combustion.

	7.4 Calculate heat of reaction at various temperature and adiabatic reaction temperatures.				Guide the students to perform experiment to determine heat of combustion.	

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: Introduction toKiln Operations and Control.	**Course Code: CET 123**	**UNIT:2**	**CONTACT HOURS: 2**
			THEORETICAL:2 HOURS/WEEK
YEAR/SEMESTER: ND I/2nd	**PRE-REQUISITE: CET 111**		**PRACTICAL: 0HOUR/WEEK**
Goal: To enable the students acquire basic knowledge of Kiln Operations and Control. **GENERAL OBJECTIVES:** On completion of this course, the student should be able to:			

1	Know types of kiln
2	Know the different zones in the kiln
3	Know types of coolers
4	UnderstandBasickiln operations
5	Understand Basic kiln control

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: Introduction to Kiln Operations and Control	**COURSE CODE:** CET 123	**UNIT: 2**	**CONTACT HOURS: 2**
			THEORETICAL: 2HOURS/WEEK
YEAR/SEMESTER: ND I/ 2nd	**PRE-REQUISITE:-**		**PRACTICAL:0HOURS/WEEK**

Goal: To enable the students acquire basic knowledge of Kiln Operations and Control

GENERAL OBJECTIVE 1:0 Know types of kiln.

THEORETICAL CONTENTS			PRACTICAL CONTENTS			
WK	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
	1.1 Describe Kiln 1.2 Describethe following types: i. Wet kiln ii. Lepol kiln iii. Long dry kiln iv. Pre-heater kiln iv Precalciner kiln 1.3 Differentiate between static (chamber and shaft kiln) and rotary/planetary kiln. 1.4 Draw a schematic diagram of a kiln. 1.5 Explain the operationsof each section in 1.4.	Explain activities 1.1-1.5 to the students.	Instructional Manual, Video clips Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.		-	-
	General Objective 2:0 Know the different zones in the kiln.					
2	2.1List the zones in the kiln. 2.2 Explain various kiln zones relative to temperature. 2.3 Explain the transformation of raw meal in the various kiln zones.	Explain activities 2.1-2.3 to the students.	Instructional Manual, Video clips, Simulator, prototype kiln, Recommended textbooks, e-Books, lecture notes, charts, Marker Board, PowerPoint Projector, Screen, etc.	-	-	-

	General Objective 3.0 Understand Types of Coolers					
3-5	3.1 Define coolers. 3.2 List types of coolers. 3.3 Describe each type of coolers in 3.2 with sketches. 3.4 Explain the functions of a cooler. 3.5 Calculate heat balance of a cooler. 3.6 State merits and demerits of each in 3.3.	Explain activities 3.1-3.6 to the students. Guide students through simple calculation of heat balance.	Instructional Manual, Video clips, Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, etc.			
	General Objective 4.0: Understand basickiln operations.					
6	4.1 Describe preheater induced draft fan (ID fan) and its functions. 4.2 Describe the process of igniting the burner pipe. 4.3 List the equipment involved in heating up the kiln. 4.4 Describe the procedure of heating up the kiln. 4.5Explain the ignition procedure of calciner burner. 4.6 List all equipment involved and their uses in feed-taking of the kiln. 4.7 Describe the feed-taking operation of the kiln. 4.8Explain kiln rotation relative to its feed (charge) and torque. 4.9Explain thefollowing possible kiln processupset: -Cycling -Coating collapse -Ring break out(clinker ring break out)	Explain activities 4.1-4.11 to the students.	Instructional Manual, Video clips, Simulator, prototype kiln, Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen, Magnetic Board, etc.			

	-Sinter, middle, mealand mud rings -Hot meal rush(avalanche) -Red spot on the kiln shell 4.10 Explain loss of kiln feed. 4.11Describestartup and shutdown procedures. 4.12Explain safety and general considerations around the kiln.					
	General Objective 5.0: Understand basic kiln control.					
6	5.1 Define control. 5.2 Explain kiln control and its importance. 5.3 Explain basic kiln control parameters 5.4 Explain kiln control rules.	Explain activities 5.1-5.4 to the students.	Instructional Manual, Video clips, Simulator, prototype kiln, Recommended textbooks, e-Books, lecture notes, Marker Board, PowerPoint Projector, Screen,etc.	Carryout basic kiln operations and control using Kiln simulator/CECIL software.	Demonstrate the use of a kilnsimulator/CECIL software.	Kiln simulator/CECIL software.

Assessment:

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final examination (written) to assess knowledge and understanding	60
Test	At least Two (2) progress tests for feedback.	20
Assignment	At least Two (2) assignment to be assessed by the teacher	20
Total		100

SEMESTER 3 ND 2

PROGRAMME: GENERAL STUDIES	**COURSE CODE:** GNS 201	**CREDIT HOURS:** 2Hrs/Wk
COURSE: USE OF ENGLISH II **SEMESTER:**Three		
CODE: GNS 201		
UNITS: 2.0	**PRE-REQUISITE:** 102	**PRACTICALS:**

COURSE MAIN AIM/GOAL: This course is designed to consolidate the student's competence in the use of English. At the end of the course the student should understand the rules and techniques of English grammar and perform well in the use of the language.

GENERAL OBJECTIVES:

On completion of this course the student should:

1.0 Understand the rules of grammar.

2.0 Write good essays.

3.0 Comprehend the difference between denotative and connotative uses of words.

4.0 Understand the techniques of comprehension and summary writing.

5.0 Appreciate literature in English.

General Objective: 1.0 Understand the rules of grammar.						
Theoretical Content			**Practical Content**			
Week	**Specific Objectives**	**Teacher Activity**	**Resources**	**Specific Learning Outcomes**	**Teacher's Activities**	**Evaluation**
	Grammatical Rules 1.1 Define phrase. 1.2 Identify the types of phrases, e.g. noun, phrase, adjectival phrase etc. 1.3 Define clause. 1.4 Define sentence.	Explain phrase. Explain types of phrases. Explain the clause with examples. Explain sentence with examples.	Text books Marker Board Marker Projector CD	Define phrase. Identify phrases in given sentence ➢ Define the clause. ➢ Identify various clauses in given sentences. Define sentence.	Assist Supervise, Guide and Correct students' activities	Class work, Assignments and Tests

	1.5 Identify the different types of sentences e.g. simple compound, complex and compound-complex.	Explain with examples, the different types of sentences.		➢ Identify types of sentences. ➢ construct sentences.		
General Objective: 2.0 Write good essays.						
Theoretical Content			**Practical Content**			
Week	**Specific Objectives**	**Teacher Activity**	**Resources**	**Specific Learning Outcomes**	**Teacher's Activities**	**Evaluation**
	Essay: 1.1 List the different types of essay.	Explain with relevant examples the different types of essay.	Textbooks, Marker Board, Marker, Project, CD/DVD	➢ Define essay, list the different types of essay. ➢ Identify the features of each type of essay listed in 2.1. above. ➢ Generate/gather relevant information on a given topic. ➢ Draw up a good outline. ➢ Write a good essay on a given topic.	Assist Supervise, Guide and Correct students' activities	Class work Assignment Tests
General Objective: 3.0 Comprehend the difference between denotative and connotative uses of words.						
Theoretical Content			**Practical Content**			

Week	Specific Objectives	Teacher Activity	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	Denotations and Connotations 3.1 Define the term denotation. 3.2 Explain the term Connotation.	Explain denotation with examples. Explain connotation with examples.	Textbooks, Marker Board, Marker, Project, CD/DVD	➢ Define denotation. ➢ Identify words used denotatively. ➢ Define connotation with examples. ➢ Use words connotatively. ➢ Distinguish between denotative and connotative usage.	➢ Assist Supervise, Guide and Correct students' activities. ➢ Provide sentences	

General Objective: 4.0 Understanding the techniques of comprehension and summary writing.

Theoretical Content | **Practical Content**

Week	Specific Objectives	Teacher Activity	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	4.1 Define comprehension 4.2 Define summary writing.	➢ Explain the concept of comprehension. ➢ Give hints on answering questions on comprehension passages. Explain summary.	Textbooks, Marker Board, Marker, Project, CD/DVD	➢ Define comprehension. ➢ Answer questions on passages read. ➢ Define summary. ➢ Write within a specified length, good summary of given passages. ➢ Give contextual explanation to statements from the texts used.	Assist Supervise, Guide and Correct students' activities.	Class work Assignments Tests

General Objective:5.0 Appreciate literature in English.

Theoretical Content | **Practical Content**

Week	Specific Objectives	Teacher Activity	Resources	Specific Learning Outcomes	Teacher's Activities	Evaluation
	Literature in English					

	5.1 Define drama. 5.2 Explain the types of drama. E.g. comedy, tragedy, tragic-comedy farce, burlesque, opera. 5.3 .Explain the terminology of drama, e.g. act, resolution, conflict, soliloquy. 5.4 Distinguish between radio and television drama.	Explain drama with examples. Explain types of drama with examples. List the terminologies Explain the terminologies with examples. Explain with examples the differences between radio and television drama.	Textbooks, Marker Board, Marker, Project, CD/DVD	Define drama. ➢ List the types of drama. ➢ Role play. ➢ List the terminologies of drama. ➢ Explain the terminologies of drama. ➢ Give examples of the terminologies from the reading texts. ➢ Define radio drama. ➢ Define television drama. ➢ Discuss the characteristics of both radio and television drama. ➢ Role play ➢ Answer essay questions in a given drama text.	Direct Demonstrate Guide Supervise Correct Produce	Class work Assignments Tests

Assessment:

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

PROGRAMME: **NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY**

COURSE TITLE: **RESEARCH METHODOLOGY**

CODE: **GNS228**

CREDIT UNITS: **2**

CONTACT HOURS: **2 HOURS/WEEK**

GOAL: **This course is designed to provide the students with the tools to carryout research project on a topic pertinent to Cement Engineering Technology.**

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

1. Understand research management.
2. Understand the importance of research.
3. Understand types of project.
4. Understand steps in the research process.
5. Know result presentation.
6. Understand Referencing.

COURSE: RESEARCH METHODOLOGY		COURSE CODE: GNS 228		CONTACT HOURS: 2 HOURS/WEEK	
Course Specification: Theoretical & Practical Contents					
Goal: This course is designed to provide the students with the tools to carryout research project on a topic pertinent to Cement Enginering Technology.					
WEEK	**General Objective 1.0: Understand research management.**				
	Theoretical Content			**Practical Content**	
	Specific Learning Outcomes	**Teacher's Activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's Activities**	**Resources**
1-3	1.1 Explain data gathering and presentation. 1.2 Explain Technical Correspondence letter of inquiring and replies letter of application, overview of research. 1.3 Explain the logic/Breakthrough in research methods.	- Explain and make relevant lecture notes.	- Overheard projector, slides and Marker Board	- Collect and analyse available data.		- Test, Assignment, seminars, oral interviews and examination. - Practical assessment.
	General Objective 2.0: Understand the importance of research					
4-6	2.1 Introduction to research identification and formulation of problems, research objective relevance to the industries and academic. 2.2 Research literature and material gathering	- Explain and make relevant lecture notes.	- Overheard projector, slides and Marker Board	- Identify and formulate research problems and objectives relevant to the industry and academia. - Conduct literature review and material gathering	- Explain	- Test, Assignment, seminars, oral interviews and examination. - Practical assessment.

	General Objective 3.0: Understand types of project.					
7 - 8	3.1 Explain different types of research projects. - Experimental - Analytical, - Modelling - Validation and - Simulation types.	- Explain, analyse and make relevant lecture notes.	- Overheard projector, slides and Marker Board	Identify different types of research projects	- Explain	- Test, Assignment, seminars, oral interviews and examination. - Practical assessment.
	General Objective 4.0: Understand steps in the research process.					
9 - 10	4.1 List the steps involves in carrying a research. 4.2 Discuss the various steps in Research. - Review of relevant literatures. - Formulation of research questions. 4.3 Describe methods for data collection. 4.4 Discuss data analysis methodology. 4.5 Explain method of Recording results	Explain activities 4.1-4.7 to the students and prepare detailed lecture notes and relevant diagrams with video clips.	Overheard projector, slides and Marker Board			

	4.6 Explain how to analyze data while carrying out a research 4.7 Explain how to make conclusions based on data analysis.					
	General Objective 5.0: Know result presentation					
11-13	5.1 Explain Engineering Sub routing available. Presentation of results. Trend in engineering research Student paper writing. 5.2 Explain purpose of report writing 5.3 Explain the importance of literature review 5.4 Explain data measurement 5.5 Apply the use of tables graphs in data presentation 5.6 Examine methods of data interpretation	- Explain and apply MS-EXCEL and MATLAB in data analysis	- Overheard projector, slides and Marker Board - PCs with MS-WORD, EXCEL and MATLAB software	- Apply EXCEL or MATLAB to present research results.	- Explain with EXCEL or MATLAB for the students to learn and allow them to perform the task.	- Test, Assignment, seminars, oral interviews and examination. - Practical assessment.

	5.7 Evaluate oral presentation of information					
	General Objective 6.0: Understand referencing.					
14 - 15	6.1 List the different types of references. 6.2 Discuss the various types of references in 6.1 6.3 Explain the term plagiarism 6.4 Discuss how plagiarism can be avoided	Explain activities 6.1-6.4 to the students and prepare detailed lecture notes and relevant diagrams with video clips.	Overheard projector, slides and Marker Board			

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: PRACTICE OF ENTREPRENEURSHIP	**COURSE CODE: EEd 216**	**UNIT:3**	**CONTACT HOURS: 3HOURS/WEEK**
			THEORETICAL: 12HOURS/WEEK
YEAR/SEMESTER: ND II/1	**PRE-REQUISITE: NONE**		**PRACTICAL: 2HOURS/WEEK**

Goal: this course is designed to enable students to acquire the knowledge of entrepreneurship

General Objectives:

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

1.0 Understand Financial Management
2.0 Know how to prepare simple accounts
3.0 Know simple cost preparation
4.0 Know product and job costing
5.0 Understand the Laws relating to formation of Companies
6.0 Understand Labour and Industrial Law
7.0 Understand Copyright and patent laws
8.0 Understand the nature of sale of goods

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY						
COURSE TITLE: **PRACTICE OF ENTREPRENEURSHIP**		COURSE CODE: EEd 216		UNIT: 3	CONTACT HOURS: 3HOURS/WEEK	
					THEORETICAL: 1HOURS/WEEK	
YEAR/SEMESTER: ND II/ 1		PRE-REQUISITE : NONE			PRACTICAL: 2HOUR/WEEK	
Goal: this course is designed to enable students to acquire the knowledge of entrepreneurship						
	General objective 1:0 Understand Financial Management					
THEORETICAL CONTENT					PRACTICAL CONTENT	
WEEK\S	SPECIFIC LEARNING OUTCOMES	TEACHER'S ACTIVITY	RESOURCES	SPECIFIC LEARNING OUTCOME	TEACHER'S ACTIVITY	RESOURCES
1-2	1.1 Define financial management 1.2 Explain sources and types of finding 1.3 Define the concepts of cost, price, revenue, profit and break-even point. 1.4 Explain financial statements e.g budgeting, balance sheet, profit and loss accounts, and cash flow budget.	Illustrate activities in 1.1 -1.4	Marker, Magi-board Manuals, Recommended textbooks, Lecture notes, Ropes and Chairs pulley boice.			
	General objective 2:0 Know how to prepare simple accounts					
3-4	2.1 Explain Dealing with assets 2.2 Prepare profit and loss statement. 2.3 Prepare balance sheet.	Illustrate activities in 2.1 -2.3	Marker, Magi-board Manuals, Recommended textbooks, Lecture notes, Ropes and Chairs pulley boice.			
	General objective 3:0 Know simple cost preparation					
5-6	3.1 Determine labour costs. 3.2 Determine direct machine cost. 3.3 Determine Overheads: labour, machine, and general	Illustrate activities in 3.1 -3.3	Marker, Magi-board Recommended textbooks, Manuals, lecture notes, etc. Dusters			
	General objective 4:0 Know product and job costing					
7-8	4.1 Explain product costing 4.2 Explain Job costing	Illustrate activities in 4.1-4.3 with diagrams	Marker, Magi-board Recommended			

	4.3 Explain Project costing	and make notes where necessary	textbooks, Manuals, lecture notes, etc. Dusters			
	General objective 5:0 Understand the Laws relating to formation of Companies					
9-10	5.1 Identify the fundamental concepts in company law. 5.2 Explain memorandum and Articles of Association. 5.3 Explain promoters, promotion and the prospectus. 5.4 Distinguish between shares and debentures. 5.5 Analyse the functions and powers of Directors, Secretaries and Auditors. 5.6 Explain liquidation of companies.	Illustrate activities in 5.1-5.6 with diagrams and make notes where necessary	Marker, Magi-board Recommended textbooks, Lecture notes, Manuals, Marker, Magi-board , Duster, etc.			
	General Objective 6.0: Understand Labour and Industrial Law					
13-14	6.1 Analyse the laws relating to employer - employee relationship 6.2 Explain industrial safety laws. 6.3 Examine water and public health laws. 6.4 Evaluate land acquisition.	Illustrate activities in 6.1-6.4 with diagrams and make notes where necessary	Recommended textbooks, Lecture notes, Manuals, Marker, Magi-board , Duster, etc.			
	General Objective 7.0: Understand Copyright and patent laws					
13-14	7.1 Explain copyrights 7.2 Explain patent. 7.3 Explain rights and liabilities under the copyrights and patient laws. 7.4 Evaluate beach and remedies	Illustrate activities in 7.1-7.4 with diagrams and make notes where necessary	Recommended textbooks, Lecture notes, Manuals, Marker, Magi-board , Duster, etc.			
	General Objective 8.0: Understand the nature of sale of goods					

13-14	8.1 Define contract of sale of goods 8.2 Distinguish sale of goods from other contracts e.gbastar, hire purchase and works and materials. 8.3 Explain duties of the parties. 8.4 Explain passing of properties and titles. 8.5 Examine breach and remedies.	Illustrate activities in 8.1 -8.5	Recommended textbooks, Lecture notes, Manuals, Marker, Magi-board , Duster, etc.			

Assessment:

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

Programme:ND CEMENT ENGINEERING TECHNOLOGY	Course Code: MTH 211	UNIT: 2	Total Contact Hours:
COURSE TITLE: CALCULUS			Theoretical: 2 hours/week
Year/Semester: ND II /1	Pre-requisite:-		Practical: 0 hours/week

Goal: To enable the students acquire the basic knowledge of differential and integral calculus and apply same in solving problems.

General Objectives: On the completion of the course, the students should

1.0 Understand the basic concepts of differential calculus and its application in solving engineering problems.

2.0 Know integration as the reverse of differentiation and its application to engineering problems.

3.0 Understand first order homogenous linear ordinary differential equations with constant coefficients as applied to simple circuits.

4.0 Understand the basic concepts of partial differentiation and apply same to engineering problems.

5.0 Understand the methods of solving second order differential equations

6.0 Understand Laplace transform

7.0 Understand double integrals and their geometric and physical application.

PROGRAMME: NATIONAL DIPLOMA PROGRAMME IN CEMENT ENGINEERING TECHNOLOGY		
COURSETITLE: Calculus	**CODE: MTH 211**	**CH/CU: 2**
GOAL: To enable the students acquire the basic knowledge of differential and integral calculus and apply same in solving problems.		
GENERAL OBJECTIVE 1.0: Understand The Basic Concepts of Differential Calculus And Their Application In Solving Engineering Problems**.**		

	THEORETICAL CONTENT: 2 hours/week			**PRACTICAL CONTENT: 0hours/week**		
WK/S	**Specific Learning Outcome**	**Teacher Activities**	**Resource**	**Specific Learning Outcome**	**Teacher Activities**	**Resource**
1-4	1.1 Define limits with examples. 1.2 State and prove the basic theorems on limits. 1.3 Prove that $\lim_{\theta\to 0}\frac{\tan\theta}{\theta}=1$ $\lim_{\theta\to 0}\frac{\sin\theta}{\theta}=1$ 1.4 Define differentiation as an incremental notation of a function. 1.5 Differentiate a function from first principles. 1.6 Prove the formulae for derivative of functions, Function of a function, products, and quotient of functions. 1.7 Differentiate simple algebraic, trigonometric, logarithmic, exponential, hyperbolic parametric, inverse and implicit functions. 1.8 Derive second derivative of a function. 1.9 Apply differentiation to simple engineering and technological problems. 1.10Explain the rate of change of a function 1.11Explain the condition for turning point of a function. 1.12Distinguish between maximum and minimum value of a function. 1.13Sketch the graph of a function showing its maximum, minimum points and points of inflexion. 1.14Estimate error quantities from	Define the limits and gives examples. Prove sine and tangent of limit to be one (1) as θ tends to zero (0). Differentiate a function from first principles. Show the formulae for derivative of functions, Function of a function, products, and quotient of functions. Differentiate simple algebraic, trigonometric, logarithmic, exponential, hyperbolic parametric, inverse and implicit functions. Explain the rate of change of a function and the condition for turning point of a function. Explain the differences between maximum and minimum value of a function.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Define the limits and give examples. Prove sine and tangent of limit to be one (1) as θ tends to zero (0). Differentiate a function from first principles. Show the formulae for derivative of functions, Function of a function, products, and quotient of functions. Differentiate simple algebraic, trigonometric, logarithmic, exponential, hyperbolic parametric, inverse and implicit functions. Explain the rate of change of a function and the condition for turning point of a function. Explain the differences between maximum and minimum value of a function. Sketch the graph of a function showing its maximum and	Correct any error in the students' definitions and concepts. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.

	the small increment of a function. 1.15 Determine the tangent to a curve. 1.16 Determine the normal to a curve.	Sketch the graph of a function showing its maximum and minimum points and points of inflexion. Estimate error quantities from the small increment of a function. Determine the tangent and normal to a curve.		minimum points and points of inflexion. Estimate error quantities from the small increment of a function. Determine the tangent and normal to a curve.		
GENERAL OBJECTIVE 2.0: Know Integration as The Reverse of Differentiation And Its Application to Engineering Problems						
5-8	2.1 Define integration as the reverse of differentiation. 2.2 Explain integration as a limit of summation of a function. 2.3 Distinguish between definite and indefinite integrals. 2.4 Determine definite integrals of functions. 2.5 Determine the indefinite integrals of a function. 2.6 Integrate algebraic, logarithmic, trigonometric and exponential simple functions. 2.7 List the methods of integration. 2.8 Integrate algebraic and trigonometric functions by substitution method. 2.9 Integrate trigonometric and exponential functions by parts. 2.10 Integrate algebraic functions by partial fraction. 2.11 Integrate trigonometric and	Define integration as the reverse of differentiation. Explain integration as a limit of summation of a function. Explain the differences between definite and indefinite integrals. Determine definite and indefinite integrals of a function. Integrate algebraic, logarithmic, trigonometric and exponential simple functions. List the methods of integration. Integrate algebraic and trigonometric functions by substitution method. Integrate trigonometric and exponential functions by parts.	Recommended textbooks, Marker Board, graph sheets, Lecture notes, multimedia projector, and computer.	Define integration as the reverse of differentiation. Explain integration as a limit of summation of a function. Explain the differences between definite and indefinite integrals. Determine definite and indefinite integrals of a function. Integrate algebraic, logarithmic, trigonometric and exponential simple functions. List the methods of integration. Integrate algebraic and trigonometric functions by substitution method. Integrate trigonometric and exponential functions by parts.	Correct any error in the students' definitions and concepts. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.

	logarithmic functions applying reduction formula. 2.12 State standard forms of some basic integrals. 2.13 Calculate length of arc, area under a curve, area between two curves, volume of revolution, centre of gravity, surface area, second moment and moment of inertia. 2.14 Define Trapezoidal and Simpson's rule as methods of approximating areas under given curves. 2.15 Find approximate area under a curve applying Trapezoidal method. 2.16 Find approximate area under a curve applying Simpson's rule. 2.17 Compare result obtained from Trapezoidal and Simpson's rules with the results by direct integration. 2.18 Apply integration to kinematics.	Integrate algebraic functions by partial fraction. Integrate trigonometric and logarithmic functions applying reduction formula. List standard forms of some basic integrals. Solve length of arc, area under a curve, area between two curves, volume of revolution, centre of gravity, centre of surface area, second moment and moment of inertia. Define Trapezoidal and Simpson's rule as methods of approximating areas under given curves. Solve approximate area under a curve applying Trapezoidal and Simpson's rule. Show the students how to compare the results obtained from Trapezoidal and Simpson's rules with the results by direct integration. Apply integration to kinematics.		Integrate algebraic functions by partial fraction. Integrate trigonometric and logarithmic functions applying reduction formula. List standard forms of some basic integrals. Solve length of arc, area under a curve, area between two curves, volume of revolution, centre of gravity, centre of surface area, second moment and moment of inertia. Define Trapezoidal and Simpson's rule as methods of approximating areas under given curves. Find approximate area under a curve applying Trapezoidal and Simpson's rule, and compare the results obtained with the results by direct integration. Apply integration to kinematics.		
GENERAL OBJECTIVE 3.0: Understand First Order Homogenous Linear Ordinary Differential Equations With Constant Coefficients As Applied To Simple Engineering Problems						
	3.1 Define first order differential equation.	Define first order differential equation.	Recommended textbooks, Marker	Define first order differential equation.	Correct any error in the students'	Recommended textbooks, Marker

9-12	3.2 Explain order, degree, general solution, boundary or initial conditions and particular solution of differential equations. 3.3 Explain linear first order linear differential equation. 3.4 Define first order homogenous differential equations. 3.5 List the methods of solving differential equations by separation of variables. 3.6 Identify differential equations reducible to the homogenous form. 3.7 Explain exact differential equations. 3.8 Solve exact differential equations. 3.9 Define integrating factors. 3.10 Determine the solution of differential equations using integrating factors. 3.11 Define linear differential equations of the first order.	Explain order, degree, general solution, boundary or initial conditions and particular solution of differential equations. Define linear first order linear and first order homogenous differential equations. List the method of solving differential equations by separation of variables. Identify differential equation reducible to the homogenous form. Explain and solve exact differential equations. Define integrating factors. Determine the solution of differential equations using integrating factors. Define linear differential equations of the first order.	Board, graph sheets, Lecture notes, multimedia projector, and computer.	Explain order, degree, general solution, boundary or initial conditions and particular solution of differential equations. Define linear first order linear and first order homogenous differential equations. List the methods of solving differential equations by separation of variables. Identify differential equations reducible to the homogenous form. Explain and solve exact differential equations. Define integrating factors. Determine the solution of differential equations using integrating factors. Define linear differential equations of the first order.	definitions and concepts. Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	Board, Lecture notes, multimedia projector, and computer.
GENERAL OBJECTIVE 4.0: Understand The Basic Concepts Of Partial Differentiation And Apply Same To Engineering Problems						
13-15	4.1 Define partial differentiation. 4.2 List and explain the uses of partial derivatives. 4.3 Solve problems on partial differentiation.	Define partial differentiation. List and explain the uses of partial derivatives.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and	Apply partial differentiation to engineering problems.	Correct any error in the students' definitions and concepts.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and

	4.4 Apply partial differentiation to engineering problems.	Solve problems on partial differentiation relating to engineering.	computer.		Illustrate with examples. Observe, instruct and guide the students in the exercises. Supervise the students' work.	computer.

Assessment:

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

	Programme: ND Cement Engineering Technology	**Course Code: EEC 211**		**Contact Hours: 4**
	Subject/Course:Electronics and Instrumentation			**Theoretical: 2hours/week**
	Year: ND II Semester: 1st	**Pre-requisite:-**	**-**	**Practical:2 hours/week**

Goal: This course is to acquaint the students with operation and application of electrical/electronic instruments for laboratory and industrial measurements.

General Objectives

1.0:Understand the operating characteristics of diodes

2.0:Understand the operating characteristics of Transistor

3.0 Understand the operating characteristics of Thyristors

4.0 Understand the operating characteristics of FET's

5.0 Know various types of electrical and electronic instruments.

6.0 Know the operation of bridge circuits

7.0 Understand the factors for selection of instruments

8.0 Know the importance of instrumentation in industries

	Course: Computer Electronics and Instrumentation		**Course Code: EEC 211**		**Contact Hours :5HRS/WEEK**	
					Theoretical: 2hr/wk	
	Year: ND II Semester:1st		**Pre-requisite:-**		**Practical:3hrs/wk**	
	THEORITICAL CONTENT			**PRACTICAL CONTENT**		
	Goal: This course is to acquaint the students with operation and application of electrical/electronic instruments for laboratory and industrial measurements.					
Week	**General Objective 1.0:** Understand the operating characteristics of diodes					
	Specific Learning Outcome:	**Teacher Activities**	**Resources**	**Specific Learning Outcome:**	**TeachersActivities**	**Resources**
1-4	1.1 Distinguish between conductors,semiconductors, and insulators, using Fermi-energy level concept. 1.2 Explain intrinsic and extrinsic semiconductors. 1.3 Explain carriers in semi-conductors 1.4 Define majority and minority carriers 1.5 Outline the effect of temperature on the conductivity of semi-conductors and conductors 1.6 Identify the circuit symbols for PN junction diode. 1.7 Explain with the aid of suitable sketches the forward and reverse and zener characteristics of the PN junction diode. 1.8 Explain zener diode	Explain to the students activities 1.1-1.11. Prepare detailed lecture notes and relevant diagrams with video clips.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Perform experiment to determine temperature effect on resistance Carry out experiment to verify temperature effect on semi conductor Determine by experiment on the forward and reverse characteristics of a Zener diode Perform experiment on the application of Zener diode of a Zener diode	Teacher should give instructions that will assist the students to successfully carryout the experiments	PN junction diodes, PNP and NPN transistors, thyristor, ammeter, voltmeter, Zener diode and cables.

	characteristics 1.9 Identify the circuit symbols for zenerdiode. 1.10 Explain the zenereffectPhenomenon. 1.11 Explain the applications of zenerdiode (clipping, clamping, stabilization etc.)					
	General Objective 2.0: Understand the operating characteristics of transistor					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
5-7	2.1 Explain the structure and operation of a bipolar transistor (NPN and PNP) 2.2 Explain the biasing arrangements of NPN and PNP bipolar transistors. 2.3 Explain the circuit configurations of NPN and PNP bipolar transistors: a. the common base configuration b. the common collector configuration c. the common emitter configuration. 2.4 Sketch the static characteristic curves of NPN and PNP bipolar transistors	Explain to the students activities 2.1-2.5. Prepare detailed lecture notes and relevant diagrams with video clips.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Determine by experiment the static characteristics of NPN transistor in common-emitter (CE) configuration	Teacher should give instructions that will assist the students to successfully carryout the experiments	PN junction diodes, PNP and NPN transistors, thyristor, ammeter, voltmeter, Zener diode and cables.

	for 2.3 (i.) and 2.3 (ii). 2.5 Determine the input and output resistances, current and voltage gains from 2.4.					
	General Objective 3.0: Understand the operating characteristics of Thyristors;					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
8-9	3.1 Explain basic structures of the thyristor 3.2 Explain the working principles of the thyristor. 3.3 List sample applications of the thyristor 3.4 State the advantages of the thyristorswitch over other types of electromechanical switches e.g. relay.	Explain to the students activities 3.1-3.4. Prepare detailed lecture notes and relevant diagrams with video clips.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Perform experiment on the voltage vs. current characteristics ofathyristor	Teacher should give instructions that will assist the students to successfully carryout the experiments	PN junction diodes, PNP and NPN transistors, thyristor, ammeter, voltmeter, Zener diode and cables.
	General Objective 4.0: Understand the operating characteristics of FET's					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
10-11	4.1 Explain the basic constructional features of FET's (junction gate andinsulated gate). 4.2 Plot the output and transfer characteristics from given data. 4.3 Determine mutual	Explain different types of biasing arrangement of transistor amplifiers viz: a. fixed bias b. collector-base bias with out a decoupling capacitor	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.	Determine by experiment the output and transfer characteristics of FET Determine by experiment the d.cpower dissipated by Class A, B, AB and C amplifier Determine by experiment the power efficiency of Class A, B, AB, and C	Check the connection of the circuit made by students Ensure that the students follow the	Field affect transistors, bipolar transistors, voltmeter, ammeter, resistors, transistors cable, veroboard,

	conductance and drain resistance for the device. 4.4 State the precautions necessary when using FET's 4.5 Obtain voltage gain, input and output resistance from output characteristics. 4.6 Explain dc biasing, dc & AC resistive load lines, Voltage/ Current /Power Gain of the stage for bipolar transistors and Field Effect devices. 4.7 Explain the AC equivalent circuit of a transistor in each configuration. 4.8 Calculate the Voltage, Current & Power Gain of the stage.	c. potential divider bias Junction FET simple bias Draw the circuit diagram of a single stage common emitter and common source transistor amplifiers having resistive load. Repeat for transformer Loads, and show effect on load line. Draw equivalent circuits of amplifiers in CC, CE, CB mode. Calculate the voltage and power gains of the amplifiers for given data using equivalent circuit Explain the principle of operation of the circuit.		amplifiers	instruction strictly	oscilloscope, frequency counter/meter and stabilised power units.
	General Objective 5.0: Know various types of electrical and electronic instruments.					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
10-11	5.1 List various types of Electrical and Electronic	Identify the items in section 1.1	Recommended textbooks, Marker Board, Lecture			

	Measurement Instruments: a. Moving iron b. Moving Coil c. Voltmeter d. Ammeter e. Cathode ray Oscilloscope (C.R.O.) f. Megger g. Wheatstone bridge h. Wattmeter i. Digital Voltmeter j. Frequency Counters k. Clip ammeter etc. 5.2 Identify the instruments listed in 5.1 above 5.3 State the applications of the instruments listed in 5.1 above. 5.4 Sketch the permanent magnet moving Coil Instrument 5.5 Explain the operation of moving Coil Instrument 5.6 Show how the moving Coil Instrument can be used as	Illustrate the operating principle with diagram(s)	notes, multimedia projector, and computer.			

	a. Ammeter and b. Voltmeter. 5.7 Show how a multiplier and Shunt can be used to increase the range of Voltmeter and ammeter respectively. 5.8 Calculate the Values of the multiplier and shunt. 5.9 Calibrate a moving Coil Instrument. 5.10 Measure Voltage and Current by connecting multiplier and shunt respectively. 5.11 Draw a block diagram of the following Digital Meters: a. Digital Voltmeter b. Frequency Counter 5.12 Explain the operation of the instruments in 5.11 above.					
	General Objective 6.0: Know the operation of bridge circuits					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
10-11	6.1 List various types of bridge Circuit a. Wheatstone,	Explain the operation and applications of bridge circuits.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and	Calibrate and measure with moving coil instruments Calibrate and measure with	The teacher should demonstrate the process of calibration with the	Moving coil instrument, moving iron instrument,

	b. Capacitance, c. Inductance. 6.2 State the industrial applications of the bridges listed in 5.1 above. 6.3 Explain the operation of the bridge circuitslisted in 5.1 above. 6.4 Explain the operation of a null detector 6.5 Use Wheatstone bridge to measure resistance. 6.6 Sketch the diagram of Ohmmeter and Megger 6.7 Describe the Construction and Operation of the instruments in 6.6 above 6.8 Identify an earth point 6.9 Use Megger to Measure the following: a. Earth resistance and b. Insulation resistance.	State the differences Ohmmeter and Megger.	computer.	moving iron instrument Determine the resistance using Wheatstone bridg Demonstrate bridge circuits to measure a. inductance b. capacitance c. frequency Measure a.c voltage in experiments using suitable instruments	students Ask students to comment bridge circuit Involve the students in the measurement using suitable instruments	drawing sets Wheatstone bridge and other bridge circuits A.C voltmeters
	General Objective 7.0: Understand the factors for selection of instruments					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
10-11	7.1 Explain the importance of the following factors in selecting	Explain the fabric in selecting measurement instruments	Recommended textbooks, Marker Board, Lecture notes, multimedia			

	measurement instruments: a. Range b. Accuracy c. Response d. Stability e. Reliability f. Sensitivity		projector, and computer.			
	General Objective 8.0: Know the importance of instrumentation in industries					
Week	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**	**Specific Learning Outcome:**	**Teachers Activities**	**Resources**
10-11	8.1 Explain the importance of instrument in industries 8.2 List important measurement in industries a. Pressure b. Temperature c. Level d. Flowrate e. Density f. Viscosity g. Humidity, etc. 8.3 Explain why the variables in 8.2 above are important. 8.4 Classify and give	The teachers should emphasize on all the industrial measurements and instruments' classification.	Recommended textbooks, Marker Board, Lecture notes, multimedia projector, and computer.			

	examples of each of the following types of instruments: a. Indicating b. Recording c. Controlling 8.5 State the applications of Instruments in 8.4 above.					

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: FLUID MECHANICS	**COURSE CODE: MEC 214**	**UNIT:4**	**CONTACT HOURS: 4HOURS/WEEK**
			THEORETICAL: 2HOURS/WEEK
YEAR/SEMESTER: ND II/1	**PRE-REQUISITE: NONE**		**PRACTICAL: 2HOURS/WEEK**

Goal: this course is designed to enable students to acquire the knowledge of fundamentals of fluid measurements applicable to cement engineering

General Objectives:

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

1. Know the Classification, Types of Fluid and their Characterize Properties
2. Understand the concept of pressure and the principles of pressure
3. Understand Archimedes principles
4. Understand energy and motion of fluid for one dimensional flow
5. know the momentum equation and its practical application
6. Understand the fundamentals of Hydrostatics
7. Understand the fundamental elements of fluid Dynamics

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY						
COURSE TITLE: FLUID MECHANICS		**COURSE CODE:** MEC 214		**UNIT: 4**	**CONTACT HOURS: 4HOURS/WEEK**	
					THEORETICAL: 2HOURS/WEEK	
YEAR/SEMESTER: ND II/ 1		**PRE-REQUISITE : NONE**			**PRACTICAL: 2HOUR/WEEK**	
Goal: this course is designed to enable students to acquire the knowledge of fundamentals of fluid measurements applicable to cement engineering						
	General objective 1:0 Know the Classification, Types of Fluid and their Characterize Properties					
THEORETICAL CONTENT					**PRACTICAL CONTENT**	
WEEK\S	SPECIFIC LEARNING OUTCOMES	TEACHER'S ACTIVITY	RESOURCES	SPECIFIC LEARNING OUTCOME	TEACHER'S ACTIVITY	RESOURCES
1-2	1.0 Comprehend classification types and characteristics of fluids	Explain the different types of fluids	Textbooks Marker Board, duster, maker	Know types and characteristics of fluids	Determine the viscosity of different types of fluids experimentally	Different types of fluid Viscometer

	General objective 2:0 Understanding the concept of pressure and the principles of pressure					
3-4	2.1 Explain the concept of pressure and the principle of pressure measurement/ 2.2 Understand Pressure distribution over plane and curved surfaces.	Explain the concept of pressure and the principle of pressure measurement	Textbook, notes, Marker Board, duster, maker	Test the accuracy of a gauge	Perform Pressure gauge calibration experiment	Pressure gauge and dead weights,
	General objective 3:0 Understanding Archimedes principles					
5-6	3.1 Explain the Principle of Archimedes	Explain and principle of Archimedes and all the parameters in it.	Textbook, notes, Marker Board, duster, maker	Verify Archimedes principles	Demonstration of pressure drops in the laboratory using ship models Perform Floating bodies experiment Perform Buoyancy experiment	Metacentric height
	General objective 4:0 Understand energy and motion of fluid for one dimensional flow					
7-8	4.1 Explain fluid and one dimensional flow	Explain uniform & uniform flows Describe nature of motion around blunt and streamline bodies Describe velocity profile, boundary layer separation Explain the principle of shear flow	Textbook, notes, Marker Board, duster, maker	Carryout fluid flow through orifices	Perform Orifices jet experiment	Orifices and jet apparatus
	General objective 5:0 Know the momentum equation and its practical application					

9-10	5.1 Describe momentum and its application 5.2 State the effects of fluid friction in pipes and channels	Explain momentum and its application State the differences between frictional factor and Reynolds number Explain flow characteristics of pumps and turbines	Textbook White maker board, multimedia	Demonstrate fluid flow Demonstrate effects of friction in fluid flow	Perform Impact of jet experiment	Impact of jet apparatus
	General Objective 6.0: Understand the concept of Hydrostatics					
13-14	6.1 Define pressure, density, surface tension, viscosity, compressibility 6.2 State Hydrostatics equation and its integration for incompressible fluids 6.3 Identify fluid pressure distribution over plain and curved surfaces 6.4 Describe measurement of pressure	Describe the fundamental elements of statics: i. Pressure ii. Density iii. Velocity iv. Surface tension	Recommended Textbooks, Marker Board, marker, Projector	Demonstrate fluid flows through channels of circular cross section and parallel plates.	Perform the experiment on fluid flows through large channels of low viscosity	Open channel apparatus
	General Objective 7.0: Understandthe fundamental elements of fluid Dynamics					
15	7.1 Define the following teams: • Steady and unsteady fluid flow • Streamlines fluids flow, steam tubes • Two and three dimensional flow, uniform and non-uniform flows, laminar and turbulent flows	Describe the following teams: • Steady and unsteady fluid flow • Streamlines fluids flow, steam tubes • Differentiate between two and three dimensional flow, • Differentiate between	Textbooks, Marker Board, marker, Projector	Determine types of fluid flows and their characteristics Demonstrate laminar and turbulent flows	Demonstrate types of fluid flows and their characteristics Perform laminar and turbulent flows experiment	Pressure gauge and dead weights Viscometers

		uniform and non-uniform flows, • Differentiate between laminar and turbulent flows				

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: PRINCIPLESOF UNIT OPERATIONS I	**COURSE CODE: CET 211**	**UNIT:4**	**CONTACT HOURS: 4HOURS/WEEK**
			THEORETICAL: 2HOURS/WEEK
YEAR/SEMESTER: ND II/1	**PRE-REQUISITE: NONE**		**PRACTICAL: 2HOURS/WEEK**

Goal: This course is designed to enable students to acquire the knowledge of basic fundamentals of size reduction and homogenization applicable to cement and alliedindustries.

General Objectives:

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

1.0 Know the techniques of particle size analysis.
2.0 Understand the principles and practice of particle screening in the industry.
3.0 Know the principles and practice of size reduction processes
4.0 Know particle separation processes.
5.0 Know material handling andconveying of solids
6.0 Understand storage of solids, size classification and air separators
7.0 Know blending and pre-homogenisation
8.0 Know the principles of liquid and solid mixing

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: PRINCIPLES OFUNIT OPERTATIONS I	**COURSE CODE:** CET 211	**UNIT: 4**	**CONTACT HOURS: 4HOURS/WEEK**
			THEORETICAL: 2HOURS/WEEK
YEAR/SEMESTER: ND II/ 1	**PRE-REQUISITE : NONE**		**PRACTICAL: 2HOURS/WEEK**
Goal: This course is designed to enable students acquire the knowledge of basic fundamentals of unit operations applicable to cement/allied industries.			
	General objective 1:0 Know the techniques of particle size analysis		

THEORETICAL CONTENT					**PRACTICAL CONTENT**	
WEEK\S	SPECIFIC LEARNING OUTCOMES	TEACHER'S ACTIVITY	RESOURCES	SPECIFIC LEARNING OUTCOME	TEACHER'S ACTIVITY	RESOURCES
1-4	1.1 Explain the meaning of particle size and shape. 1.2 Explain particle size distribution, size averaging and equivalence. 1.3 Explain the reasons for and methods of particle size analysis. 1.4 Identify the range of particle sizes found in dusts, powders, slurries and mists. 1.5 Explain size estimation in sub-micron range 1.6 State optimum sizes at various stages from extraction to mills. 1.7 Explain the influence of size fraction and reactivity. 1.8 Describe the following screening equipment: grizzlies, stationary, vibrating,curved and DSM screens & screen capacity. 1.9 Explain cumulative and frequency particle size distribution (Gaussian, poison, etc). 1.10 Distinguish mean particle diameters from the various size reduction units. 1.11Analyse particle size using	Explain activities1.1-1.12 to the students.	Marker, Magic-board Manuals,Recommended textbooks, Lecture notes,	Carry out experiments in screen analysis.	Guide the students to conduct the practical. Show students how to calculate average particle size and standard deviation from experiment on screen analysis.	Raw sample, Sieves (mm – µm), shaker log graph paper.

	probability graph papers. 1.12 Explain particle size measurement techniques: sieving, microscopy, sedimentation, permeability.					
	General objective 2:0 Understand the principles and practice of particle screening in the industry.					
3-4	2.1 Explain the need for industrial screening. 2.2 Explain screening in de-dusting operations. 2.3 List various classifiers. 2.4 Explain each in 2.3. 2.5 Calculate screencapacity and effectiveness.	Explain activities2.1 to 2.5 to the students.	Marker, Magic-board Manuals,Recommended textbooks, Lecture notes,			
	General objective 3:0 Know the principles and practice of size reduction processes.					
5-6	3.1 Explain the need for size reduction. 3.2 Describe the common types of comminution equipment e.g. jaw crushers; gyratory crushers; roll mills; ball mills; dix mills etc. 3.3 Explain the behavior of materials subjected to size reduction. 3.4 State laws of size reduction (Bond's, Rittinger's, Kick's laws and Work index). 3.5 Estimate power requirements of a size reduction process applying Bond's, Kick's, Rittinger's laws and Work index formulae. 3.6 Explain the theory of crushing and grinding. 3.7 Explain open and closed grinding circuit. 3.8 Explain the factors affecting performance of size	Explain activities3.1 to 3.8 to the students.	Marker, Magic-board Manuals,Recommended textbooks, Lecture notes,	Carryout experiment on particle size analysis to estimate and identify settling regimes. Determine energy and power requirements in crushing and grinding in the laboratory.	Guide students to carryout experiments.	Sieves, shaker, laboratory size crushing and grinding machine, raw mix, weighing balance.

	reduction equipment.					
	General objective 4:0 Know particle separation processes.					
7-8	4.1 Describe the features and operation of: horizontal flow-setting tank; settling chamber for dust removal; gas cyclone; solid bowl centrifuge and electrostatic precipitator. 4.2 Describe the different zones of separation. 4.3 Describe the effect of flocculation on suspension sedimentation. 4.4 Describe the measurements of settling rates for different concentrations of a suspension. 4.5 Calculate maximum settling rate using given experimental data.	Explain activities4.1 to 4.5 to the students.	Marker, Magic-board Manuals,Recommended textbooks, Lecture notes,	• Carry out experiment to determine sedimentation rate with varying concentrations and heights of suspension. • Determine experimentally factors (particle size, thickner, time, and composition) affecting the flow of slurries.	Guide students to carryout experiments.	Glasswares, sedimentation study apparatus, thickner (Chloride based), centrifuge.
	General objective 5:0 Know material handling andconveying of solids.					
9-10	5.5 Explain the various systems of material handling, haulage and transportation from mines e.g trucks, dumpers, conveyors etc. 5.6 Describe the features and operations of the following solid conveying systems: screw conveyors, bucket conveyors, belt conveyors, vibrator conveyors and pneumatic conveyors. 5.7 State factors that determine conveyor selection. 5.8 Explain pneumatic and hydraulic transportation of solids.	Explain activities5.1 to 5.4 to the students.	Marker, Magic-board Manuals,Recommended textbooks, Lecture notes,	Carryout an industrial visit to cement/allied industries to observe materials handling and transportation. Write a report detailing the various methods of handling and transportation of materials.	Guide students at the industrial visit.	Cement/allied industry. Video clips.
	General Objective 6.0: Understand storage of solids, size classification and air separators.					
13-14	6.1 Describe the storage of raw	Explain activities6.1 to	Marker, Magic-			

	materials in bins, silos, hoppers, and stockpiles. 6.2 List methods of size classification. 6.3 Explain each in 6.2. 6.4 State types of air separators used in cement/allied product manufacturing. 6.5 Explain the principle of operation ineach of 6.4. 6.6 Explain wet classification and hydro-cyclones. 6.7 Describe cyclone material balances in open and closed circuit operations and their separating efficiencies.	6.7 to the students.	board Manuals,Recommended textbooks, Lecture notes,			
	General Objective 7.0: Know blending and pre-homogenisation					
15	7.1 Explain preparation of cement raw meal as per raw mix design, combined & segregated pre-homogenisation. 7.2 List methods of pre-homogenisation, stacking of blending beds, chevron method and windrow method. 7.3 Explain area stock pilling, axial stock pilling and continuous stock pilling. 7.4 List the equipment used for reclaiming materials from stockpiles. 7.5 Explain blending bed theory, batch and continuous homogenisation. 7.6 Explain Fullller's one-eighth blending method. 7.7 Explain stacking of blending beds: in longitudinal and circular stockpiles system and their comparism.	Explain activities7.1 to 7.8	Marker, Magic-board Manuals,Recommended textbooks, Lecture notes,			

	General Objective 8.0: Know the principles of liquid and solid mixing.					
15	8.1 Describe a typical agitation equipment. 8.2 Explain the effects of baffles in agitation vessels. 8.3 Distinguish impellers in terms of flow types. 8.4 Explain axial and radial types of impellers. 8.5 Describe propellers, paddies and turbines. 8.6 Explain the effect of viscosity on the selection of mixers 8.7 Describe mixers for thick pastes e.g. kneeders, extruders etc. 8.8 Describe mixers for powders.	Explain activities8.1 to 8.7 to the students.	Marker, Magic-board Manuals,Recommended textbooks, Lecture notes,			

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: CEMENT PLANT SERVICES AND MAINTENANCE	**COURSE CODE: CET 212**	**UNIT:3**	**CONTACT HOURS: 3HOURS/WEEK**
			THEORETICAL: 1HOURS/WEEK
YEAR/SEMESTER: ND II/1	**PRE-REQUISITE: NONE**		**PRACTICAL: 2HOURS/WEEK**

Goal: This course is designed to enable the student acquire the knowledge of fundamentals of plant services and maintenance applicable to cement and alliedindustries

General Objectives:

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

1.0 Know the general Safety Rules for maintenance

2.0 Know installation and commissioning of machinery in the cement industry

3.0 Understand utility services in plant operations and maintenance

4.0 Know how to maintain different types of bearings, gear box and impellers

5.0 Understand the principles of maintenance planning

6.0 Understand the maintenance of conveyors.

7.0 Understand the maintenance in the kiln section

8.0 Understand the maintenance of vertical roller mill and ball mill

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY						
COURSE TITLE: CEMENT PLANT SERVICES AND MAINTENANCE		**COURSE CODE:** CET 212		**UNIT: 4**	**CONTACT HOURS: 4HOURS/WEEK**	
					THEORETICAL: 2HOURS/WEEK	
YEAR/SEMESTER: ND II/ 1		**PRE-REQUISITE : NONE**			**PRACTICAL: 2HOUR/WEEK**	
Goal: this course is designed to enable students to acquire the knowledge of fundamentals of plant services and maintenance applicable to cement and allied industries						
	General objective 1:0 Know the general Safety Rules for maintenance.					
THEORETICAL CONTENT					**PRACTICAL CONTENT**	
WEEK\S	SPECIFIC LEARNING OUTCOMES	TEACHER'S ACTIVITY	RESOURCES	SPECIFIC LEARNING OUTCOME	TEACHER'S ACTIVITY	RESOURCES
1-2	1.1 List the safety rules for maintenance. 1.2 State factors affecting maintenance practices in the industry. 1.3 Explain types of maintenance. 1.4 Describe the various safety signs and signals 1.5 Explain safety drill	Explain activities 1.1-1.5 to the students	Markerboard Manuals, Recommended textbooks, safety charts	Identify safety signs and symbol in laboratory and workshop. Conduct safety evaluation of a typical laboratory/workshop Conduct safety drill	Guide students to carry out the practical exercise	Safety manuals and charts Safety equipment
	General objective 2:0 Know installation and commissioning of machinery in the cement industry					
3-4	2.1 State factors affecting plant installation such as weight; size Stability, rigidity, and running speed. 2.2 State properties of concrete, metal, wood and bricks for plant installation 2.3 Describe typical machine foundation. 2.4 Describe the use of the following in machinery installation: Ropes and Chains, Kate's Tripod and shear legs, Forklift and pulley block, Mobile and overhead cranes, Derrick and	Explain activities 2.1-2.4 to the students	Markerboard Manuals, Recommended textbooks, safety charts	Watch a documentary on installation and commissioning of machinery in a cement plant.	Provide relevant video clips to demonstrate installation and commissioning of machinery.	Video clips Projectors, screens, etc

	gantry, etc					
	General objective 3:0 Understand utility services in plant operations and maintenance.					
5-6	3.1 State the utility services in cement plant operation. 3.2 Describe the following utility equipment: compressors, pumps, valves, air receiver tanks, air dryer, sedimentation tanks, filtration bed etc. 3.3 State the functions of items in 3.2. 3.4 Draw symbols of items in 3.2. 3.5. State the causes of bearing failure. 3.6 Draw flow diagrams with symbols. 3.7 Interpret flow diagrams with symbols. 3.9 Identify basic parts of equipment in 3.2	Explain activities 3.1 to 3.9 to students.	Markerboard, recommended textbooks, charts manuals, etc.	Identify the following types of utility equipment: compressors, pumps, valves, air receiver tanks air dryers, sedimentation tanks, filtration beds. Fix the following utility equipment on the flow line: compressors, pumps, valves, air receiver tanks, air dryers, sedimentation tanks, filtration beds.	Guide students to carry out repairs and maintenance.	compressors, pumps, valves, air receiver tanks, air dryers, sedimentation tanks, filtration beds.
	General objective 4:0 Know how to maintain different types of bearings, gearboxes and impellers					
7-8	4.1 Define bearing, gearbox and impeller. 4.2 State types and functions of items in 4.1. 4.3 Explain routine inspection and maintenance of items in 4.1. 4.4 List possible faults of items in 4.1. 4.5 Explain how to remove and replace bearing. 4.6 Explain lubrication of bearings and gearboxes. 4.7 Explain how to remove and replace small size	Explain activities 4.1 to 4.9 to the students.	Markerboard recommended textbooks, manuals, etc.	Dismantle and couple back small gearbox and impeller.	Guide students to carry out routine maintenance.	Bearing extractor puller bearings small size impeller small gearbox complete' tools box diagnose and inspection equipment.

	impellers. 4.8 Interpret bearing codes. 4.9 List tools for carrying out the tasks in 4.3.					
	General Objective 5.0: Understand the principles of maintenance planning					
13-14	5.1 Define maintenance. 5.2 List types of maintenance 5.4 Explain basic procedures for maintenance types in 5.2. 5.4 State requirements for maintenance planning such as manpower, task, spare parts, man-hour, Standard Operation Practice (SOP), tools and materials 5.5 Explain how to write maintenance report.	Explain 5.1 to 5.5 to students.	Markerboard recommended textbooks, manuals, etc.	-	-	-
	General Objective 6.0: Understand maintenance of conveyors.					
15	6.1 Define a conveyor. 6.2 State types and functions of conveyors. 6.3 Identify parts of each conveyor in 6.2 6.4 Explain how to carry out inspection and training/adjustment of idlers. 6.5 Identify safety devices on conveyors such as sway max, rope switch, Emergency stop (E-stop), Safety gaps. 6.6 Explain procedure for replacement of conveyor belt, chain, lamina pan, screw and bucket. 6.7 Define vulcanization	Explain activities 6.1 to 6.9to the students	Recommended textbooks, manuals, markerboard,etc.	Carry out vulcanization of a sample of a conveyor belt.	Guide students to conduct the maintenance exercise.	Sample of conveyor belt, cold patch chemicals,

	6.8 List materials and tools required for vulcanization 6.9 Explain how to carry out vulcanization of conveyor belt.					
	General Objective 7.0: Understand the maintenance in the kiln section					
15	7.1 State maintenance schedule of a kiln: • routine • preventive • predictive. 7.2 Explain how to carry out items in 7.1. 7.3 Explain how to carry out inspection of the kiln with respect to floating, migration, red spot, tyre temperature, tyre bearing temperature, retaining ring, outlet nose ring. 7.4 Explain how to clean cooler hydraulic filters. 7.5 Explain how to replace damaged seal of kiln support roller. 7.6 Explain how to replace: damaged seal support roller oil 7.7 Explain how to adjust kiln support roller during operation. 7.8 Explain how to replace support roller oil if the temperature is high. 7.9 Explain inspection of kiln support roller	Explain activities 7.1 to 7.20to the students.	Recommended textbooks, Manuals, Markerboard , Duster, etc.	Take a visit to cement factory to observe maintenance activities at the kiln section	Guide students during the visit	Cement factory

	bearing water line with the view of avoiding blockage or scaling. 7.10 Explain how to clean kiln support roller surface in order to aid migration. 7.11Explain how to replace damaged bag filter bags and cages. 7.12Explain the fixing of malfunctioning air blasters. 7.14 Explain the cleaning of raw meal silo root blowers filters. 7.15Explain the inspection and torqueing of bucket elevator belt joints.					
	General Objective 8.0: Understand the maintenance of vertical roller mill and ball mill.					
15	8.1 State types and functions of mills 8.2 Describe the following mills: Vertical Roller Mill (VRM) and ball mills (BM). 8.3 Identify types of mills in 8.2 8.4 Explain routine inspection and maintenance of mills in 8.2 8.5 Explain how to lubricate main gear box, rollers, classifiers, bearings of VRM. 8.6 Draw schematic diagram of VRM and BM 8.7 Draw schematic diagram of VRM hydraulic system. 8.8 Explain SOP for	Explain activities 8.1 to 8.10to the students.	Recommended textbooks, Manuals, Markerboard , Duster, Pipes, etc.	Identify physically the parts stated in 8.9 of a small ball mill.	Demonstrate activities to students	Small size ball mill, Hand tools

	carrying out welding work in the mills. 8.9 Explain how to replace the following in ball mills: Head wall liners, step liners, intermediate segment plate, diaphragm slot, water injection nozzle and bearings. 8.10 Explain the inspection of the following in ball mills: FK pump (Fuller Kinyon pump), vibrating screen (for tears) , bucket elevator, centre diaphragm mesh (for cracks), gear box, filling-up or mill charge.					

Assessment:

Type of Assessment	**Purpose and Nature of Assessment**	**Weighting (%)**
Examination	Final examination (written) to assess knowledge and understanding	60
Test	At least Two (2) progress tests for feedback.	20

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: GEOLOGY AND MINING OF CEMENT RAW MATERIALS	**COURSE CODE: CET 213**	**UNIT:3**	**CONTACT HOURS: 3HOURS/WEEK**
			THEORETICAL: 1HOURS/WEEK
YEAR/SEMESTER: ND II/1	**PRE-REQUISITE: NONE**		**PRACTICAL: 2HOURS/WEEK**

Practical	At least Five (5) works to be assessed by the teacher	20
Total		100

Goal: This course is designed to enable students acquire the knowledge of geology and mining of cement raw materials

General Objectives:

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

1.0 Know the source and classification of cement raw materials.

2.0 Know the distribution and assessment ofdeposits of cement raw materials in Nigeria.

3.0 Understand the fundamental principles of rock mechanics required for excavation design and support selection.

4.0 Understand the concepts of formation and exploitation of geologic deposits.

5.0 Understand the factors that affect mining methods.

6.0 Understand hard rock mining methods.

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY						
COURSE TITLE:GEOLOGY AND MINING OF CEMENT RAW MATERIALS		**COURSE CODE:** CET 213		**UNIT: 3**	**CONTACT HOURS: 3HOURS/WEEK**	
					THEORETICAL: 1HOURS/WEEK	
YEAR/SEMESTER: ND II/ 1		**PRE-REQUISITE : NONE**			**PRACTICAL: 2HOUR/WEEK**	
Goal: This course is designed to enable students acquire the knowledge of geology and mining of cement raw materials.						
	General objective 1:0 Know the sources and classification of cement raw materials.					
THEORETICAL CONTENT					**PRACTICAL CONTENT**	
WEEK\S	SPECIFIC LEARNING OUTCOMES	TEACHER'S ACTIVITY	RESOURCES	SPECIFIC LEARNING OUTCOME	TEACHER'S ACTIVITY	RESOURCES
1-2	1.1 Define geology 1.2 List the branches of geology. 1.3 Define rocks. 1.4 List types of rocks. 1.5 Explain the term mineral. 1.6 State the class of rock from which cement raw materials are derived. 1.7 Describe the sources of rock types that constitute cement raw materials. 1.8 List the characteristics of various cement raw materials.	Explain activities1.1 to 1.8to the students.	Maker board Manuals,Recommended textbooks, Lecture notes,	Perform physical identification of cement raw materials. -Colour -Texture - Grain size - Determination of specific gravity - Hardness - Compressive strength Perform determination of total Carbonate and Magnesium Carbonate of cement raw materials Perform chemical analysis and determination of LOI, CaO, SiO_2, Al_2O_3, Fe_2O_3, MgO, Na_2O, K_2O, Cl of cement raw materials Field visit to some mine sites is an essential part of this course.	Guide students to carryoutUniaxial CompresiveStrength(UCS)determination of rocks , Tri-axial tests, Brazilian Tests, Direct Shear Strength, Point Load Index test , Schmidt Hammer Rebound Number determination tests Guide students to determine total carbonate and Magnesium Carbonate of cement raw materials Guide students carry out chemical analysis and determination of LOI, CaO, SiO_2, Al_2O_3, Fe_2O_3, MgO, Na_2O, K_2O, Cl of cement raw materials	Samples, specific gravity bottles, sieves, atterberg limit apparatus, tray, oven,tri-axial machine,UCS machine, crushing machine, Schmidt hammer, X-ray crystalolograph machine, chemical analysis test etc
	General objective 2:0 Know the distribution and assessment of deposits of cement raw materials in Nigeria.					

3-4	2.1 Describe geological distribution of cement raw materials deposits in Nigeria. 2.2 Assess the quality, quantity and suitability ofcement raw materials deposits in Nigeria, 2.3 Explain calcareous and argillaceous raw materials. 2.4 Explain sourcesof Silica, Alumina, Iron oxide and Shale. 2.5 Explainthe effects of coal ash and additives as corrective materials (fly ash, slag, lime sludge) in cement manufacturing. 2.6 Explain prospecting and exploration of cement raw materials deposits. 2.7 Explain reserve estimation. 2.8 Explain statistical and geo-statistical evaluation of deposits. 2.9 DescribeComputer aided deposit evaluation.	Explainactivities 2.1 to 2.9 to the students.	Markerboard,Manuals, Geological Maps, Recommended textbooks, Lecture notes etc.	• Appreciate the strata of geological formation. • Extract data from the geological maps. • Analyze the data. • Interpretethe result of the analysis. • Draw conclusion.	Organize visit to : • Geological survey department. • Mining site Guide students to ask questions on prospecting, exploration,expoitation and reserve estimation of cement raw materials in Nigeria. Guide students to observe the geological informantion of the limestone deposits.	Geological survey maps Mining sites
	General objective 3:0 Understand the fundamental principles of rock mechanics required for excavation design and support selection.					
5-6	3.1Explain the concepts of stress and infinitesimal strain. 3.2 Explain linear elasticity. 3.3 List physical and mechanical properties	Explainactivities 3.1 to 3.9 to the students.	Instructional manual, video clips, Marker board Recommended textbooks, , e-books, power point projector,	Carry out stress analysis of rocks.	Guide students to carryout stress analysis of rocks.	Samples of rocks, Crushing machine Universal testing machine (UTM)

	of rocks. 3.4 Expain rock failure theory. 3.5 Explain rock mass classification schemes and their applications in excavation design and support selection 3.6 Describe in-situ stress. 3.7 Explain openings in massive jointed and weak rocks. 3.8 Describe stability analysis and design of rock slopes and pillars. 3.9 Explain subsidence, its prediction,measurement and control.		screen, geological maps, etc			
	General objective 4:0 Understand the concepts of development and exploitation of geologic deposits.					
7-8	4.1 Explain surface mining. 4.2 Explain Unit operations & Mining steps. 4.3 Describe methods of mining of limestone deposits 4.4 Expalinbenchsize and height. 4.5 Explain estimation of tonnage and grade of benches. 4.6 Explain mine production scheduling.	Explainactivities 4.1 to 4.6to to the students.	Instructional manual, video clips Marker board, Recommended textbooks, e-books, power point projector, screen, etc	Observe unit operations in a typical surface mine.	Guide students to undertake a visit to a typical surface mine	Mining sites
	General Objective 5.0: Understand the factors that affect mining methods.					

13-14	5.1 State the factors affecting choice of mining methods 5.2 Explain geometrical considerations in open pits. 5.3 Explain Pit limits 5.4 Explain Slope stability 5.5 Relate choice of mining methods to economic, safety and production capacity	Explainactivities 5.1 to 5.5 to the students.	Recommended textbooks, Lecture notes, Manuals, Marker board, Duster, etc.	-	-	-
	General objective 6:0 Understand hard rock mining methods.					
9-10	6.1 Explain the types of mining methods for hard rocks 6.2 Describe the equipment for hard rock mining. 6.3 DesribeBlasting techniques 6.4 State types of explosives and accessories. 6.5 Explain safety in mining operation. 6.6 Explain pit head quality control	Explain activities 6.1 to 6.6 to the students.	Marker board Recommended textbooks, Lecture notes, Manuals, Duster, projector, etc.	Observe unit operations in a typical surface mine.	Guide students to undertake a visit to a typical surface mine	Mining sites

Assessment:

Type of Assessment	**Purpose and Nature of Assessment**	**Weighting (%)**
Examination	Final examination (written) to assess knowledge and understanding	60

Test	At least Two (2) class tests for feedback.	20
Practical	At least Eight (8) practical exercises to be assessed by the teacher	20
Total		100

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITL33E: RAW MIX DESIGN AND CHEMISTRY OF CEMENT	**COURSE CODE: CET 214**	**UNIT:1**	**CONTACT HOURS: 1HOURS/WEEK**
			THEORETICAL: 1HOURS/WEEK
YEAR/SEMESTER: ND II/1	**PRE-REQUISITE: NONE**		**PRACTICAL: -HOURS/WEEK**

Goal: This course is designed to enable students acquire knowledge of raw material proportioning to achieve desired cement quality.

General Objectives:

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

1.0 Know raw mix design.
2.0 Understand the chemistry of cement manufacturing process
3.0 Know the constituents of cement and their roles in cement performance

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY						
COURSE TITLE: RAW MIX DESIGN AND CHEMISTRY OF CEMENT		**COURSE CODE:** CET 214		**UNIT: 2**	**CONTACT HOURS: 2HOURS/WEEK**	
					THEORETICAL: 1HOURS/WEEK	
YEAR/SEMESTER: ND II/ 1		**PRE-REQUISITE : NONE**			**PRACTICAL: -1HOUR/WEEK**	
Goal: This course is designed to enable students acquire knowledge of raw material proportioning to achieve desired cement quality.						
	General objective 1:0 Know raw mix design.					
THEORETICAL CONTENT					**PRACTICAL CONTENT**	
WEEK\S	SPECIFIC LEARNING OUTCOMES	TEACHER'S ACTIVITY	RESOURCES	SPECIFIC LEARNING OUTCOME	TEACHER'S ACTIVITY	RESOURCES
1 - 4	1.1 Explain sampling and pre blending of cement raw materials. 1.2 Explain the estimation of Silica Modulus (SM), Alumina Modulus (AM), Hydraulic Modulus (HM), Lime saturation Factor (LSF), Liquid Content (LC). 1.3 Describe the methods of proportioning, 2, 3 and 4 component mixes. 1.4 Explain the impact of moduli values on cement manufacturing process and quality of clinker.	Explain1.1 to 1.4.	Instructional manual, video clips Marker, Magi-board Recommended textbooks, , e-books, power point projector, screen, etc	Carryout experiment to determine Silica Modulus, Alumina Modulus and Lime Saturation Factor	Guide students to carryout determination of Silica Modulus, Alumina Modulus and Lime Saturation Factor	Reagent, glass wares
	General objective 2.0: Understand the chemistry of cement manufacturing process					
5 – 8	2.1 Explain the Cement manufacturing process. 2.2 Explain chemical composition of various types of cement, cement component and their phase relation. 2.3 Explain binary and ternary compounds of cement and formation of eutectic.	Explain2.1 to 2.4 to students.	Instructional manual, video clips Marker, Magi-board Recommended textbooks, , e-books, power point projector, screen, etc			

	2.4 Explain Bauge'scalculation.					
	General objective 3:0 Know the constituents of cement and their roles in cement performance					
9 - 15	3.1 Explain clinker minerals. 3.2 Explain absorption of constituents in clinkers phases. 3.3 Explain using the phase diagram absorption of constituents in clinkers phases. 3.4Explain chemical reaction during clinkerization, roles of minor constituents in clinkerization, 3.5Explain Thermochemistry of clinker formation. 3.5 Explain mineralizer 3.6 Explain the role of additives in clinker formation. 3.7 Explain the various mineralizer and fluxes, their role in manufacture of clinker. 3.8 Explain hydration of clinker materials. 3.9 Explain the role of gypsum in cement hydration process. 3.10 Explain hydration of Portland and strength of Portland cement	Explainactivites3.1 to 3.10to the students.	Instructionalmanual, video clips Marker, Magi-board Recommended textbooks, , e-books, power point projector, screen, etc	Carryout experiment to determine the composition, LSF, SM and AM, of limestone, clinker, gypsum and cement available locally.	Guide students in carryout the experiment.	Glasswares, Reagents, Samples.

Assessment:

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final examination (written) to assess knowledge and understanding	60
Test	At least Two (2) progress tests for feedback.	20

Practical	At least Three (3) works to be assessed by the teacher	20
Total		100

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: MATERIAL AND ENERGY BALANCE	**COURSE CODE: CET 215**	**UNIT:2**	**CONTACT HOURS: 2HOURS/WEEK**

			THEORETICAL: 2HOURS/WEEK
YEAR/SEMESTER: ND II/1	**PRE-REQUISITE: NONE**		**PRACTICAL: 0 HOURS/WEEK**

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: MATERIAL AND ENERGY BALANCE	**COURSE CODE:** CET 215	**UNIT: 1**	**CONTACT HOURS: 1HOURS/WEEK**
			THEORETICAL: 1HOUR/WEEK
YEAR/SEMESTER: ND II/ 1	**PRE-REQUISITE : NONE**		**PRACTICAL: -HOUR/WEEK**
Goal: This course is designed to enable the student acquire the knowledge of material and energy balance applicable to cement technology.			
	General objective 1:0 Understand materials and energy balance.		
THEORETICAL CONTENT			**PRACTICAL CONTENT**

Goal: This course is designed to enable the student acquire the knowledge of material and energy balance applicable to cement technology.

General Objectives:

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

1.0 Understand material and energy balance.

2.0 Understand steady and unsteadystate materials balance.

3.0 Understand phase equilibrium and vapour pressure saturation.

4.0 Understand material and energy balance in reactive processes.

5.0 Understand mass and energy balance calculation for unit operations.

WEEK\S	SPECIFIC LEARNING OUTCOMES	TEACHER'S ACTIVITY	RESOURCES	SPECIFIC LEARNING OUTCOME	TEACHER'S ACTIVITY	RESOURCES
1-3	1.1.Explain the concepts of unit and dimensions. 1.2 Describe the range of functions performed by process engineers. 1.3. Identify the unit of operationsinvolved in a process drawing and process flowchart for: • singleunit operations. • multiple unit operations. 1.4. Identify process variables. 1.5 Explain materials and energy balance incement production stages.	Explain activities 1.1 - 1.5 to the students.	Marker board Manuals, Recommended textbooks, Lecture notes, Ropes and Chairs pulley boice.			
	General objective 2.0: Understandsteady and unsteady state materials balance.					
4 – 6	2.1 Define steady and unsteady states. 2.2 Derive mass and energy balance equations necessary for solving reaction and non –reaction steady – state. 2.3 Solve steady state problemsthat include both mass and energy balances. on: a) non-reactive processes b) reactive processes. 2.3 Solve simple problems on unsteady state material and energy balance.	Explain activities 2.1 - 2.5 to the students.	Marker board Manuals, Recommended textbooks, Lecture notes, Ropes and Chairs pulley boice.			

	General objective 3.0 : Understand phase equilibrium and vapour pressure saturation.					
7 – 9	3.1 Explain single-phase system. 3.2 Explain single-component phase Equilibrium. 3.3 Explain gibbs phase rule. 3.4 Explain gas-liquid system one condensable component. 3.5 Explain liquid and solid densities 3.6 Describechange in pressure at constant temperature. 3.7 Explain phase change operations.	Explain activities 3.1 – 3.7 to the students.	Markerboard Recommended textbooks, Manuals, lecture notes, etc. Dusters			
	General Objective4.0: Understandmaterial and energy balance in reactive processes.					
10 – 12	5.1 State content related to reactive processes. 5.2 Explainatom balance method. 5.3 Describe the extent of reaction method. 5.4 Explain heat of formation method. 5.5 Explain the general procedure for energy balance with reaction.	Explain acvtivities 4.1 – 4.5 to the students.	Recommended textbooks, Lecture notes, Manuals, Markerboard, Duster, etc.			
	General Objective 5.0: Understand mass and energy balance calculation for unit operations.					
13 – 15	5.1 Define the following terms: • Mass input. • Mass output. • Mass inventory. 5.2 State mass balance	Explain activities 5.1 – 5.5 to the students	Recommended textbooks, Lecture notes, Manuals, Markerboard, Duster, etc.			

	equations according to law of conservation of mass. 5.3 Explain the principle of conducting mass and energy balances for unit operations and processes with and without chemical reaction. 5.4 Define the following processes: • Recycle. • Bye-pass. • Reflux ratio. • Current and co-current. 5.5 Calculate mass and energy entering and leaving process by component balances.					

Assessment:

Type of Assessment	**Purpose and Nature of Assessment**	**Weighting (%)**
Examination	Final examination (written) to assess knowledge and understanding	60
Test	At least Two (2) class tests for feedback.	20
Assignment	At least three (3) assignments to be assessed by the teacher	20
Total		100

SEMESTER 4 ND 2

PROGRAMME: GENERAL STUDIES		
COURSE: COMMUNICATION IN ENGLISH II **SEMESTER:** SECOND		**CREDITHOURS:** 2Hrs/wk
CODE: GNS 202	**THEORY:**	
UNITS: 2.0	**PRE-REQUISITE:** GNS 201	PRACTICALS:

COURSE GOAL: This course is designed to equip the student with the necessary level of competence and proficiency to enable him adapt to his professional environment. At the end of this course the student should be able to communicate clearly and effectively in both general and specific situations.

GENERAL OBJECTIVES:

On completion of this course the student should:

1.0 Understand the registers.
2.0 Apply the principles of correspondence.
3.0 Apply the principles of writing for publication.
4.0 Write a report.

General Objective: 1.0 Understand the registers.						
Theoretical Content				**Practical Content**		
Week	**Specific Objectives**	**Teacher's Activity**	**Resources**	**Specific Learning Outcomes**	**Teacher's Activities**	**Evaluation**
	Register: 1.1Define registers. 1.2 List factors influencing register, viz., field (profession), mode (speech or writing), tenor (relationship between the interacting parties). 1.3 List some items of register peculiar to different professions. 1.4 State appropriate uses of jargon.	Explain the meaning of registers. Explain the factors that influence registers. Explain some registers found in the students' professions. Explain the use of jargons.	Textbooks Journals Internet Projector Marker Board marker CD/DVD	Define registers. List the factors that influence registers. List some registers found in different profession. Identify registers in a given passage.	Guide, lead, supervise and assess students' activities.	Class work, Assignments and Tests.

General Objective:2.0 Apply the Principles of Correspondence.						
Theoretical Content				**Practical Content**		
Week	**Specific Objectives**	**Teacher Activity**	**Resources**	**Specific Learning Outcomes**	**Teacher's Activities**	**Evaluation**
4-7	**Correspondence:** 2.1 Describe different types of business letters e.g., applications, enquiries, invitations and complaints, with their replies. 2.2 Identify suitablelanguages for specific types of letters.	Explain the different types of business letters. Explain the language suitable for	Textbooks Journals Internet Projector Marker Board marker CD/DVD	Describe different types of business letters. ➢ Identify the suitable language for a specific	Guide, lead, supervise and assess students' activities.	Class work, Assignments and Tests.

		specific types of letter, with appropriate examples.		type of letter. ➢ Use the identified languages to write different types business letters.		
	General Objective: 3.0 Apply the Principle of Writing for Publication.					
Theoretical Content				**Practical Content**		
Week	**Specific Objectives**	**Teacher Activity**	**Resources**	**Specific Learning Outcomes**	**Teacher's Activities**	**Evaluation**
	Writing for Publication: 3.1 List techniques of writing for publication. 3.2 Identify published essays of literary value. 3.3 State the development of ideas in a given article.	Explain the techniques of writing for publication. Analyse published essays of literary value. Explain the development of ideas in a given article.	Textbooks Journals Internet Projector Marker Board marker CD/DVD Magazines Newspapers	List the techniques. ➢ Identify published essays. ➢ Analyse published essays. ➢ Write essays on topical and current issues. ➢ State the stages of development of ideas. ➢ Write good articles for publication	Guide, lead, supervise and assess students' activities.	Class work, Assignments and Test
	General Objective:4.0 Write a report.					
Theoretical Content				**Practical Content**		
Week	**Specific Objectives**	**Teacher Activity**	**Resources (Theory)**	**Specific Learning Outcomes**	**Teacher's Activities**	**Evaluation**

11-12	**Reports:** 4.1 Define report. 4.2List the types of report. 4.3 Enumerate uses of report. 4.4 List the characteristics of a good report. 4.5 Outline the stages of writing a report. 4.5 Evaluate a given report.	Explain reports. Explain the types of report. Explain the uses of report. Explain the characteristics of report e.g objectivity, style etc. Explain the stages of writing a report. Analyse a report.	Textbooks Journals Internet Projector Marker Board marker CD/DVD	Define report. List the types of report. Mention the uses of report. Mention the characteristics of a good report. Outline the stages of writing a report. ➢ Analyse a given report. ➢ Write a report.	Guide, lead, supervise and assess students' activities.	Class work Assignments

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA **CEMENT ENGINEERING TECHNOLOGY**	**COURSE CODE:** **MTH 122**	**UNIT:** **2**	**TOTAL CONTACT HOURS: 2HRS/WEEK**
COURSE TITLE: TRIGONOMETRY AND			**THEORETICAL: 2HOURS/WEEK**

ANALYTICAL GEOMETRY			
YEAR/SEMESTER: ND II/2	**PRE-REQUISITE: -**		**PRACTICAL: - HOURS/WEEK**

Goal: This course is to enable Students understand trigonometry and analytical geometry applicable to cement engineering

GENERAL OBJECTIVES

On completion of this course, the student will be able to:

1.0 Understand the manipulation of Trigonometric Formulae and equations

2.0 Understand the concept of Mensuration and its application to Engineering problems.

3.0 Understand concept of Analytical Geometry and their applications.

4.0 Know the different forms of conics such as ellipse, Parabola and hyperbola.

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: TRIGONOMETRY AND ANALYTICAL GEOMETRY	**COURSE CODE : MTH122**	**UNIT: 2**	**CONTACT HOURS: 2**
			THEORETICAL: 2 Hours/week
YEAR/SEMESTER: ND II /2			**PRACTICAL: - Hours/week**
Goal: This course is to enable Students understand trigonometry and analytical geometry applicable to cement engineering			
GENERAL OBJECTIVES 1.0 : Understand the manipulation of Trigonometric Formulae and equations			

THEORETICAL CONTENTS			**PRACTICAL CONTENTS**			
WEEK/S	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-3	1.1 Convert sums and differences of trigonometric ratios to products: Sin A + Sin B = 2 Sin $\frac{(A+B)}{2}$ Cos $\frac{(A+B)}{2}$ Cos A + Cos B = 2 Cos $\frac{(A+B)}{2}$ Cos $\frac{(A+B)}{2}$ 1.2 Prove the sine and cosine formulae of triangles 1.3 Solve triangles using the sine and cosine formulae e.g.:- The sides a,b,c, of a triangle are 4cm, 5cm, and 6cm respectively. Find the angles. 1.4 Calculate angles of elevation and depression using trigonometric ratios e.g.:- From the top of a tree 120m high an observer sees a boat 560m away. Calculate the angle of depression. 1.5 Compute bearings, heights and distances of inaccessible objects and projections, e.g. B A man walks 3km due N, and the 3km N.52° W. How far is the of his starting point? What is his bearing from his original position. 1.6 Derive half angle formulae fro sin,	Illustrate with good examples activities in 1.1 to 1.10 and ask the students to solve problems on them.	Recommended textbook, Chalkboard, duster, Chalk, Lecture notes			

	cos and tan. 1.7 Define inverse circular function. 1.8 Explain inverse circular functions graphically. 1.9 Solve problems involving 1.8 and e.g.:- Draw the graph of 1/(cos 2θ□ Taking values from Q^{o} to 90^{o} inclusive. 1.10 Apply the concepts in 1.8 above to three dimensional problems.					
	GENERAL OBJECTIVE 2.0: Understand the concept of Mensuration and its application to Engineering problems.					
3-6	2.1 Explain circular measure 2.2 State the relation between radians and degrees 2.3 Prove the formulae for arc length and area of a sector. 2.4 Identify segment and chord of a circle. 2.5 Determine the area of a segment and the chord of length of a given circle. 2.6 Calculate the surface areas and volumes of simples shapes such as cylinder, sphere and cone. E.g. A solid sphere has radius 8cm. Calculate its volume. 2.7 Determine the areas and volumes of irregular shapes applying Simpsons rule. 2.8 Apply mid-ordinate rule to determine the areas and volumes applying mid-ordinate rule.	Illustrate with good examples activities in 2.1 to 2.8 and ask the students to solve problems on them.	Recommended textbooks, chalkboard, duster, chalk, lesson notes, etc			
	GENERAL OBJECTIVE 3.0 : Understand concept of Analytical Geometry and their applications.					

7-8	3.1 Explain two dimensional coordinate systems: Cartesian and Polar-coordinate systems. 3.2 Explain plotting and sketching of graphs w.r.t. the two coordinate systems. 3.3 Relate Cartesian coordinate to polar coordinates. 3.4 Explain the slope of a line in relation to the above concepts in 3.3. above. 3.5 Explain the intercept of a line. 3.6 Derive the formula for the gradient of line passing through two points. 3.7 Derive the equation of a straight line given the gradient and the co-ordinates of a point. 3.8 Reduce a given linear equation to the intercept form. $x/a + y/b = 1$ 3.9 Determine the coordinates of the point of intersection of two straight lines. 3.10 Define locus 3.11 Derive the slope-intercept form of the equation of a straight line: $y = mx+c$ 3.12 Derive the point B slope form of the equation of a straight line: $y - y_1 = m(x - x_1)$ 3.13 Derive the double B point form of the equations of the straight line: $y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$ 3.14 Derive the perpendicular form of the equation of a straight line 3.15 Solve examples of 3.11 to 3.14 above. 3.16 Find the angle (Q) between two lines whose slopes, (m_1, and m_2) are Known: $Q = \tan (m_2 B m_1)/1 + m_1 m_2$ 3.17 Determine the conditions for two	Illustrate with good examples activities in 3.1 to 3.26 and ask the students to solve problems on them.	Recommended textbooks, chalkboard, chalk Dusters, lesson notes etc.			

	lines to be parallel and to be perpendicular. 3.18 Derive the expression for the perpendicular distance from a point to a line. 3.19 Draw a circle. 3.20 Derive the equation of a circle with center at the origin and radius r. 3.21 Derive the equation of a circle with center outside the origin. 3.22 State general equation of a circle. 3.23 Determine the coordinates of the center of a circle from a given equation of a circle. 3.24 Draw orthogonal circles 3.25 Find the equations of the tangent and the normal at a point circle 3.26 List illustrative examples of each of 3.20 to 3.25 above					
	GENERAL OBJECTIVE 4.0 : Know the different forms of conics such as ellipse, Parabola and hyperbola.					
9-11	4.1 Define the Parabola 4.2 Derive the standard equation of a Parabola $y^2 = 4ax$ 4.3 State the properties of the parabola 4.4 Define the focal chord, axis and lotus rectum of the parabola 4.5 Determine the equation of the tangent and normal from a given point to the parabola. 4.6 Solve problems on parabola e.g. Write down the equation of the parabola and state its vertex if the focus B is (2,0) and the directex x = -2. 4.7 Define and ellipse 4.8 Derive the equation of an ellipse $x^2/G^2 + y^2/b^2 = 1$ 4.9 State the properties of the ellipse 4.10 Determine the equation of the tangent and the normal to an ellipse from a given point. 4.11 Define focal chord and axes of	Illustrate with good examples activities in 4.1 to 4.19 and ask the students to solve problems on them.	Recommended textbook, Chalkboard, duster, Chalk, Lecture notes, etc Drawing materials/instrument	-	-	-

	ellipse. 4.12 Solve problems on ellipses e.g. Find the length of the axes and the eccentricity for the ellipse: $4x^2 + 9y^2 = 36$ 4.13 Define the Hyperbola 4.14 Derive the equation of the Hyperbola 4.15 Identify the properties of the Hyperbola. 4.16 Define asymptotes, chord, tangent and normal to a hyperbola.4.17Solve problems on hyperbola e.g. Find the foci and directrices for hyperbola: $x^2/16$ B $y^2/9 = 1$ 4.18 Explain rectangular hyperbola 4.19 Determine tangent and normal to the rectangular hyperbola.					

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA CEMENT ENGINEERING TECHNOLOGY	**COURSE CODE: MAR 224**	**UNIT: 2**	**TOTAL CONTACT HOURS: 2H RS/WEEK**
COURSE TITLE: INTRODUCTION TO ENGINEERING MANAGEMENT			**THEORETICAL: 2HOURS/WEEK**
YEAR/ SEMESTER: ND II/ 2	**PRE-REQUISITE:-**		**PRACTICAL: 0HOURS/WEEK**

Goal: This course is to enable Students understand organization of an industry, basic management and personnel functions, basic economics, elements of law and different organizational working conditions.

GENERAL OBJECTIVES

On completion of this course, the student will be able to:

1.0 Know The Organization Of An Industry

2.0 Know Industrial Relations

3.0 Know The Basic Management Functions

4.0 Know Personnel Management Functions

5.0 Know Basic Economics

6.0 Know Elements Of Law

7.0 Know Different Working Conditions

8.0 Review Of Stcw 78 And Subsequent Amendments

COURSE TITLE: INTRODUCTION TO ENGINEERING MANAGEMENT	**COURSE CODE:** MAR 224	**UNIT: 2**	**CONTACT HOURS: 2**
		THEORETICAL:2 HOURS/WEEK	
YEAR/ SEMESTER: ND II/ 2	**PRE-REQUISITE:_**	**PRACTICAL: 0 HOURS/WEEK**	

Goal: This course is to enable Students understand organization of an industry, basic management and personnel functions, basic economics, elements of law and different organizational working conditions.

GENERAL OBJECTIVES 1:0 KNOW THE ORGANIZATION OF AN INDUSTRY

THEORETICAL CONTENTS			**PRACTICAL CONTENTS**			
WEEK/S	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-2	Industrial Organization 1.1 Differentiate between small, medium and large industries 1.2 Explain the structure of various types of industries 1.3 State the functions of the various departments in an industry 1.4 State the functions and responsibilities of a Director, Manager and Supervisor 1.5 Explain the decision process and communication in an organization 1.6 Explain the structure of ship board management 1.7 Explain the structure of shipyard management 1.8 List the different types of business and explain their structures e.g. sole proprietorship, partnership, limited liability and public liability companies.	Explain 1.1-1.8	Teaching aids: Diagrams Photographs Sketches O/H projector Multimedia projector And slides, diskettes, CDs etc.	-	-	-
	GENERAL OBJECTIVE 2.0: KNOW INDUSTRIAL RELATIONS					
3-4	Management Functions	Explain 2.1-2.6	Teaching aids as in 1.1	-	-	-

	2.1 Outline the functions of Directors 2.2 Outline the functions of Managers 2.3 Discuss the influence of production on the viability of the company 2.4 explain planning and control process 2.5 Explain the effect of work study, job analysis and specification to the decision making process 2.6 Discuss the function of a ship's master and Chief Engineer Officer		Evaluation, group discussion, test and examination			
	GENERAL OBJECTIVE 3.0: KNOW THE BASIC MANAGEMENT FUNCTIONS					
5-7	Personnel Management 3.1 State various man power selection and training methods 3.2 State various methods of advertising for recruitment 3.3 Discuss interview techniques 3.4 Outline industrial training schemes 3.5 Discuss the merits of on-the-job training 3.6 Discuss the effect of incentive on production level	Explain 3.1-3.6	Teaching aids: Diagrams Photographs Sketches O/H projector Multimedia projector And slides, diskettes, CDs etc.	-	-	-
	GENERAL OBJECTIVE 4.0: KNOW PERSONNEL MANAGEMENT FUNCTIONS					
8-10	Industrial Relation 4.1 Outline employee-employer relationship in an organization 4.2 Discuss trade unions, strikes and lockouts 4.3 Discuss the advantages and disadvantages of having trade unions in an	Explain 4.1-4.5	Teaching aids: Diagrams Photographs Sketches O/H projector Multimedia projector And slides, diskettes, CDs etc.	-	-	-

	organization and collective bargaining 4.4 Discuss the role of industrial arbitration 4.5 Discuss workers participation in management					
	GENERAL OBJECTIVE 5.0: KNOW BASIC ECONOMICS					
11-13	Fundamentals of Economics 5.1 Outline the basic concept and scope of economics 5.2 Explain the demand and supply theory 5.3 Discuss costing and pricing concepts 5.4 Describe the straight line method of evaluating equipment depreciation	Explain 5.1-5.5	Teaching aids: Diagrams Photographs Sketches O/H projector Multimedia projector And slides, diskettes, CDs etc.	-	-	-
	GENERAL OBJECTIVE 6.0: KNOW ELEMENTS OF LAW					
14-15	**Law** 6.1 Discuss elements of legislation, wages act, workman's compensation etc. 6.2 Discuss elements of contact and contact obligation 6.3 Discuss the provisions of the ISM – code 6.4 Differentiate between port-state and flag- state control 6.5 International safety management 6.6 Rational of safety management 6.7 the ISPS code 6.8 The ISM code 6.9 ISM Auditors 6.10 ISM code operation 6.11 ISM code development	Explain 6.1-6.11	Teaching aids: Diagrams Photographs Sketches O/H projector Multimedia projector And slides, diskettes, CDs etc.	-	-	-
	GENERAL OBJECTIVE 7.0: KNOW DIFFERENT WORKING CONDITIONS					
16	7.1 Comparison of Nigeria Navy and University conditions 7.2 Comparison of Nigerian Defence Academy and	Explain 7.1-7.5	Teaching aids: Diagrams Photographs Sketches	-	-	-

	Maritime Academy of Nigeria, Oron 7.3 Working conditions in NIMASA 7.4 Working conditions in Mobil Nigeria 7.5 Working conditions in different European countries		O/H projector Multimedia projector And slides, diskettes, CDs etc.			
	GENERAL OBJECTIVE 8.0: REVIEW OF STCW 78 AND SUBSEQUENT AMENDMENTS					
17	8.1 1978 Convention 8.2 1995 amendments 8.3 1997 amendments 8.4 1998 amendments 8.5 2006 amendments 8.6 2010 amendments	Explain 8.1-8.6	Teaching aids: Diagrams Photographs Sketches O/H projector Multimedia projector And slides, diskettes, CDs etc.	-	-	-

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA CEMENT ENGINEERING TECHNOLOGY	**COURSE CODE: MEC 222**	**UNIT: 4**	**TOTAL CONTACT HOURS: 2HRS/WEEK**
COURSE TITLE: STRENGTH OF MATERIAL			**THEORETICAL: 2HOURS/WEEK**
YEAR/SEMESTER: ND II/2	**PRE-REQUISITE: -**		**PRACTICAL: 2HOURS/WEEK**

Goal: This course is to enable Students understand various types of stress & strain, shearing force & bending moments, shear stress, torque in circular shafts, temperature stresses and second moment of area.

GENERAL OBJECTIVES

On completion of this course, the student will be able to:

1.0 Understand various types of stress and strain

2.0 Understand the construction of shearing force and bending moment diagrams and the computation of shearing force and bending Moment

3.0 Know Shear Stress and Torque in Circular Shaft

4.0 Understand the Use of Mohr's Circle

5.0 Know composite bar and Temperature stresses

6.0 Bending Stresses and Second moment of area

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY						
COURSE TITLE: STRENGTH OF MATERIALS	**COURSE CODE : MEC 222**		**UNIT: 4**		**CONTACT HOURS: 4**	
					THEORETICAL:2 Hours/week	
YEAR/SEMESTER: ND II /2					**PRACTICAL: 2 Hours/week**	
Goal: This course is to enable Students understand various types of stress & strain, shearing force & bending moments, shear stress, torque in circular shafts, temperature stresses and second moment of area.						
	GENERAL OBJECTIVES 1.0 : UNDERSTAND VARIOUS TYPES OF STRESS AND STRAIN					
THEORETICAL CONTENTS			**PRACTICAL CONTENTS**			
WEEK/S	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-3	**Direct stress and Strain** 1.1 Define Stress and Strain 1.2 Give the type of stresses and strains 1.3 Differentiate between the following: Tensile and Compressive stresses 1.4 State Hooke's law 1.5 Draw and explain stress and strain curves for :brittle and ductile materials 1.6 Describe strength properties of some	Explain in details direct stress and strain.	Recommended textbook, Chalkboard, duster, Chalk, Lecture notes	Verify Hooke's law using spring and dead weight Conduct tensile tests and compression tests on ductile and brittle materials. Conduct Izod and Charpy tests on different materials And Brinell hardness test	Demonstrate activities in 1.1, 1.2, 1.3 and 1.4 for the students to learn and ask them to carry out all the activities.	Springs, loads modulus of rubber apparatus etc.

	engineering materials.					
	GENERAL OBJECTIVE 2.0: UNDERSTAND THE CONSTRUCTION OF SHEARING FORCE AND BENDING MOMENT DIAGRAMS AND THE COMPUTATION OF SHEARING FORCE AND BENDING MOMENT					
3-6	**Shear Force and Bending moment** 2.1 Define shearing force and bending moments. 2.2 Beam 2.3 Type of beams and loads 2.4 sign convention for shear force and bending moment 2.5 Write expression for shear force and bending moment at a section of a loaded beam. 2.6 Calculate the point of contraflexure. 2.7 Calculate the neutral axis, the second moment of area of section, the moment of resistance.	Explain shear force and bending moment in detail and derive an expression to draw the shear and bending moment at a section.	Recommended textbooks, chalkboard, duster, chalk, lesson notes, etc	Identify different types of beam. Analyze simply supported beams with concentrated loads Perform experiment on young modulus using metal rod	Demonstrate 2.2 to 2.3 to students and let them carry it out	Springs Young modulus apparatus etc.
	GENERAL OBJECTIVE 3.0 : KNOW SHEAR STRESS AND TORQUE IN CIRCULAR SHAFT					

7-8	3.1 Define shaft 3.2 List materials used for shafts 3.3 List types of shafts 3.4 Know requirement for design of shafts 3.5 Derive an expression for torsion of Circular shafts : Solid and hollow shafts Solve problems related to 3.1 angles of twist, torsional stress, torque etc.	Explain torsion and derive an expression for the torsion of a circular shaft. Solve problems relating to shear stress. angle of twist and torque in circular shafts	Recommended textbooks, chalkboard, chalk Dusters, lesson notes etc.	Conduct torsion test. Investigate the whirling speed of an unloaded shaft with fix-fixed ends.	Demonstrate all the activities for the students to learn and ask them to carry out all the activities	Torsion test apparatus
	GENERAL OBJECTIVE 4.0 : UNDERSTAND THE USE OF MOHR'S CIRCLE					
9-11	4.1 Define mohr's circle 4.2 Know how to use mohr's circle to determine principal stresses and the plane in which they occur	Explain in details the application of mohr's circle and how to use mohr's circle to solve basic problems.	Recommended textbook, Chalkboard, duster, Chalk, Lecture notes, etc Drawing materials/instrument	-	-	-
	GENERAL OBJECTIVE 5.0 : KNOW COMPOSITE BAR AND TEMPERATURE STRESSES					

12-13	5.1 Define composite bar 5.2 Define temperature stresses 5.3 Derive an expression for 5.1 and 5.2 above 5.4 Solve basic problems related to 5.1 and 5.2	Explain composite bar and temperature stresses with working examples.	Recommended textbook, Chalkboard, duster, Chalk, Lecture notes, etc Drawing materials/instrument	-	-	-
	GENERAL OBJECTIVE 6.0 : BENDING STRESSES AND SECOND MOMENT OF AREA					
13-15	6.1 Define center of gravity 6.2 define centroid 6.3 differentiate between 6.1 and 6.2 6.4 Explain Bending Stresses 6.5 Derive an expression for pure bending of a rectangular beam ,position of neutral axis and moment of resistance 6.6 explain second moment of area 6.7 explain the parallel axis theorem 6.8 solve basic	Explain 6.1 to 6.7 in details with aid of diagrams, working examples and adequate notes.	Recommended textbook, Chalkboard, duster, Chalk, Lecture notes, etc Drawing materials/instrument	-	-	-

	problems on 6.1. 6.9 determine the second moment of area the neutral axis.					

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA CEMENT ENGINEERING TECHNOLOGY	**COURSE CODE: CET 221**	**UNIT: 4**	**TOTAL CONTACT HOURS: 5HRS/WEEK**
COURSE TITLE: PRINCIPLES OF UNIT OPERTATIONS II			**THEORETICAL: 2HOURS/WEEK**
YEAR/SEMESTER: ND II/2	**PRE-REQUISITE: -**		**PRACTICAL: 2 HOURS/WEEK**

Goal: This course is designed to enable the student understand the principles of separation processes.

GENERAL OBJECTIVES

On completion of this course, the student will be able to:

1.0 Understand leaching and extraction processes.

2.0 Understand the principles of gas absorption operations.

3.0 Understand the principles of evaporation.

4.0 Understand the principles of humidification and drying.

5.0 Understand the principles of crystallization.

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY						
COURSE TITLE: PRINCIPLES OF UNIT OPERATION II	**COURSE CODE : CET 221**		**UNIT: 4**		**CONTACT HOURS: 4**	
					THEORETICAL: 2 Hours/week	
YEAR/SEMESTER: ND II /2					**PRACTICAL: 2Hours/week**	
Goal: This course is designed to enable the student understand the principles of separation processes.						
	GENERAL OBJECTIVES 1.0 : Understand leaching and extraction processes.					
THEORETICAL CONTENTS			**PRACTICAL CONTENTS**			
WEEK/S	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-3	1.1 Define the following: • Leaching and • Extraction processes. 1.2 Explain liquid-liquid and liquid-solid equilibra. 1.3 Explain pre-treatment of feed. 1.4 Explain the process of solvent recovery. 1.5 Differentiate between batch and continuous operations. 1.6 Explain the shank's system of counter-current contacting. 1.7 List equipment for continuous counter-current contacting. 1.8 Describe layout of continuous counter-current contacting. 1.9 Describe liquid-liquid extraction equipment.	Explain activities 1.1- 1.9 to the students.	Recommended textbook, Marker board, cleaner, Lecture notes etc.	• Select solvents and test for extraction efficiency. • Determine the effect of agitation, particle size,temperature and feed rate on extraction efficiency for batch and continuous leaching operation. • Compare concurrent and counter-current leaching.	Guide students to conduct the practical.	Solvents, Soxhlet apparatus, solid – liquid extraction apparatus, glasswares.
	GENERAL OBJECTIVE 2.0: Understand the principles of gas absorption operations.					

3-6	2.1 Define solubility of gases. 2.2 Define absorption and stripping. 2.3 Explain the properties and types of tower packing. 2.4 Describe the construction of gas absorption towers. 2.5 Explain the factors affecting the selection of solvents in gas absorption operations. 2.6 Explain the principles of operation for: • stage-wise gas absorption and • continuous gas absorption equipment.	Explain activities 2.1- 2.6 to the students.	Recommended textbooks, cleaner, markerboard, etc			
	GENERAL OBJECTIVE 3.0 : Understand the principles of evaporation					
7-8	3.1 Define evaporation. 3.2 Explain the mechanism of evaporation. 3.3 Describe single and multiple effect evaporation. 3.4 Explain the following terms and modes: • forward feed • backward feed and • parallel feed.	Explain activities 3.1- 3.4 to the students.	Recommended textbooks, Markerboard, cleaners, etc.			
	GENERAL OBJECTIVE 4.0 : Understand the principles of humidification and drying.					
9-11	4.1 Explain humidification and dehumidification. 4.2 Distinguish between wet bulb and adiabatic saturation temperatures. 4.3 Explain humidity and dew point. 4.4 Expalin the principles and operation of a cooling tower.	Explain activites4.1- 4.7 to the students.	Recommended textbook, Chalkboard, duster, Chalk, Lecture notes	Determine humidity and dew point using psychomatic charts. Carry out moisture content test.	Guide students to conduct the practical.	Wet and dry bulb hydrometer, psychomatic charts, weighing balance, glasswares, oven etc.

	4.5 Explain the mechanism of drying operations. 4.6 Define the following terms: • bond and unbond moisture; • free moisture; • critical moisture content and • equilibrium moisture. 4.7 List equipment used for batch and continuous drying.					
	GENERAL OBJECTIVE 5.0 : Understand the principles of crystallization.					
12-13	5.1 Define crystallisation. 5.2 Explain the mechanism of crystallisation. 5.3 Explain the effects of temperature and impurities on crystallization. 5.4 State examples of batch and continuous crystallizers.	Explain activites 5.1- 5.4 to the students.	Recommended textbook, Markerboard, etc.			

Assessment:

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

PROGRAMME:	NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY
COURSE TITLE:	MASS & HEAT TRANSFER
COURSE CODE:	CET 222
CREDIT UNIT:	4
CONTACT HOUR:	4 HOURS/WEEK
GOAL:	The course is designed to provide the students with knowledge on fundamentals of heat and mass transfer operations.

GENERAL OBJECTIVES

On completion of the course the student should:

1.0 Know the fundamentals of mass transfer operations

2.0 Understand molecular diffusion in fluids

3.0 Know how to evaluate mass transfer coefficients.

4.0 Understand fundamentals of heat transfer phenomena.

5.0 Understand the analysis of heat conduction.

6.0 Understand the concepts of heat convection.

7.0 Understand basic radioactive heat transfer.

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY					COURSE CODE: CET 222	
					CONTACT HOURS: 4 HOURS/WEEK	
COURSE SPECIFICATION: MASS & HEAT TRANSFER					PRACTICAL CONTENTS:	
GOAL: The course is designed to provide the students with knowledge on fundamentals of heat and mass transfer operations.						
WEEK	**SPECIFIC LEARNING OBJECTIVES**		**TEACHERS ACTIVITIES**		**LEARNING RESOURCES**	
	GENERAL OBJECTIVE: 1.0: Know the fundamentals of mass transfer operations					
WEEK	**SPECIFIC LEARNING OBJECTIVE**	**TEACHER'S ACTIVITIES**	**LEARNING RESOURCES**	**SPECIFIC LEARNING OBJECTIVE**	**TEACHER ACTIVITIES**	**LEARNING RESOURCES**
1	1.1 Differentiate between transport and transfer processes. 1.2 Describe mass transfer operation. 1.3 Differentiate between direct and indirect phase contact operations. 1.4 Explain criteria for choice of specific mass transfer operation.	Explain to the students activities 1.1-1.4 to the students.	Video clips, Pictures, Power point slides, Marker Board, Recommended textbooks etc.	-	-	-
	General Objective 2.0: Understand molecular diffusion in fluids.					
2-4	2.1 Define molar flux and molar average velocity. 2.2 Define molecular, thermal and momentum diffusivity. 2.3 State Fick's first law of diffusion for binary system. 2.4 Derive the general expression for net molar flux for steady state diffusion in fluids at rest and in laminar flow. 2.5 Determine the diffusion coefficient for liquids and	Explain to the students activities 2.1-2.7 to the students.	Video clips, Pictures, Power point slides,Marker Board, Recommended textbooks, etc.	Measure the rate of diffusion of gaseous components evaporating into air stream. Measure equimolar counter diffusion of liquid components into a liquid solvent. Determine the net molar	Carry out gaseous diffusion experiment Carry out equimolar diffusion experiment.	Gas diffusion apparatus Liquid diffusion coefficient apparatus

	gases using empirical equation and formulae.			flux for steady state equimolar counter diffusion. Determine the net flux for steady state diffusion through a stagnant medium.		
GENERAL OBJECTIVES: 3.0: Know how to evaluate mass transfer coefficients.						
WEEK	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**LEARNING RESOURCES**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER ACTIVITIES**	**LEARNING RESOURCE**
5- 7	3.1 Define Mass transfer 3.2 Explain mass transfer coefficient in relation to net molar flux and concentration driving force. 3.3 Explain mass transfer coefficient with respect to mole faction, partial pressure and concentration in liquid and gas phases. 3.4 Explain mass transfer coefficient in relation to equimolar counter diffusion in a stagnant medium. 3.5 Explain the conversion of mass transfer coefficient from one form to another. 3.6 Define Schmidt, Prandtl and Reynolds numbers. 3.7 Estimate mass transfer coefficients from empirical equations and formula for laminar and turbulent flows. 3.8 Define overall mass transfer coefficient, gas film and liquid film control. 3.9 Carry out calculations from 3.2 – 3.5.	Explain activities 3.1-3.7 to the students.	Video clips, Pictures, Power point slides, Marker Board, Recommended textbooks, Lesson notes, etc.	Carry out experiment to determine the effect of temperature on diffusivities of gases and liquids.	Guide the student to carry out the experiment.	Liquid diffusion coefficient apparatus.

	General Objectives 4.0: Understand basic heat transfer phenomena.					
WEEK	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**LEARNING RESOURCE**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**LEARNING RESOURCE**
8	4.1 Explain the phenomena and mechanism of heat transfer by conduction, convection and radiation. 4.2 Explain the importance of heat transfer in cement industry. 4.3 Explain the characteristic behaviour and properties of materials vis-à-vis heat conduction, convection and radiation.	Explain activities 4.1-4.3 to the students	Video clips, Pictures, Power point slides, Marker Board, Recommended textbooks, etc.	-	-	-
GENERAL OBJECTIVES: 5.0: Understand the analysis of heat conduction.						
9- 10	5.1 Explain Fourier's First Law. 5.2 Develop Fourier's field equation for heat conduction in an isotropic medium by energy balance. 5.3 Explain thermal conductivity for isotropic and anisotropic media. 5.4 Calculate thermal conductivities for solids, liquids and gases from empirical equations and formulae.	Explain activities 5.1-5.4 to the students.	Video clips, Pictures, Power point slides, Marker Board, Recommended textbooks, etc.	Determine linear and radial temperature profiles applying Fourier's law of heat conduction. Determine the effect of individual thermal conductivities, surface contacts and insulation on thermal conductivity.	Preform linear and radial temperature profile experiment applying Fourier's law of heat conduction Perform thermal conductivity experiment	Heat conduction apparatus
GENERAL OBJECTIVES: 6.0: Understand the concepts of convection.						
	6.1 Explain natural and forced convection mechanisms of heat transfer. 6.2 Define the heat transfer coefficient. 6.3 Explain the dependence of heat transfer	Explain to the students activities 6.1-6.7.	Video clips, Pictures, Power point slides,Marker Board, Recommended textbooks, etc.	Carry out heat convection experiments.	Guide the students to carry out the experiment.	Heat convection apparatus. Heat exchange test rig.

11- 13	coefficient on the fluid flow regions. 6.4 Define overall heat transfer coefficient. 6.5 Describe heat exchange equipment. 6.6 Define temperature gradient, heat transfer resistance, effectiveness and Net Unit Transfer (NUT) concepts. 6.7 Determine heat exchange surface through simple performance and design calculations.					
GENERAL OBJECTIVES: 7.0: Understand basic radioactive heat transfer						
14- 15	7.1 Explain ideal or black body radiation. 7.2 Define transmitivity, reflectivity, emissivity and absorptivity. 7.3 Differentiate between spectral and total values of intensity, emissive power and parameters in black body radiation. 7.4 Develop Lambert's Cosine law, Wien's displacement law, Stefan-Boltsman law and Kirchoff's law. 7.5 Differentiate between black and grey surfaces. 7.6 Explain view factors and direct radiant interchange areas.	Explain activities 7.1-7.6 to the students. Prepare detailed lecture notes and relevant diagrams with video clips.	Video clips, Pictures, Power point slides, Marker Board, Recommended textbooks, Lesson notes, etc.	Perform the foolowingradioactive heat transfer experiments: Determine radiant heat exchange between ideal isothermal surfaces. Determine view factors and radiant exchange between ideal rectangular surfaces in various configurations. Determine view factors in radiant exchange systems.	Guide the students to carry out the experiments.	Thermal radiation apparatus

Assessment:

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final examination (written) to assess knowledge and understanding	60
Test	At least Two (2) progress tests for feedback.	20
Practical	At least Eight (8) works to be assessed by the teacher	20
Total		100

PROGRAMME: NATIONAL DIPLOMA CEMENT ENGINEERING TECHNOLOGY	**COURSE CODE: CET 223**	**UNIT: 2**	**TOTAL CONTACT HOURS: 2HRS/WEEK**
COURSE TITLE: ELECRICAL MACHINES AND INDUSTRIAL DRIVES			**THEORETICAL: 2HOURS/WEEK**
YEAR/SEMESTER: ND II/2	**PRE-REQUISITE: -**		**PRACTICAL: 0 HOURS/WEEK**

Goal: This course is designed to enable the student understand electrical machines and industrial drives.

GENERAL OBJECTIVES

On completion of this course, the student will be able to:

1.0 Know electrical/electronic graphical symbols.

2.0 Know and draft basic wiring diagrams.

3.0 Know different sizes and applications of cables.

4.0 Understand the fundamentals of D.C. and A.C. machines.

5.0 Understand the need for various types of AC Machines.

6.0 Know the drives for various industrial applications.

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: ELECRICAL MACHINES AND INDUSTRIAL DRIVES	**COURSE CODE : CET 223**	**UNIT: 2**	**CONTACT HOURS: 2**
			THEORETICAL: 2 Hours/week
YEAR/SEMESTER: ND II /2			**PRACTICAL: Hours/week**
Goal: This course is to enable Students understand electrical machines and industrial drives			

	GENERAL OBJECTIVE 1.0 : Know electrical/electronic graphical symbols.					
1 – 3	1.1 Identify and draw electrical/electronic graphical symbols such as: Resistor, Capacitor, Inductor, Diodes, Thyristor, Diac, Triac, Operational Amplifier, Logic gates, Linear IC, Power switches, Sockets, Isolator switches, Breakers, Motors, 1.2 Draft various electricalinstallation/ wiring diagrams. 1.3 Draw the installation diagram for a single phase and three-phase energy meters in domestic and commercial/industrial premises.	Explain activities 5.1-5.4 to the students.	Recommended textbook, Markerboard, duster, Drawing materials/instrument, circuit diagrams, electrical symbol charts.			
	GENERAL OBJECTIVE 2.0 : Know and draft various wiring diagrams.					

3 – 5	2.1 Explain schematic and wiring diagrams. 2.2 State the merits and demerits of schematic and wiring diagrams 2.3 Draft various wiring diagrams. 2.4 Explain methods of preventing hazards 2.5 Define earth continuity conductor, earth electrode, consumer's earth terminal. 2.6 Explain the protection of an installation by fuse and by ELCB. 2.7 Distinguish between solidearthing practice and earth leakage circuit breaker protection. 2.8 State a number of problems associated with earth leakage circuit breakers. 2.9Explain how to prevent electric shock. 2.10Explain artificial respiration: a) mouth resuscitation b) revised Holger Nelson resuscitation c) external cardio compression/cardiopulmonary resuscitation.	Explain to the students activities 2.1 – 2.10. Show various wiring diagrams. Use video clips to demonstrate artificial respiration in 2.10.	Recommended textbook, Marker board, duster, Lecture notes,Drawing materials/instrument video clips etc			
	GENERAL OBJECTIVE 3.0 : Know different sizes and applications of cables.					

13-15	3.1 List the main types of insulating and conducting materials. 3.2 Distinguish between conductors and insulators. 3.3 State the advantages and disadvantages of using different types of cable such as PVE - Insulated, PVC - sheathed cables, Mineral - Insulated metal-sheathed cables, Armoured PVC - insulated,PVC - sheathed cables, Steel/PVC conduits, Steel/PVC trunking and Flexible cable etc.	Explain to the students activities 3.1-3.3. Identify various cables. Students to visit nearby industries to familiarize with the industrial machines and drives	Recommended textbook, Markerboard, cleaner, Drawing materials/instrument, samples of assorted cables, etc.			
	GENERAL OBJECTIVES 4.0 : Understand the fundamentals of D.C. and A.C machines.					
1-3	4.1 Define motor and generator. 4.2 Explain the principle of construction of motor and generator (DC/AC). 4.3 Explain the principle of operation of motor and generator (DC/AC). 4.4 Explain the characteristics of motor and generator (DC/AC). 4.5 State torque and Electromagnetic induction (EMI) equation.	Explain activities 4.1 – 4.5 to the students.	Recommended textbook, Markerboard, cleaner.			

	4.6 Explain various excitation schemes. 4.7Explain speed control and braking of D.C. Motor.					
	GENERAL OBJECTIVE 5.0: : Understand the need for various types of AC Machines					
3-6	5.1 List types of A.C machines. 5.2 Explain the principle of operation of each in 2.1. 5.3State Electromotive force (EMF) law. 5.4 Sketch phasor diagrams of synchronous motor. 5.5 Explain principle of rotation in a magnetic field. 5.6 Explain starting methods. 5.7 Explain the principle of operation of induction motor. 5.8 Explain the features of synchronous motor. 5.9 Explain speed control of induction motor. 5.10 List types of single phase induction motor. 5.11 Explain the following: • Capacitor start • Capacitor run motors. • Shaded pole motor.	Explain activities 5.1 – 5.13 to the students.	Recommended textbooks, Markerboard, duster, etc			

	• Repulsion type motor • Universal motor • Hysteresis motor • Permanent magnet synchronous motor. • Switched reluctance motor. 5.12 Compare single and three phase induction motors. 5.13 Explain: • features • principle of operation of synchronous generators.					
	GENERAL OBJECTIVE 6.0 : Know the drives for various industrial applications					
9-11	6.1 Define electrical drives. 6.2 Explain factors determining selection of drives: • Rating of motors, • speed – torque • loads, • distance. 6.3Explain starting, braking and reversing operations in relation to drives. 6.4 Explain speed control of DC motors 6.5 Explainthyristorconverter fed DC drives. 6.6 Explainsingle, two and four quadrant operations of thyristor.	Explain activities 4.1-4.20 to the students	Recommended textbook, Chalkboard, duster, Chalk, Lecture notes, etc Drawing materials/instrument			

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA CEMENT ENGINEERING TECHNOLOGY	**COURSE CODE: CET 224**	**UNIT: 1**	**TOTAL CONTACT HOURS: 1HRS/WEEK**
COURSE TITLE: INTRODUCTION TO INDUSTRIAL AUTOMATION			**THEORETICAL: 1HOURS/WEEK**
YEAR/SEMESTER: ND II/2	**PRE-REQUISITE: -**		**PRACTICAL: 0 HOURS/WEEK**

Goal: This course is to enable the student understand basic concept of industrial automation.

GENERAL OBJECTIVES

On completion of this course, the student will be able to:

1.0 Understand the basic concept of industrial automation

2.0 Know different industrial sensors and their applications

3.0 Know different industrial controllers and their applications

4.0 Understand basic industrial communication protocol

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: INTRODUCTION TO INDUSTRIAL AUTOMATION	**COURSE CODE : CET 224**	**UNIT: 1**	**CONTACT HOURS: 1**
			THEORETICAL: 1Hours/week
YEAR/SEMESTER: ND II /2			**PRACTICAL: 0Hours/week**
Goal: This course is designed to enable the student understand basic concept of industrial automation.			
	GENERAL OBJECTIVES 1.0 : Understand the basic concept of industrial automation		

THEORETICAL CONTENTS			**PRACTICAL CONTENTS**			
WEEK/S	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-3	1.1 Explain the significance of feedback as the basis of automation. 1.2 Explain automation as combination of sensing, measurement andcontrol of physical variable without human intervention. 1.3 Explain classification of control as: Open loop control system; Closed loop control system. 1.4 State the features of each classification in 1.3. 1.5 Explain the following process control components: i) Set point (Reference input) ii) Controller iii) Process or plant iv) Feedback sensor v) Actuator (final control element)	Explain activities 1.1 – 1.5 to the students.	Recommended textbook, Markerboard, duster, etc,			

	vi) Controlled output					
	GENERAL OBJECTIVE 2.0: Know different industrial sensors and their applications					
3-6	2.1. Identify the following sensors: i) Temperature sensors ii) Level sensors iii) Flow sensors iv) Pressure sensors v) Position sensorse.gProximity Switches, Photo - Electric Sensors and Encoders. 2.2. Explain principles of operation of items in 2.1 above 2.3 Understand common application of these sensors in industrial processes. 2.4 Explain general procedure on installations, repair and maintenance of different sensors	Explain activities 2.1 – 2.4 to the students.	Recommended textbooks, Markerboard, samples of thermocouples, RTD, thermistor, etc.			
	GENERAL OBJECTIVE 3.0 : Know different industrial controllers and their applications					
7-8	3.1 Explain the following types of controls: • on and off control, • proportional control, • integral control and • derivative control. 3.2. Explain the operation of the following controllers: • Proportional Integral	Explain activities 2.1 – 3.4 to the students.	Recommended textbooks, Markerboard, chalk Cleaner, samples of control etc.			

	(PI) controller • Proportional Derivative (PD) controller • Proportional Integral and Derivative (PID)controller . 3.4 Describe the following modern controllers: • Programmable logic controller (PLC) • Supervisory Control and data acquisition system (SCADA) • Distributed Control System (DCS). 3.4 State the function and applications of modern controllers in cement production.					
	GENERAL OBJECTIVE 4.0 : Understand basic industrial communication protocol					
9-11	4.1 Explain the basic operating principles of the following: i) Foundation field bus ii) Modbus iii) HART(Highway Addressable Remote Transmitter) iv) AS-I (Actuator Sensor Interface) v) Device-Net vi) Profibus vii) CANbus viii) ControlNET 4.2 Explain the applications of each itemin 4.1.	Explain activities 4.1 – 4.2 to the students.	Recommended textbook, Markerboard, cleaner, etc	Industrial visit. Write report on the visit.	Organize industrial visit to cement/allied factoryto appreciate automated cement production.	Cement/allied factory.

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA CEMENT ENGINEERING TECHNOLOGY	**COURSE CODE: CET 225**	**UNIT: 2**	**TOTAL CONTACT HOURS: 2HRS/WEEK**
COURSE TITLE: PYRO-PROCESSING AND CLINKER FORMATION			**THEORETICAL: 2HOURS/WEEK**
YEAR/SEMESTER: ND II/2	**PRE-REQUISITE: -CET 123**		**PRACTICAL: 0 HOURS/WEEK**

Goal: This course is designed to enable students understand pyro-processing of the raw meal for clinker formation.

GENERAL OBJECTIVES

On completion of this course, the student will be able to:

1.0 Know the types of fuels used in pyro-processing.

2.0 Understand the treatment of fuels for pyro-processing.

3.0 Understand firing process.

4.0 Understand clinkerization in cement kilns

5.0 Understand cooling of clinker.

6.0 Know refractories.

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: PYRO-PROCESSING AND CLINKER FORMATION	**COURSE CODE : CET 225**	**UNIT: 2**	**CONTACT HOURS: 2**
			THEORETICAL: 2 Hours/week
YEAR/SEMESTER: ND II /2			**PRACTICAL: 0Hours/week**
Goal: This course is designed to enable students understand pyro-processing of the raw meal for clinker formation.			
GENERAL OBJECTIVE 1.0 : Know the types of fuels used in pyro-processing.			

THEORETICAL CONTENTS			**PRACTICAL CONTENTS**			
WEEK/S	**SPECIFIC IN LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-2	1.1 Define pyro-processing. 1.2 State the sources of the following types of fuel used in cement kilns pyro processing: i. Low Pour Fuel Oil (LPFO). ii. Coal iii. Petroleum Coke iv. Gas. v. Waste fuel (tyres, palm kernel, oils, residues, rice husks) 1.3 Explain the availability of the types of fuel in 1.2 locally. 1.4 Compare the calorific values and sulphur contents of the types fuel stated in 1.2. 1.5 Explain the effect of fuel types listed in 1.2 on the chemistry of clinker and cost of production.	Explain activities 1.1-1.5 to the students.	Instructional Manual, Video Clips, Recommended textbooks, e-books, Markerboard, Power Point Projector, Screen, etc	Carry out laboratory determination of calorific values of these types of fuel. Carry out laboratory determination of sulphur content of these types of fuel.	Guide the students in identifying samples of types of fuel used in pyro-processing	Calorimeter, and fuel samples, chemical reagents and glass wares.

	GENERAL OBJECTIVE 2.0: Understand the treatment of fuels for pyro-processing.					
3-4	2.1 Explain the treatment of LPFO using oil boilers. 2.2 Explain coarse coal grinding and fine coal storage. 2.3 Explain the storage and treatment of waste fuel. 2.4 Explain the safety involved in the treatment of fuels listed in 1.2.	Explain activities 2.1-2.4 to the students.	Instructional Manual, Video Clips, Recommended textbooks, e-Books, Markerboard, Power Point Projector, Screen, etc.			
GENERAL OBJECTIVE 3.0 : Understand Firing Process.						
5-7	3.1 Explain direct and indirect firing methods. 3.2 State the advantages and disadvantages of the firing methods 3.3 Describe with the aid of diagram the burner pipe of cement kilns. 3.4 Explain the firing mechanism of the kilns main burner (burner pipe). 3.5 Explain pattern of flame formation during firing of the burner pipe. 3.6 Explain the heating-up process with the aid of heating curve. 3.7 Explain the impact of the tertiary air duct (T.A.D) control on burner pipe firing using the T.A.D damper.	Explain activities 3.1-3.8 to the students	Instructional Manual, Video Clips, Recommended textbooks, e-Books,Markerboard, Power Point Projector, Screen, , etc			

	3.8 State the similarities and differences between the calciner burners and burner pipe. 3.9 Explain burner pipe alignment and its importance.					
GENERAL OBJECTIVE 4.0 : Understand clinkerization in cement kilns.						
8-10	4.1 Define clinkerization. 4.2 Explain the burning process of raw meal (mix). 4.3 Explain sintering reactions. 4.4 Write the chemical equations for 4.3. 4.5 Distinguish solid phase and liquid phase of clinker formation in cement kilns. 4.6 Explain the transition of kiln feed at the various zones. 4.7 Distinguish ring and coating formations during clinkerization. 4.8 Explain types of ring formation. 4.9 Distinguish normal coating formation and coating build-up. 4.10 Explain the effects of silica modulus, lime saturation factor and alumina modulus on	Explain activities 4.1-4.10 to the students.	Instructional Manual, Video Clips, Recommended textbooks, e-books, Marker Board, Power Point Projector, Screen, etc			

	clinkerization. 4.11 Explain cement kiln dust.					
GENERAL OBJECTIVE 5.0 : Understand cooling of clinker.						
10-11	5.1 Explain the cooling mechanism for clinker. 5.2 Explain effect of mechanical flow regulator (MFR) on cooling of clinker. 5.3 Explain the formation of snowman in the clinker cooler. 5.4 Explain the recuperation of heat loss during cooling of clinker. 5.5 State the advantages and disadvantages of types of cooler.	Explain activities 5.1-5.5 to the students.	Instructional Manual, Video Clips, Recommended textbooks, e-Books,Markerboard, Power Point Projector, Screen etc.			
	GENERAL OBJECTIVE 6.0 : Know Refractories					
12-14	6.1 Define refractory. 6.2 Explain the role of refractories in pyro-processing. 6.3 List all refractory materials used in cement kilns. 6.4 State the chemical composition of refractories. 6.5 Explain refractory maintenance planning. 6.6 Distinguish hot and red spots. 6.7 Explain refractory	Explain activities 6.1-6.10 to the students.	Instructional Manual, Video Clips, Recommended textbooks, e-books,Markerboard, Power Point Projector, Screen etc			Samples of refractory materials

	brick lining in cement kilns. 6.8 List the equipment used in refractory lining. 6.9 Compare the coefficient of heat transfer of refractories in 6.2. 6.10 State the significance of ISO and VDZ shapes in brick lining.					

Assessment:

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

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY			
COURSE TITLE: QUALITY CONTROL IN CEMENT MANUFACTURE	**COURSE CODE: CET 226**	**UNIT: 2**	**CONTACT HOURS: 2 HOURS/WEEK**
			THEORETICAL: 2HOURS/WEEK
YEAR/ SEMESTER: ND II/2	**PRE-REQUISITE: NONE**		**PRACTICAL: 0 HOURS/WEEK**

Goal: This course is designed to enable the student acquire basic knowledge of Quality control in Cement Manufacturing

General Objectives:

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

1.0 Understand the use statistical analysis in quality control.

2.0 Understand national and international standards and specifications for cement.

3.0 Understand quality assurance methods.

4.0 Understand quality management systems (QMS).

PROGRAMME: NATIONAL DIPLOMA IN CEMENT ENGINEERING TECHNOLOGY						
COURSE TITLE: QUALITY CONTROL IN CEMENT MANUFACTURE		COURSE CODE: CET 226		UNIT: 1	CONTACT HOURS: 1HOURS/WEEK	
					THEORETICAL: 1HOUR/WEEK	
YEAR/SEMESTER: ND II/2		PRE-REQUISITE : NONE			PRACTICAL: 0 HOUR/WEEK	
Goal: This course is designed to enable the student acquire basic knowledge of Quality control in Cement Manufacturing.						
	General objective 1:0 Understandthe use of statistical analysis in quality control.					
THEORETICAL CONTENT					PRACTICAL CONTENT	
WEEK\S	SPECIFIC LEARNING OUTCOMES	TEACHER'S ACTIVITY	RESOURCES	SPECIFIC LEARNING OUTCOME	TEACHER'S ACTIVITY	RESOURCES
1-2	1.1 Explain statistical quality control. 1.2 Explain control charts 1.3 State theimportance of quality control 1.4 Describe sampling and sampling techniques 1.5 Explain input control. 1.6 Explain the control of raw meal and kiln feed. 1.7 Explain the control of chemical composition and physical characteristics of limestone, coal, gypsum and cement.	Explain activities 1.1 - 1.7 to the students. Give students exercises	Instructional manuals, Video clips, Recommended textbooks, e-books, power point, projector resources, statistical tables, calculators			Calculators, statistical tables
	General objective 2:0 Understand national and international standards and specifications for cement.					
3-4	2.1 Explain specification in relation to national and international standards. 2.2 Explain quality and specification requirements. 2.3 State the differences in test methods for national and international standards and specifications. 2.4 State the methods of comparison for each requirements in 2.3. 2.5 Explain the scheme of testing and inspection, detailed	Explain to the students activities 2.1-2.6.	Instructional manuals, Video clips, Recommended textbooks, e-books, power point, projector resources, statistical tables, calculators, ASTM, NIS, BS			NIS,ASTM, BS, etc

	requirements of Standards Organisationof Nigeria. 2.6 State the coding for national and international standards and specifications.					
	General objective 3:0 Understand Quality Assurance Methods.					
5-6	3.1 Define quality assurance. 3.2 Explain quality assurance needs, principles and essentials. 3.3 Statethe advantages of quality assurance system and quality manual. 3.4 Explain field complaints, quality audit and types.	Explainactivities 3.1-3.4 to the students.	Instructional manuals, Video clips, Recommended textbooks, e-books, power point, projector resources,	-	-	-
	General objective 4:0 Understand Quality Management Systems					
7-8	4.1 Explain Quality Management Systems (QMS). 4.2 Describe QMS concept of quality circles. 4.3 Explain ISO:9001-2000 and NIS equivalentsin relation to QMS. 4.4 Explain the practices of quality control system in a cement plant. 4.5 Explain the job functions of a Quality Control Manager in a cement factory.	Explain 4.1-4.5 to the students activities	Instructional manuals, Video clips, Recommended textbooks, e-books, power point, projector resources,			

Assessment:

Type of Assessment	Purpose and Nature of Assessment	Weighting (%)
Examination	Final examination (written) to assess knowledge and understanding	60
Test	At least Two (2) progress tests for feedback.	20
Assignment	At least Four(4) exercises to be assessed by the teacher	20
Total		100

PROGRAMME: NATIONAL DIPLOMA IN BOAT/SHIPBUILDING TECHNOLGOY			
COURSE TITLE:FINAL YEAR PROJECT	**COURSE CODE:**CET 227	**UNIT: 4**	**CONTACT HOURS: 4**
			THEORETICAL: 0HOURS/WEEK
YEAR/SEMESTER: ND II/2	**PRE-REQUISITE:-**		**PRACTICAL: 4HOURS/WEEK**
Goal: This module is intended to allow each Student work on an Independent Project and to inculcate in the Students the ability to integrate all the objectives learnt during his/her course of study and to Utilize the acquired skills on finding solutions to problems relating to his/her profession and the Cement Industry as a whole			

THEORETICAL CONTENTS			**PRACTICAL CONTENTS**			
WEEK/S	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOMES**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-15	-	-	-	Suggested Project Topics 1.1 Condition monitoring as maintenance tool e.g. vibration measurements, temperature monitoring, pressure monitoring etc. 1.2 Repair/maintenance of : - Diesel engines - Centrifugal pumps - Air compressor - Refrigeration and air conditioning plants - Sewage plants - Main switch board - Alternators/generators - Emergency lighting - Steering gear - Domestic hydrophor plant - Fresh water generator	Guide in selection of project topic and supervise Advise throughout the duration of project work	Materials/systems for projects.

MINIMUM PHYSICAL FACILITIES REQUIRED FOR ND CEMENT ENGINEERING TECHNOLGOY PROGRAMME

MINIMUM PHYSICAL FACILITIES REQUIRED FOR NATIONAL DIPLOMA CEMENT ENGINEERING TECHNOLOGY PROGRAMME

S/N	Laboratory	Workshop	Studio
1	Electrical machines	Machine/ fitting /Fabrication shop	Drawing
2	Electrical Pwer	Cement technology	ICT
3	Electronics		
4	Basic Electricity		
5	Instrumentation and Control		
6	Physics		
7	Chemistry		
8	Cement Quality control		
9	Strength of Materials		
10	Thermodynamics		
11	Fluid mechanics		
12	Soil		
13	Materials		
14	Unit operations		

WORKSHOPS

A. Machine/ fitting /Fabrication shop

S/N	Description	Quantity
	Work benches	For 30 students
	Bench vices	30
	Lathe Machine	1
	Pillar drilling machine	1
	Marking out table	1
	Sensitive bench drilling machine	2
	Surface plate	2
	Radial drilling machine	1
	Pedestal grinder with drill grinding attachment	1
	Power hacksaw	1
	Machine reamers	1
	Hand reamers machine	5
	Flat rough file (300 mm)	30
	Round rough file (300 mm)	30
	Round smooth file (300 mm)	30
	Source rough file (300 mm	30
	Flat smooth file (250 mm)	30
	Half round rough file (150 mm)	30
	Half round smooth file (250 mm)	30
	Triangular smooth file (150 mm)	30
	Try-square	30
	Dividers	30
	Steel Rules	30
	Scribers	16
	Vee block and clamp	2
	Scribing block	2
	Chisels	10
	Centre punches	30
	Cold chisels (set)	10 Sets
	Scrapers (set)	5
	Guillotine	2
	Vernier Caliper	10
	Hacksaw frames	30
	Stock and dies (set) metric	3 Sets
	Taps and wrenches (set) metric	3 Sets
	Hand drill	2
	Centre drills	Lot

	Tap extractor (set)	2 Sets
	Screw extractor (set)	4 Sets
	Screw gauges (assorted	2 Sets
	Screw driver (set)	4 Sets
	Hammers (assorted weight)	30
	Wire brush	5
	Micrometer (assorted)	5
	Oil can	5
	Fire extinguisher, water and sand buckets	4 each
	Measuring tapes	10
	Feeler gauges	10
	Rivet gun	6 pairs
	Goggles	30 pairs
	Drill set	4 set
	Electric Hand drill	2
	Electric hand grinder/sander	5
	Vernier height gauge	2
	Dial indicators and stand	5
	Mallets (rubber, wood and rawhide)	5 each
	Number stamps	2 sets
	Letter stamps	2 sets
	Hydraulic press	1
	Punches (cold)	4 sets
	Pliers (assorted)	10
	Hand shear	5
	Oxygen gas cyliders	2
	Acetylene gas cylinders	2
	Cylinder regulator	2
	Nozzles hose	2
	Electric Arc Welding Machine	2
	Welding chipping hammer	8
	Wire brush (bench type)	8
	Welding shield	8
	Gloves	15
	Gas bottle keys	4
	Welding and cutting burner set	2
	Gas cylinder truck	2
	Brazing rods	6 tins
	Flash gas lighter	4
	Soldering flux	6 tins
	Blow lamps	10

	Stools	6
	Try-square	6
	Leg vice	2 (optional)
	Electrode drying oven	1
	Swing beam folder	1
	Bending roller	1
	Double ended buffer and polisher	1
	Profile cutting machine	1
	Foot operated guillotine machine	1
	Assorted cutting snips	10
	Twist drill sets	4 sets

B. Cement Technology

S/N	Description	Quantity
1	Rock drilling machine	3
2	Samples of rock	Assorted
3	Sand	Assorted
4	Coarse Aggregate	Assorted
5	Hydraulic binders	Assorted
6	Limestone	Assorted
7	Chalk	Assorted
8	Marble	Assorted
9	Shale	Assorted
10	Clay	Assorted
11	Marl	Assorted
12	Iron ore	Assorted
13	Laterite	Assorted
14	Mill Scale	2
15	Vicat apparatus	2
16	Glasswares	Assorted
17	Weighing Machine	2
18	Crushing Machine	2
19	Compressor	2
20	Pumps	2
21	Valves	2
22	Air receiver tank	1
23	Air dryers	2

24	Sedimentation tank	1
25	Filtration bed	1
26	Bearing extractor	2
27	Puller bearing	2
28	Small size immpeller	2
29	Small gearbox	2
30	Sample of conveyor belt	2
31	Complete tool box	2
32	Cold patch	2
33	Diagnose and inspection equipment	2
34	Smale size ball mill	2
35	Hand tools	Assorted
36	Chemicals	Assorted
37	Set of Sieves	2
38	Specific gravity bottles	2
39	Atterberg limit apparatus	2
40	Tray	Assorted
41	Oven	2
42	Tri-axial machine	1
43	Schmidt hammer	2
44	X-ray Crystalograph Machine	1
45	Universal Testing Machine (UTM)	1
46	Calorimeter	2
47	Fuel Sample	Assorted
48	Sample of Refractory Materilas	Assorted
49	Pressure gauge	15
50	Thermometer	10
51	Kiln draft meter	5
52	Kiln speed meter	5
53	Oxygen concentration	5
54	CO_2 meter	5
55	H_2O meter	5
56	Spanners	Different types
57	Screw drivers	Different types
58	Barometer	5
59	Pressure sensors	10
60	Pressure transmitter	5
61	Pressure gauges with output signal	5
62	Switches	25
63	Relay	20
64	Electronic pressure measuring instrument	5

65	Pyrometer	5
66	Handheld infrared thermocouples	5
67	Thermistor	5
68	Probes	5
69	Resistance temperature detectors (RTD)	Large Quantity
70	Thermopiles	5
71	Amplifier (held junction compensation)	5
72	Camera field devices	5
73	Transmitters and readouts	2
74	Hotplate	5
75	Probe holder	25
76	Rheostat	5

LABORATORIES

A. MACHINES

S/**N**	DESCRIPTION	QUANTITY
1	Machine Test Bed	3
2	Shaded Pole Motor	3
3	Capacitor Start Motor	3
4	AC Series Motor	3
5	Synchronous Generator	3

6	Cage Induction Motor	3
7	Wound Rotor Induction Motor	3
8	Resistive Load Bank	3
9	Inductive Load Bank	3
10	Capacitive Load Bank	3
11	Cathode Ray Oscilloscope	3
12	Thyristor Drive	3
13	Ward Leonard Complete Set	3
14	Classic/Electronics ward-leonard machine set	3
15	Laptop Computer	2
16	Digital Clamp Meter	2
17	Power Protection Devices (Circuit Breakers, Isolators, Relays and Fuses e.t.c.)	2
18	Solar Power Module Photovoltaic Cell	3
19	Versatile Data Acquisition System Bench-mounted version	4
20	Frequency Meter	2 each
21	Transformer oil Tester	1
22	Flux Meter	1
23	Current Transformer	6
24	Voltage Transformers for Demonstration	2
25	Industrial Scope Meter	6
26	AC Motor Demonstration Unit	3
27	Single phase induction motors (assorted)	4
28	Three phase Transformers module	3
29	Transformer demonstrator/trainer unit	4

B. POWER

S/N	DESCRIPTION	QUANTITY

1	Modern Electric Power Simulator	2
2	Power Quality Analyzer Single Phase -	1
3	Power Quality Analyzer-Three phase	1
4	Digital Earth Resistance Testers	10
5	Hipotonic AC/DC Testers	3
6	Sectioned Electric Motors for demonstration	1
7	Sectioned Transformers for demonstration	1
8	Insulation Testing Equipment HV	1
9	Cable Fault Locating System HV	2
10	Isolators	5
11	Relays	5
12	Fuses	5
13	Frequency Meter	3
14	Transformer oil Tester	3
15	Digital Flux Meter	5
16	Megger Tester	5
17	Wheatstone Bridge	5
18	Rheostats (various ranges)	10
19	Power factor meter	4
20	Wattmeter: single phase	5
21	Wattmeter: three phase	5
22	Energy meter: Three phase	5
23	Energy meter: Single phase	5
24	Voltmeter: 0 – 500 DC	5
25	Ammeter: 0 – 30A	5
26	Clip-on Ammeter	4
27	Distribution and Transmission lines units	2
28	Multimeter (AVO)	10

C. ELECTRONICS

S/N	DESCRIPTION	QUANTITY
1	Fluke Professional Digital Meter	10
2	Bench-Top Oscilloscope Digital Storage 100 MHz 2GS/s 4-Ch	5
3	Advanced Digital Training Board	4
4	Basic Digital Training Board	5
5	Operational Amplifier Training Board	5
6	Basic Electricity Training System	5
7	Three phase and single phase power supply unit	6
8	Tripple Output DC Power Supply	6
9	PIC Programmer	10
10	Electrical and thermionic fundamentals laboratory kit	2
11	Communication receiver demonstration units (including AM and FM radio, television)	4
12	Communication Transmitters Demonstration Units	4
13	Experimental trainer for electronic circuits	5
14	Transistor Amplifier Demonstrator	5
15	Oscilloscope Dual trace 15 MHz	4
16	Signal Generator (RF)	5
17	Signal Generator (AF)	5
18	Sweep Generator	5
19	Multirange DC voltmeter	10
20	Single Trace MHz Probe	5
21	Storage Screen display Oscilloscope	5

D. BASIC ELECTRICITY

S/N	DESCRIPTION	QUANTITY
1	Multimeter (AVO)	10
2	Circuit Fault Trainer	4
3	Assorted electronics circuit	10
4	Analog digital and hardware electronics training system	5
5	Elecricity and semiconductors training system	5
6	Analog computer module	4
7	Kits for Introductory course in electricity and experiment in electromagnetism	4

8	Technology and the computer training system	4
9	Communication training system	4
10	Pulse generator	5
11	Voltage divider	5
12	NAND module	5
13	AND module	5
14	DC Power supply	5
15	20 MHz Oscilloscope	4
16	Vacuum tube voltmeter	5
17	Capacitance box	5
18	Resistance box	5
19	RC oscillator	5
20	Ammeters various ranges (assorted)	10
21	Voltmeter various ranges (assorted)	10
22	Wattmeter	4
23	Electronic Trainer (assorted)	4
24	CR oscillator	2
25	Rheostats (Various ranges)	10
26	Earth-loop tester	4
27	Function generator	5
28	Sweep generator	5
29	Power factor meter	5

E. INSTRUMENTATION AND CONTROL

S/N	DESCRIPTION	QUANTITY
1	Gravimetric Hydraulic Bench	2
2	Flow Meter Calibration	2
3	Pressure Measurement Bench	2
4	Venturi Flow Meter	4

5	Orifice Flow Meter	4
6	Nozzle Flow Meter	4
7	Flow Through an Orifice	2
8	Set of orifices	5
9	Control Software	2
10	Servo trainer	2
11	PLC Trainer	2
12	Pressure Process Training System	2
13	Flow process Training System	2
14	Level process Training System	2
15	Temperature Process Training System	2
16	Computer Control System	4
17	Service Module	4
18	Control and Instrumentation Study station	2
19	Distributed Control System	2
20	Ward Leonard Complete Set	2
21	Analog PID Controller Trainer	4
22	Process Simulator Panel	2
23	Thyristor Actuator Panel	2
24	Stepper Motor Demonstrator Expt. Panel	2
25	Servo Interface Panel (AC or DC Servo)	2
26	Conductor joint kits	2
27	Safety belts	2
28	Testing equipment for power line	2
29	Earthing kits	5

F. PHYSISCS

S/N	Description	Qty
1	Weights	Different masses
2	Stopwatch	20
3	Thermometer	40
4	Micrometer screw gauge	15

5	Vernier calipers	15
6	Measuring cylinders	25
7	Beam balance	5
8	Lever balance	5
9	Fork board	10
10	Pulley system	5
11	Bob	50
12	Collision setup	5
13	Friction board	5
14	Inclined plane	5
15	Scale pan	4
16	Plates of different sizes (square, circle, rectangle)	20
17	Meter rule	50
18	Pins	5 packets
19	Cork	50
20	String	25
21	Spring	20
22	Centrifuge	3
23	Hydrometer	10
24	Conical flask	15
25	Fortin barometer	3
26	Manometer	5
27	Barometer	3
28	U-tube	5
29	Detergent	5
30	Capillary tubes of varying sizes	50
31	Knife edge	20
32	Liquids of different viscosity	5
33	Thermometers	20
34	Thermocouple	10
35	Copper wire	5 reels
36	Constantan wire	2 reels
37	Clinical thermometer	10
38	Laboratory thermometer(in ^{o}F and ^{o}C)	10
39	Resistance thermometer	5
40	Pyrometers	5
41	Gas thermometer	3
42	Minimum and maximum thermometer	5
43	Beaker	20
44	Water bath	5
45	Napthalene	5

46	Boyle's law apparatus	3
47	Charles's law apparatus.	3
48	G clamp	20
49	Retort stand	30
50	Bunsen burner	20
51	Tripod stand	35
52	Mercury	2
53	Spring balance	5

G. Chemistry

SN	EQUIPMENT	QUANTITY
1	Direct vision spectroscope	2
2	Bunsen burner	12
3	Nichrome wire with handle	12
4	Watch glasses	12
5	Beakers (1000ml)	10
6	(250ml)	20
7	(100ml)	20
8	Glass funnel	12
9	Conical flask (250ml)	20
10	" (100ml)	20
11	Spatula	24
12	Tripod stand	12
13	Wire guaze	12
14	Bar magnet	12
15	Standard flask (500ml)	5
16	(250ml)	10
17	(100ml)	10
18	Test tubes	50
19	Copper Calorimeter	12
20	Thermometer (0 – 120°C)	20
21	pH meter	4
22	Burettes	20
23	Pipettes (25ml)	20
24	(10ml)	20
25	(5ml)	20
26	(1ml)	20
27	Indicator bottles	25
28	Reagent bottles (Plain)	40

29	(Amber)	20
30	White tiles	25
31	Retort stand with clamps	30
32	Glass rod	50
33	Chromatographic tank	10
34	Chromatographic column	10
35	Dropping pipettes	20
36	Measuring cylinder (5ml)	20
37	(10ml)	20
38	(100ml)	10

H. Cement Quality Control

SN	EQUIPMENT	QUANTITY
1	Burette	100
2	Pipette	100
3	Conical flask	50
4	Beaker	50
5	Crucible	50
6	Tripod stand	25
7	White tile	100
8	Glass funnel	50
9	Retort stand	50
10	Sieves	Different sizes 20
11	Watch glass	100
12	Stirring rod	100
13	Spatula	100
14	Electric oven	2
15	Muffle furnace	2
16	Bunsen burner	50
17	Buchner funnel	25
18	Buchner flask	25
19	Measuring cylinder	100
20	Heating mantle	10
21	Magnetic stirrer	15
22	Wire guaze	50
23	Thermometer	20
24	pH meter	5
25	Conductivity meter	5
26	Atomic Absorption Spectrophotometer	1

27	Deioniser	3
28	Water distiller	3
29	Calorimeter	2
30	Calculators	10
31	Statistical Tables	10
32	NIS	10
33	ASTM	10
34	BS	10
35	Laboratory X – ray flouresence	1
36	Cross belt analyser (Prompt Gamma Neutron Activation Analysis)	1
37	Belt scale system Thermo Scientific "Ramsey 10 – 14 belt scale system.	2
38	Tramp metal detectors Oretronic IV Tramp metal detector	1
39	Automatic compression and Flexural testing machine	1
40	Bond Ball Mill	1

I. Unit Operations

S/N	Description	Quantity
1	Tray drier	1
2	Spray drier	1
	Jaw crusher	1
3	Sieves	2 set
4	Sieve shaker	2
5	Shaker log graph paper	2
6	Crushing machine	1
7	Grinding machine	1
8	Weighing balance	2
9	Glasswares	Assorted
10	Sedimentation study apparatus	1
11	Centrifuge	2
12	Thickner (chloride based)	Assorted
13	Solvent extraction (Soxhlet apparatus)	2
14	Solid-liquid extraction apparatus	1
	Gas absorption equipment	1
15	Wet and dry bulb hydrometer	2
16	Oven	1
17	Psychomatic charts	2
18	Gas diffusion apparatus	1

19	Liquid diffusion coefficient	1
20	Heat conduction apparatus	1
21	Heat convection apparatus	1
22	Thermal radiation apparatus	1
23	Heat exchange test rig	1
24	Single effect evaporator	1
25	Stop watch	10
26	p^H meter	2
27	Digital Temperature indicator	2

J. STRENGTH OF MATERIALS

S/NO	ITEM	QUANTITY
1	Leaf Spring testing Machine	1
2	Portable strain meter	1
3	Loads	Assorted
4	Modulus of rubber appatus	1
5	Young Modulus apparatus	1
6	Torsion test apparatus	1

K. FLUID MECHANICS

S/NO	ITEM	QUANTITY
1	Losses in fitting and pipe bending Apparatus	1
2	Universal pump Testing Unit	1
3	Hydraulics Bench with accessories for Various Experiment in Fluid flow measurement	1
4	Impact of jet apparatus	2
5	Floating body Apparatus	1
6	Manometer	1
7	Rotameter	1
8	Laminar Flow apparatus	1
9	Pilot static Tube	1
10	Water meter	2
11	Viscometer	1
12	Pressure gauge	3
13	Dead weight	3

L. THERMODYNAMIC

S/NO	ITEM	QUANTITY
1	Water heater/stirrer unit with bath	1
2	Uncalibrated mercury in glass thermometer 10o to 110oc	25
3	Resistant Thermometer	1
6	Auto bomb calorimeter	1
7	Boyle gas calorimeter	1
8	Orsat gas analyzer	1
9	Heat of reaction apparatus	1
10	Heat of solution apparatus	1
11	Heat of combustion apparatus	1
12	Air compressor test set	1
13	Thermal conductivity Apparatus	1
14	Market boiler	1
15	Stam boiler plant (laboratory type)	1
16	High pressure vapor unit	1
17	Vapour density Apparatus	1
18	Pressure cooker	1
19	Falling ball Viscometer	1
20	Rotary viscometer	1
21	Gas law Apparatus	1
22	Portable emission analyser	1
23	Slack monitoring kit	1
24	High volume sampler	1
25	Pyrometer, infrared, non-contact digital infratrace	1
26	Combined separating and throttling calorimeter	1
27	Immersion heater	
28	Fire Extinguisher	2
29	Sand buckets	2

M. SOIL

S/N	EQUIPMENT	QUANTITY
1	Triaxial machine	2
2	CBR machine	2
3	Oedometer	2
4	Oven	2
5	Permeameter	2
6	Cassagrande Machine	8
7	Physical Weighing Balance	3
8	Electrical Weighing Balance	1
9	Compaction Mould	12
10	Extruder	2
11	Rammer	4
12	Speedy Moisture Tester	2
13	Sand Replacement Apparatus	2
14	Hand Auger	1
15	Vacuum Pump	2
16	U-tube Sampler	2
17	Shovel	4
18	Digger	4
19	Wheel barrow	3
20	Pycnometer	3

N. MATERIALS

S/N	DESCRIPTION	QUANTITY
1	Concrete table vibrator	1
2	slump test apparatus	2
3	cube crushing machine	1
4	vicat apparatus	5
5	curing tank	1
6	stop clock	1
7	physical balance	3
8	150mm cube mould	150
9	150mm cylindrical mould	6
10	drying oven	1
11	steel mixing board	1

12	raffle box	2
13	compacting factor apparatus	1
14	v-b consistometer	1
15	tilting pan concrete mixer	1
16	tapping rod	1
17	tapping bar	2
18	sieve shaker	1
19	wheel barrow	1
20	shovel	3
21	spirit level	3
22	trowel	4

STUDIOS

A. ICT STUDIO

S/N	Description	Quantity
1	Computers	30
2	Printers	2
3	Tables and Chairs	30
4	Different Types of Software	Assorted
5	Kiln Simulator/CECIL Sof ware	Assorted
6	Magi-board and Marker	1
7	Projector	1

B. DRAWING STUDIO

S/NO	ITEM	QUANTITY
1	Drawing table complete with drafting machine/stood	30
2	Drawing set Complete with pen for ink work	2
3	45o set square	2
4	60o set Square	2
5	Bleu printing Machine	1
6	Adjustable set Square	5
7	Desk Sharpener	5
8	Triangular Scale Rule (300mm)	5
9	Flat Scale Rule (300mm)	5
10	Blackboard Ruler	4-1
11	Blackboard Tee Square	4-1
12	Blackboard set Square (450 60o)	4 each 2
13	Blackboard compasses	4-1
14	Belabored projector	4-1
15	French Curve set	4-1
16	Letter Stencil (3mm, 6mm, 7mm and 10mm)	5 each
17	Rubber stencil (3mm, 6mm, 7mm, 6mm and 10mm)	5 each
18	Erasing stencil	5 each
19	Drawing rack/shelve for 30 students	
20	Personal computers	2
21	Plotter	1
22	Printer to handle A3 Size	1

GUIDELINES FOR ASSESSMENT OF STUDENT PROJECTS

PART A: SUPERVOSOR'S ASSESSMENT

Title of Project:	
Name of Student:	
Registration Number:	
Course:	

		Maximum Score	**Actual Score**
1	Presentation of Report (if conformity with standards)	**6**	
2	Understanding of the problem(s) and the pursuit of it to achieve the set objectives	**7**	
3	Report content (Data collection, Test procedures, Design/Construction, results and discussions)	**12**	
4	Does the report read as an integrated whole? (e.g. Details of work should be put in appendices)	**12**	
5	Quality of English (Sentence construction, grammar, spelling)	**6**	
6	Conclusion, Recommendations and summary	**7**	
	Total	**50**	

Brief Remark

_____

_____

Name of Reader _____

Signature _____ Date _____

PART B: PANEL'S ASSESSMENT

Title of Project:	

Name of Student:	
Registration Number:	
Course:	

		Maximum Score	Actual Score
1	Presentation of Report (if conformity with standards)	**10**	
2	Report content (Data collection, Test procedures, Design/Construction, results and discussions)	**20**	
3	Knowledge of theory	**10**	
4	Conclusion and summary	**10**	
5	Total	**50**	

Brief Remark

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GUIDELINES FOR TEXTBOOK WRITERS

NATIONAL DIPLOMA

The following guidelines are suggestions from the Engineering Committees to the writers of the textbooks for the new curricula. They are intended to supplement the detailed syllabuses which have been produced, and which define the content and level of the courses.

Authors should bear in mind that the curriculum has been designed to give the students a broad understanding of applications in industry and commerce, and this is reflected in the curriculum objectives.

i. One book should be produced for each syllabus
ii. Page size should be A4
iii. The front size should be 12 point for normal text and 14 point where emphasis is needed
iv. Line spacing should be set to 1.5 lines
v. Headings and subheadings should be emboldened
vi. Photographs, diagrams and charts should be used extensively throughout the book, and these items must be up-to-date
vii. In all cases, the material must be related to industry and commerce, using real life examples wherever possible so that the book is not just a theory book. It must help the students to see the subject in the context of the 'real world'
viii. The philosophy of the courses is one of an integrated approach to theory and practice, and as such, the books should reflect this by not making an artificial divide between theory and practice.
ix. Illustrations should be labeled and numbered.
x. Examples should be drawn from Nigeria wherever possible, so that the information is set in a country context.
xi. Each chapter should end with student self-assessment questions (SAG) so that students can check their own master of the subject
xii. Accurate instructions should be given for any practical work having first conducted the practical to check that the instructions do indeed work
xiii. The books must have a proper index or table of contents, a list of references and an introduction based on the overall course philosophy and aims of the syllabus.
xiv. Symbols and units must be listed and a unified approach used throughout the book
xv. In case of queries regarding the contents of the books and the depth of information, the author must contact the relevant curriculum committee via the National Board for Technical Education
xvi. The final draft version of the books should be submitted to Nigerian members of the curriculum working groups for their comments regarding the content in relation to the desired syllabus.

PROJECT FORMAT AND MARKING SCHEME
TIME TABLE

Format

All Projects are to be written up and printed on A4 paper, double spaced and should normally not exceed 40 pages; appendices and tables outside the text may be incorporated as extra. The department or school shall give as much assistance as possible, for example, where funds permit in subsiding the binding cost.

Four bound copies should be submitted about a month to the ND II second semester examinations; one of these copies will be returned to the student.

Marking Scheme

There are three categories of assessing and marking student's project, these being:

- Supervisor'sMarks **- 15%**
- Project Report Assessment by Supervisor/External Examiner **- 60%**
- Oral Examination **- 25%**

Supervisor's Marks

15% of the total marks will be allocated to the Supervisor exclusively who shall assess those aspects of practical work which are very difficult to quantify and are not necessarily apparent in the written, work. Such will include; the student's diligence, attitude and initiative in the face of non-controllable internal and external difficulties encountered.

Project Report

60% of the total marks will dwell on the overall quality and content of the project. The supervisor marks the project initially and this is without disclosure of original score passed on the External Examiner who using the same guidelines as below, awards his own marks. The two marks are moderated by the Board of Examiners which shall consist of all academic staff of the department or school. A general marking guide would include.

General Presentation

Considering: layout, quality of diagrams and photography, quality of English **- 20%**

Approach

Considers: Depth and Scope of Literature survey presentation of the aims of the project, design and construction work, operation of equipment, deficiencies in the techniques, precautions taken at experimental level and originality of thought or work **- 20%**

Treatment of Results

Considers: discussion, interpretation and critical assessment of results, linking up to previous and other work, conclusions and recommendation for further work **- 20%**

Oral Examination

The Board of Examiners of Moderating committee needs to familiarize themselves more fully with the work of the student as well as clarity of areas of misunderstanding that may arise from the report though an oral examination. This also aims at determining whether the report is a true and original account of work actually carried out.

The student shall be judged by his, confidence, presentation including mode of appearance, technical accuracy and other attributes that individual committees may deem necessary **- 25%**

LIST OF PARTICIPANTS AT THE PRE-CRITIQUE WORKSHOP FOR THE CURRICULUM DEVELOPMENT OF NATIONAL DIPLOMA CEMENT ENGINEERING TECHNOLOGY HELD IN FEDERAL POLYTECHNIC, ILARO 11TH- 17TH MARCH 2018

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