

NATIONAL BOARD FOR TECHNICAL EDUCATION

CURRICULUM AND COURSE SPECIFICATIONS

NATIONAL DIPLOMA (ND)

N

ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY

NOVEMBER, 2024

PLOT B, BIDA ROAD, P.M.B. 2239 KADUNA – NIGERIA www.nbte.gov.ng

FOREWORD

This curriculum has been strategically updated to provide skills and knowledge in the field of Electrical and Electronic Engineering Technology. It is designed to prepare technicians to contribute effectively to the diverse and critical industries that rely on electrical and electronic systems across Nigeria.

The curriculum is structured to introduce students to the core principles, theories, and practical applications within electrical and electronic systems, laying a solid groundwork for further specialization and career development. It provides the technicians with the skills to support the design, installation, operation, and maintenance of various electrical and electronic systems and devices.

I would like to express my sincere appreciation to the ERYK Group, industry professionals, and stakeholders whose valuable contributions and unwavering commitment were instrumental in the comprehensive review and updating of this vital curriculum. Their collective expertise ensures the relevance and contemporary applicability of this programme.

It is my hope that the effective implementation of this National Diploma curriculum will create a robust pipeline of skilled technicians who will be instrumental in the development and maintenance of critical electrical and electronic infrastructure across Nigeria, significantly contributing to industrial growth, technological advancement, and national development.

Prof. Idris M. Bugaje
EXECUTIVE SECRETARY
NBTE, KADUNA

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GENERAL INFORMATION

1.0 TITLE OF THE PROGRAMME - National Diploma (ND) in Electrical and Electronics Engineering Technology

2.0 GOAL AND OBJECTIVES OF THE PROGRAMME:

2.1 GOAL: The programme is designed to produce skilled electrical and electronics engineering technicians for manufacturing, assembling, servicing, power generation, transmission, distribution and utilization, telecommunications and other related industries.

2.2 OBJECTIVES:

At the end of the programme the technician should be able to:

- 1. Solve a range of engineering problems using appropriate mathematical and scientific principles.
- 2. Support the construction of simple electrical and electronic circuits when necessary for use in modification or as a part of a system
- 3. Assist in carrying out both preventive and corrective maintenance on simple electrical and electronic installations, equipment and appliances
- 4. Select and use appropriate instruments to carry out simple tests and measurement on all types of electrical and electronic installation and equipment under various operating conditions.
- 5. Coordinate and supervise craftsmen in activities related to electrical and electronic engineering services
- 6. Set up and manage a Small or Medium Scale enterprises or Business
- 7. Assist in producing technical drawings using appropriate conventions and techniques in engineering workshop settings
- 8. Adhere to workshop safety practices
- 9. Operate basic electrical/electronic tools and equipment
- 10. Apply logical reasoning and problem solving methodologies to address engineering challenges.
- 11. Conduct research in electrical and electronics engineering technology using appropriate research methods
- 12. Draw and interpret electrical and electronics engineering drawings and schematics.
- 13. Analyse electric current flow, energy relationships, and behaviour in resistive and capacitive systems

- 14. Apply differentiation and integration techniques to model and solve engineering problems with the use of simulation software e.g. MATLAB
- 15. Assist in implementing the principles of generation, transmission, and distribution of electrical energy with hands on practicals and industrial visits to relevant sites.
- 16. Operate, maintain, and troubleshoot various electrical machines.
- 17. Apply Alternating Current (AC) theory to analyse and sketch circuits.
- 18. Assist in performing network analyses of multiphase systems using electrical circuit theorems.
- 19. Analyse power systems and implement basic operational procedures.
- 20. Conduct laboratory and industrial measurements using electrical/electronic instruments
- 21. Implement basic telecommunication techniques and configure communication systems
- 22. Assist in the installation of electrical systems in buildings according to relevant standards and regulations.
- 23. Test and troubleshoot circuits containing passive and active electronic components.
- 24. Support the analysis and design of simple digital electronic systems
- 25. operate specialized software packages relevant to electrical and electronics engineering.
- 26. Support in the diagnoses and repairs of simple faults on computer hardware and application software.
- 27. Design and simulate electrical and electronics engineering systems.
- 28. Program Programmable Logic Controllers (PLCs)
- 29. Develop Human-Machine Interface (HMI) and Supervisory Control and Data Acquisition (SCADA) systems

3.0 GENERAL ENTRY REQUIREMENTS

The entry requirements for National Diploma in Electrical and Electronics Engineering Technology are:

- a. A minimum score in the Unified Tertiary Matriculation Examination (UTME) as stipulated by JAMB
- b. Five (5) Credit O-level passes at West African Senior School Certificate Examination (WASSCE), Senior School Certificate Examination (SSCE) or their equivalents at not more than <u>TWO</u> sittings. The five (5) subjects must include English Language, Mathematics, Physics, Chemistry and any other science subject.
- c. The National Technical Certificate (NTC) or its equivalent in electrical and electronics trade with credit passes as in (b) above.

4.0 DURATION

The duration of the programme is two academic sessions consisting of four semesters of 17 weeks per semester.

5.0 CURRICULUM

- 1. The curriculum of all ND programmes consists of four main components. These are:
 - 3.1 General studies/Education
 - 3.2 Foundation courses
 - 3.3 Professional courses
 - 3.4 Supervised Industrial Work Experience Scheme (SIWES)
- 2. The General Studies/Education component shall include courses in:
 - i. Art and Humanities English language, Communication. These are compulsory
 - ii. Mathematics and Science
 - iii. *Social Studies* Citizenship, political science, sociology, philosophy, geography, entrepreneurship studies. The courses in citizenship, entrepreneurship are compulsory.
- 3. The General Studies/Education component shall account for not more than 15% of the total contact hours for the programme.
- 4. Foundation courses include courses in Mathematics, Pure Science, Computer Science, Technical Drawing, Descriptive Geometry and Statistics, etc. The number of hours will vary with the programme and may account for about 10-15% of the total contact hours depending on the programme.
- 5. Professional courses are courses which give the student the theory and practical skills he/she needs to practice in his/her field of specialization at the technician level. These may account for between 60-70% of the contact hours depending on the programme.

6. Supervised Industrial Work Experience (SIWES) shall be taken during the long vacation following the end of the second semester of the first year. See detail of SIWES at Paragraph 10.0.

6.0 CURRICULUM STRUCTURE

The structure of the ND programme consists of four (4) semesters of class room, laboratory, field and workshop activities in the College and SIWES. Each semester shall be of seventeen (17) weeks duration made up as follows.

- 1. Fifteen (15) contact weeks of teaching, i.e lecture, test, quizzes, recitation, practical exercise, etc.
- 2. Two (2) weeks for the conduct of examinations. The SIWES registration shall take place at the end of the second semester of the first year for the ND programme.

7.0 ACCREDITATION

The programme offered at the ND level shall be accredited by the NBTE before the diplomates can be awarded ND Certificate. Details about the process of accreditation for the award of the ND programme is available from the Executive Secretary, National Board for Technical Education, Plot B, Bida Road, P.M.B 2239, Kaduna, Nigeria.

8.0 CONDITIONS FOR THE AWARD OF THE NATIONAL DIPLOMA

Institutions offering accredited programmes will award the National Diploma to candidates who successfully completed the programme after passing prescribed course work, examination, diploma project and the supervised industrial work experience. Such candidates should have completed a minimum of between 65-75 semester credit units depending on the programme.

8.1 Grading of Courses:

Courses shall be graded as follows:

Mark Range	Letter Grade	Weighting
75% and above	A	4.00
70% - 74%	AB	3.50
65% - 69%	В	3.25
60% - 64%	BC	3.00
55% - 59%	С	2.75
50% - 54%	CD	2.50
45% - 49%	D	2.25
40% - 44%	Е	2.00
Below 40%	F	0.00

8.2 Classification of Diplomas: National Diplomas shall be classified as follows:

Distinction - CGPA of 3.50 - 4.00 Upper Credit - CGPA of 3.00 - 3.49 Lower Credit - CGPA of 2.50 - 2.99 Pass - CGPA of 2.00 - 2.49

9.0 QUALIFICATION OF THE TEACHERS

9.1 Holders of BSc / HND and Higher Degrees in:

i. Electrical/ Electronic Engineering,

- 9.2 In addition, teachers of this programme should have been trained and certified by:
 - (a) Council for the Regulation of Engineering in Nigeria (COREN)
 - (b) Industrial certifications in Engineering

9.3 Headship of the Department:

Holders of HND or Bachelor's degree in any of the Electrical and Electronics Engineering

Higher Degree: Electronics and Communications, Instrumentation and Control, Power and Machines Engineering, who must not be below the rank of a Senior Lecturer

10.0 GUIDANCE NOTES FOR TEACHERS OF THE PROGRAMME

- 10.1 The new curriculum is drawn in unit courses. This is in keeping with the provisions of the National Policy on Education which stress the need to introduce the semester credit units that will enable a student who wish to transfer the units already completed in an institution of similar standards from which he is transferring
- 10.2 In designing the units, the principle of the modular system by the product has been adopted; thus making each of the professional modules, when completed provides the students with technician operative skills, which can be used for the employment purposes. Also, he can move ahead for post ND studies.
- 10.3 As the success of the credit unit system depends on the articulation of the programmes between the institution and industry, the curriculum content has been written in behavioural objectives, so that it is clear to all, the expected performance of the student who successfully completed some of the courses to the diplomate of the programme. There is slight departure in the presentation of the performance-based curriculum which requires the conditions under which the performance are expected to be carried out and the criteria for the acceptable levels of performance. It is a deliberate attempt to further involve the staff of the department teaching the programme to write their own curriculum stating the conditions existing in their institution under which the performance can take place and to follow that with the criteria for determining an acceptable level of performance. Departmental submission of the final curriculum maybe vetted by the Academic Board of the institution for ensuring minimum standard and quality of education in the

programmes offered throughout the polytechnic system.

10.4 The teaching of the theory and practical work should, as much as possible, be integrated. Practical exercises, especially those in professional course and laboratory work should be taught in isolation from the theory. For each course, there should be a balance of theory-practical in the ratio of 50:50 or 60:40 or the reverse.

11.0 GUIDELINES ON SIWES PROGRAMME

11.1 For the smooth operation of the SIWES, the following guidelines shall apply:

i. RESPONSIBILITY FOR PLACEMENT OF STUDENTS

Institution offering the ND programme shall arrange to place the students in the industry. Latest by April 30 of each year; six copies of the master list showing where each student has been placed shall be submitted to the Executive Secretary, NBTE which shall, in turn authenticate the list and forward it to the Industrial Training Fund (ITF), Jos.

- ii. The Placement Officer should discuss and agree with industry on the following:
 - a) 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 (ND) approved for each field.
 - b) The industry-based supervisor of the students during the period likewise the institution-based supervisor. The evaluation of the students during the period. It should be noted that the final grading of the student during the period of attachment should be weighted on the evaluation by his industry-based supervisor.

11.2 EVALUATION OF STUDENTS DURING SIWES

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

- i. Punctuality
- ii. Attendance

- iii. General Attitude to work
- iv. Respect for authority
- v. Interest in the field/technical area
- vi. Technical competence as a potential technician in his field.

11.3 GRADING OF SIWES

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

11.4 THE INSTITUTION BASED SUPERVISOR

The institution-based supervisor should endorse the logbook 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 problem regarding the specific assignments given to them by their industry-based supervisor.

11.5 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:

- i. There is another visit six (6) weeks after the first visit; and
- ii. A final visit in the last month of the attachment.

11.6 STIPEND 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.

11.7 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 also on credit unit system. Where a student has satisfied all other requirements but failed SIWES, he may only be allowed to repeat another four (4) months SIWES at his own expense.

11.8 LOGBOOK

The candidates are expected to record and up-keep a personal logbook. This will contain daily and weekly summary of curricular activities carried out by the candidates for each semester. The ND programme coordinator of the department will supervise the assessment and evaluation of the logbook.

12.0 FINAL YEAR PROJECT

Final year students in this programme are expected to carry out a project work. This could be on individual basis or group work. The project should, as much as possible incorporate basic element of design, drawing and complete fabrication of a marketable item or something that can be used. Project reports should be well presented and should be properly supervised. The departments should make their own arrangement of schedules for project work.

13.0 MANDATORY SKILLS QUALIFICATIONS (MSQ)

See guidelines for the implementation of MSQ in Polytechnics in Nigeria vide the NBTE website

CURRICULUM TABLE

YEAR I SEMESTER I

Course Code	Course Title	Y	P	CU	СН
GNS 101	Use of English I	2	0	2	2
GNS 111	Citizen Education I	2	0	2	2
MTH 112	Algebra and Elementary Trigonometry	2	0	2	2
MEC 111	Technical Drawing	1	3	3	4
MEC 113	Basic Workshop Technology and Practice	1	3	3	4
EEC 111	Electrical Drawings	1	3	3	4
EEC 112	Introduction to Digital Electronics	2	1	3	3
EEC 113	Technical Documentation and Report Writing	1	3	3	4
EEC 114	Electrical Engineering Science I	1	2	3	3
EEC 115	Industrial Health and Safety	1	1	2	2
MSQ	Mandatory Skills Qualification	0	0	0	2
	TOTAL	14	16	26	32

^{*} All GNS courses are to be obtained in GNS curriculum

YEAR I SEMESTER II

Course Code Course Title GNS 102 Communication in English I	E	P	
- V		P	CU
CNIC 101 C'd' 1' E1 d' H	-2	0	2
GNS 121 Citizenship Education II	2	0	2
ENT 126 Introduction to Entrepreneurship I	2	1	3
MTH 211 Calculus	2	0	2
EEC 121 Electrical Power I	1	2	2
EEC 122 Electrical Machine I	1	2	2
EEC 123 Electronics I	1	2	2
EEC 124 Electrical Engineering Science II	1	2	3
EEC 125 Electrical and Electronics measurement and Instrumentation	1	3	2
EEC 126 Telecommunications I	1	2	2
EEC 127 Electrical Installation of Buildings	1	2	2
MSQ Mandatory Skills Qualification	0	0	0
TOTAL	15	16	24

YEAR II SEMESTER I

Course Code	Course Title	L	P	CU	СН
GNS 211	Use of English II	2	0	2	2
ENT 216	Introduction to Entrepreneurship II	2	1	3	3
MTH 202	Logic and Linear Algebra	2	0	2	2
EEC 211	Electrical Power II	1	2	2	3
EEC 212	Electrical Machines II	1	2	2	3
EEC 213	Electronics II	1	3	3	4
EEC 214	Electrical Circuit Theory	1	2	2	3
EEC 215	Use of Electrical and Electronics Instruments	1	2	2	3
EEC 216	Telecommunications II	1	2	2	3
EEC 217	Computer Hardware and Software I	1	2	2	3
EEC 218	Research Methods in Electrical Engineering	2	0	2	2
	TOTAL	15	16	24	31

^{*} All GNS courses are to be obtained in GNS curriculum

YEAR II SEMESTER II

Course Code	Course Title	L	P	CU	СН
GNS 202	Communication in English II	2	0	2	2
MTH 221	Trigonometry and Analytical Geometry	2	0	2	2
EEC 221	Electrical Power III	1	2	2	3
EEC 222	Computer Hardware and Software II	1	2	2	3
EEC 223	Electronics III	1	2	3	4
EEC 224	Electrical Circuit Theory II	1	2	2	3
EEC 225	Introduction to Industrial Automation	2	2	3	4
EEC 226	Project	0	0	4	4
	TOTAL	10	10	20	25

^{*} All GNS courses are to be obtained in GNS curriculum

Key

L - Lecture P - Practical

CU - Credit Unit

CH - Credit Hour

...AR ONE, SEMESTER SEE

Algebra And Elementary Trigonometry

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY							
COURSE: Algebra And Elementary Trigonometry	COURSE CODE: MTH 112	CONTACT HOURS: 2					
	CREDIT UNITS: 2	THEORETICAL: 2					
YEAR: I SEMESTER:	PRE-REQUISITE:	PRACTICAL: 0					

GOAL: This course is designed to provide the students with mathematical knowledge and skills essential for solving a range of engineering problems

GENERAL OBJECTIVES: On completion of this course, the students should 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.

PROGE	RAMME: NATIONAL D	OIPLOMA IN ELECTRIC	CAL AND ELE	CTRONICS ENGINEERIN	NG TECHNOLOGY	
COURSE: Algebra And Elementary Trigonometry			COURSE C	ODE : MTH 112	CONTACT HOURS: 2	
			CREDIT UN	NIT: 2	THEORETICAL: 2	,
YEAR:	I SEMESTER: I		PRE-REQU	ISITE:	PRACTICAL: 0)
COURS	SE SPECIFICATION:	THEORETICAL AND P	RACTICAL		•	
GOAL:	This course is designed t	o provide the students wi	th mathematica	l knowledge and skills esse	ntial for solving a range	of engineering
oroblem	ıs					
Genera	l Objective 1.0: Understa	and laws of indices and th	eir applications	in simplifying algebra exp	ressions.	
THEO	RETICAL CONTENT			PRACTICAL CONTEN	Т	
Week	Specific Learning	Teacher's Activities	Resources	Specific Learning	Teacher's Activities	Resources
	Outcome			Outcome		
1	1.1 Define index.	Explain index	Textbooks		Guide students to:	Calculators
			Journals	Establish the laws of	Establish the laws of	
	1.2 Establish the laws of	Explain the laws of	White Board	Indices.	Indices.	
	Indices.	indices.	Marker			
			Computer	Solve problems using the	Solve problems using	
	1.3 Explain how to		Projector	laws of indices	the laws of indices	
	solve simple	problems using the laws	Internet			
	problems using the	of indices.				
	laws of indices.					
Genera	l Objective 2.0: Understa	and theory of logarithms s	surds and their a	pplications in manipulating	g expression.	
2-3	2.1 Define logarithm	Explain logarithm	Textbooks		Guide students to:	Calculator
			Journals	Solve simple logarithms	Solve simple logarithms	
	2.2 Establish the four	Explain the four basic	White Board	problem.	problem.	
	basic laws of	laws of logarithm	Marker			

1		_		•
logarithm.		Computer		
		Projector		
2.3 Explain how to	Explain how to solve	Internet		
solve simple	simple logarithmic	Lecture Note		
logarithms problem.	problems.			
2.4 Define natural	Explain natural			
logarithm and	logarithm and common			
common logarithm.	logarithm		170	
2.5 Define characteristic	Explain characteristic		M_{ν}	
and mantissa.	and mantissa.		· CX / ·	
2.6 Explain how to read	Explain how to read the			
the logarithmic table				
	given numbers.	R		
2.7 Explain how to	Explain how to simplify			
simplify numerical	numerical expressions			
expressions using	using tables:			
tables:	e.g. 18D =			
e.g. 18D =	$3/4 \text{JPC}^2 \text{AM}^{\text{B}}$			
$3/4JPC^2AM^B$	find D when $J =$			
find D when J =	0935,			
0935,	0 = 35, P = 1.6			
0 = 35, P = 1.6	10^6 , C = 55, M =			
10^6 , C = 55, M =	00025			
00025	$\Pi = 3.142$			

		1				*
	$\Pi = 3.142$					
	2.8 Explain how to	Explain how to apply			, 10'	
	apply logarithm in	logarithm in solving				
	solving non-linear	non-linear equations.				
	equations.	e.g. $y = ax^n$,				
	e.g. $y = ax^n$,	logy=log a +				
	logy=log a +	$n \log x; y = bc^x,$				
	$n \log x; y = bc^x,$	logy = logb +		(U).		
	logy = logb +	$xlogc; y = a + bx^n,$		1/10.		
	$xlogc; y = a + bx^n,$					
	Log (y-a) = Logb	+ nlogx,		`(\),		
	+ nlogx,					
	2.9 Define surds.	Explain surds.				
	2.10 Explain how to	Explain how to reduce a				
	reduce a surd into	surd into its simplest	V			
	its simplest form.	form.	,			
			V			
	_	Explain how to solve				
	_	simple problems on				
	problems on surds.					
	al Objective 3.0: Underst		1	on of charts and graphs.		
4	•	Explain how to	Textbooks		Guide students to:	Calculator
	construct graphs of		Journals	Apply knowledge from	Apply knowledge from	
		functions such as:	White Board	3.1in termination as laws	3.1in termination as	
	Y + ax = b, n = 1,	Y + ax = b, n = 1,	Marker	from experimental data.	laws from experimental	

	2Y = CST(a+a)	2Y = CST(a+a)	Computer		data.	
	$Y=ax^k$, including	$Y=ax^k$, including	Projector			
	cases of	cases of asymbles.	Internet	Ask the students to draw	Ask the students to	
	asymbles.		Lecture Note	graphs.	draw graphs.	
	3.2 Explain how to	Explain how to apply				
	apply knowledge	knowledge from 3.1in				
	from 3.1in	termination as laws				
	termination as laws	from experimental data.		·40'		
	from experimental					
	data.					
	Objective 4.0: Know th			equations.		
5	•	Explain how to solve	Textbooks			Calculator
	-	quadratic equation by	Journals 🗸	Solve quadratic	Solve quadratic	
	1	factorisation.	White Board	equation by factorisation.	equation by factorisation	
	factorisation.		Marker			
			Computer			
	4.2 Explain how to solve	•	Projector			
			Internet			
	•		Lecture Note			
	completing squares.	squares.				
	4.2 E1-i14-	E1-in 100				
	•	Explain how to solve				
	=	quadratic equations by				
	equations by formula.	formula.				
	iofiliula.					
	4.4 Determine the roots.	Determine the roots.				

		1	T.		
	4.5 Explain how to form equations whose roots are given in different methods.	Explain how to form equations whose roots are given in different methods.			CONCAN
Genera	l Objective 5.0: Underst	and Permutations and Co	mbinations.		
6	5.1 Define permutation.	Explain permutation.	Textbooks		
	1	Explain examples of permutations.	Journals White Board Marker	MICH	
	5.3 Define combination.	Explain combination.	Computer Projector Internet	KCI.	
	-	Explain examples of combination.	Lecture Note		
	theorem nPr=n!/[!] giving examples e.g.: number of	Explain the theorem nPr=n!/[!] giving examples e.g.: number of ways of collecting two out of 8 balls.	260		
Genera	Objective 6.0: Underst	and the concept of set the	ory.		
7	 6.1 Establish ⁿC_r = ⁿC_n - r. 6.2 Define sets, subsets, and null sets. 	Explain ${}^{n}C_{r} = {}^{n}C_{n}$ -r. Explain sets, subset, and null sets	Textbooks Journals White Board Marker	Solve set theory problems using Venn diagrams.	Guide students to: Solve set theory problems using Venn diagrams

		Computer		
	Explain union,	Projector		
section and		Internet		
completion of sets.	completion of sets.	Lecture Note		
6.4 Explain how to draw	Explain how to draw			
	Venn diagrams to			
	demonstrate the			
concepts in $6.1 - 6.3$			2()	
	above.			
6.5 Explain how to	Explain how to			
calculate the size or	calculate the size or			
number of elements	number of elements in a			
in a given set.	given set.			
		10.		
		X		
	20) ,			
	V			
	`			

7.1 Define an	erstand the properties of ariting Explain an Arithmetic	Textbooks		Guide students to:	Calculator
Arithmetic	progression (A.P.).	Journals	Obtain the formula for	Obtain the formula for	
progression (A.P.)	, ,	White Board	nth term and the first n	nth term and the first n	
progression (14.11.)	•	Marker	terms of an A. P.	terms of an A. P.	
7.2 Explain how to	Explain how to obtain	Computer			
obtain the formula	*	· -	Ask the students to apply	Ask the students to	
	and the first n terms of	Internet	progression to solve	apply progression to	
first n terms of an		Lecture Note	problems.	solve problems.	
P.	71. MII 71. 1 .	Lecture 1 vote	problems.	sorve problems.	
1.					
7.3 Give examples of	the Explain examples of the				
above e.g. find the					
_	ries20 th term of the series				
e.g.: 2, 4, 6,	e.g.: 2, 4, 6, 8 Find	•			
	also the series of the firs				
series of the first 2					
terms.	20 terms.				
terms.					
7.4 Define geometric	Explain geometric				
progression (G.P.)					
progression (G.1.)	progression (d.i.)				
7.5 Explain how to	Explain how to obtain				
obtain the formula	1				
for the nth term an					
the first n terms of					
geometric series	geometric series.				
geometric series	geometric series.				
	<u> </u>				<u> </u>
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						*
	7.6 State examples of					
	7.5 above e.g.; given	Explain examples of 7.5				
	the sequences $1/3$, 1,	above e.g.; given the			, 10,	
		sequences 1/3, 1, 3 ½				
	20th term and hence	find the 20 th term and		•		
	the sum of the 1st 20	hence the sum of the				
	terms.	1 st 20 terms.				
	7.7 Define Arithmetic			(U)		
	Mean (AM) and	Explain Arithmetic				
	Geometric Mean	Mean (AM) and				
	(G.M.).	Geometric Mean				
		(G.M.).				
	7.8 Define convergence					
	of series.	Explain convergence				
		of series.				
	7.10 Define divergence					
	of series.	Explain divergence of				
		series.				
Genera	l Objectives 8.0: Underst	and the binomial theorem	and its application	of expressions in appro	ximations.	
10	8.1 Explain the method	Explain the method	Textbooks			
	of mathematical	of mathematical	Journals			
	induction.	induction.	White Board			
			Marker			
	8.2 State the binomial	Explain the binomial	Computer			
	theorem for a	theorem for a positive	Projector			
	positive integral	integral index.	Internet Lecture			

	<u></u>	T	<u></u>		_
index.		Note			
8.3 Explain how to	Explain how to expand			. 10"	
expand expressions	expressions of the forms				
of the forms $(x=y)^2$,	$(x=y)^2$, $(x^2-$				
$(x^2-1)^8$ applying	1) ⁸ applying binominal		X		
	theorem.				
8.4 Explain how to find	Explain how to find the		2()		
the coefficient of	coefficient of				
	a particular term in the				
the expansion of	expansion of				
simple binomial					
-	simple binomial				
expressions.	expressions.				
0.5 [1	E 1:1 4 6 141	0			
•	Explain how to find the				
the middle term in	middle term in the				
the expansion of	expansion of				
binomial expression	binomial expression				
8.6 State the binomial	Explain the binomial				
theorem for a	theorem for a rational				
rational index.	index.				
8.7 Explain how to	Explain how to expand				
expand expressions	expressions of the form:				
of the form: $(1=x)^{-1}$	$(1-x)^{-1}$, $(1-x)^{-1/2}$ (1-				
$(1-x)^{1/2}(1-$	x) applying				

	x) applying binomial theorem.	binomial theorem.			(A)	
	8.8 Explain how to	Explain how to expand				
	expand and approximate	and approximate				
	expressions of the	expressions of the				
	type (1.001) n, $(0.998)^n$,	type (1.001) n, $(0.998)^n$,				
	$(1=x)^{1/2}$, $(-x)^-$ to a	$(1=x)^{1/2}$, $(-x)^-$ to a				
	state degree of accuracy	state degree of accuracy				
	applying/scalar	applying/scalar				
	expression.	expression.		11/4		
Genera	l Objectives 9.0: Unders	tand the basic concepts ar	nd manipulation	of vectors and their appli	cations to the solution of e	engineering
problem	ıs.			·(\)		
11 - 12	9.1 Define vectors	Explain vectors	Textbooks /		Guide students to:	
			Journals 🦱	Apply the techniques of	Apply the techniques of	
	9.2 Explain the	Explain the	White Board	vectors to solve various	vectors to solve various	
	representations of	representations of	Marker	problems	problems	
	vectors.	vectors.	Computer			
			Projector	Apply the parallelogram	Apply the parallelogram	
	9.3 Define a position	Explain a position	Internet	law in solving	law in solving	
	vector.	vector.	Lecture Note	problems including	problems including	
		OK.		addition and subtraction	addition and subtraction	
	9.4 Define unit vector.	Explain unit vector.		of vectors.	of vectors.	
	9.5 Explain scalar	Explain scalar multiple		Compute the resultant	Compute the resultant	
	multiple of a vector.	of a vector.		of coplanar forces acting	of coplanar forces	
		'		at a point using	acting at a point using	
	9.6 List the	Explain the		algebraic and graphical	algebraic and graphical	
	vector. 9.4 Define unit vector. 9.5 Explain scalar multiple of a vector.	vector. Explain unit vector. Explain scalar multiple of a vector.	Lecture Note	problems including addition and subtraction of vectors. Compute the resultant of coplanar forces acting at a point using	problems including addition and subtraction of vectors. Compute the resultant of coplanar forces acting at a point using	

characteristics of	characteristics of		method	method	
parallel vectors.	parallel vectors				
			Apply the techniques	Apply the techniques	
9.7 Identify quantities	Explain quantities		of resolution and	of resolution and	
that may be	that may be classified as		resultant to the solution	resultant to the solution	
classified as vector	vector e.g.		of problems involving	of problems involving	
e.g. displacement,	displacement, velocity,		coplanar forces.	coplanar forces.	
velocity,	acceleration, force, etc.				
acceleration, force,			Apply vectorial	Apply vectorial	
etc.			techniques in solving	techniques in solving	
			problems involving	problems involving	
9.8 Explain how to	Explain how to compute		relative velocity.	relative velocity.	
compute the	the modules of any				
modules of any	given vector up to 2 and		Compute the	Compute the	
given vector up to	3 dimensions.		scalar product of given	scalar product of given	
2 and 3 dimensions.			vectors.	vectors.	
9.9 State the	Explain the		Compute the	Compute the	
parallelogram law in	parallelogram law in		scalar product of given	scalar product of given	
solving problems	solving problems		vectors.	vectors.	
including addition	including addition and	·			
and subtraction of	subtraction of vectors.		Calculate the	Calculate the	
vectors.			direction ratios of given	direction ratios of given	
			vectors.	vectors.	
9.10 Explain how to	Explain how to apply				
apply the	the parallelogram law in		Calculate the	Calculate the	
parallelogram law in	solving		angle between two	angle between two	

					*
problems including	addition and subtraction	1	product	product	
addition and	of vectors.				
subtraction of				, 10"	
vectors.					
9.11 Explain	Explain components of				
components of a	a vector			•	
vector					
9.12 Explain orthogonal	Explain orthogonal	ı			
components.	components.				
9.12 Resolve a vector	Explain a vector into its				
into its orthogonal	orthogonal components.				
components.					
9.13 List characteristics					
of coplanar localized	of coplanar localized				
vectors	vectors				
9.14 Define the resultant	_	ı			
or composition of	or composition of	ı			
coplanar vectors.	coplanar vectors.	ı			
		ı			
9.15 Explain how to	Explain how to compute				
compute the	the resultant of coplanar				
resultant of coplanar	forces acting at a point	I			

forces acting at a	using algebraic and			
point using	graphical method			
algebraic and				
graphical method				
9.16 Explain how to	Explain how to apply			
apply the techniques	the techniques		, The state of the	
of resolution and	of resolution and			
resultant to the	resultant to the solution			
solution of	of problems involving			
problems involving	coplanar forces.			
coplanar forces.				
9.17 Explain how to	Explain how to apply			
apply vectorial	vectorial techniques in			
techniques in	solving problems	,		
solving problems	involving relative			
involving relative	velocity.			
velocity.				
9.18 State the scalar	Explain the scalar			
product of two	product of two vectors.			
vectors.	00			
9.19 Explain how to	Explain how to compute			
compute the	the scalar product			
scalar product	of given vectors.			
of given vectors.	of given vectors.			
of given vectors.				

						•
		Explain the cross product of two vectors.			OUCAI	
	calculate the direction ratios of	Explain how to calculate the direction ratios of given vectors.		ich		
	calculate the angle between two vectors using the	Explain how to calculate the angle between two vectors using the scalar product.		ECHIM.		
General	Objectives 10.0: Unders	stand the concepts of equa	tions and apply	it to engineering problems		
13-14	10.1 Explain the concept of equation, i.e. AX + B = D where A and B are expressions.	Explain the concept of equation, i.e. AX + B € D where A and B are expressions.	Textbooks Journals White Board Marker Computer Projector	Solve carious equations as indicated in section 10.	Guide students to: Solve carious	Calculator
	10.2 List different types of equations: • Linear • Quadratic • Cubic, etc	Explain different types of equations: Linear Quadratic Cubic, etc.	Internet Lecture Note	Apply algebraic and graphical methods in solving two simultaneous equations a linear equation and a quadratic	Apply algebraic and graphical methods in solving two simultaneous equations a linear	

		1	T		<u> </u>
			equation	equation and a	
10.3 State examples of	_ •			quadratic equation	
linear simultaneous	linear simultaneous				
equations with two	equations with two		Apply the algebraic and	Apply the algebraic	
unknowns and	unknowns and		graphical methods in	and graphical methods	
simultaneous	simultaneous equations		solving two simultaneous	in solving two	
equations with at	with at least one		and quadratic equations.	simultaneous and	
least one quadratic	quadratic equation			quadratic equations.	
equation.			, (U)		
10.4 Explain how to	Explain how to apply		Apply determinants of	Apply determinants of	
apply algebraic and	algebraic and graphical		order 2 and 3 in solving	order 2 and 3 in	
graphical methods	methods in solving two		simultaneous linear	solving simultaneous	
in solving two	simultaneous equations a		equations.	linear equations.	
simultaneous	linear equation and a				
equations a linear	quadratic equation				
equation and a					
quadratic equation		Y			
10.5 Explain how to	Explain how to apply the				
	algebraic and graphical				
and graphical	methods in solving two				
methods in solving	simultaneous and				
two simultaneous	quadratic equations				
and quadratic					
equations.					
10.6 Define a	Explain a determinant of				
determinant	n th order				

			1			*
	of n th order.					
	10.7 Explain how to	Explain how to apply			(1)	
	apply	determinants of order 2				
	determinants of	and 3 in solving				
	order 2 and 3 in	simultaneous linear				
	solving	equations				
	simultaneous					
	linear equations.			(U)		
General	Objectives 11.0: Under	stand the definition, man	ipulation and ap	plication of trigonometric	functions.	
15	11.1 Define the basic	Explain the basic	Textbooks			
	trigonometric	trigonometric ratios,	Journals	$\mathcal{L}(X)$		
	ratios, sine, cosine	sine, cosine and tangent	White Board			
	and tangent of	of an angle	Marker			
	an angle.		Computer			
			Projector	,		
	11.2 Derive the other	Explain the other	Internet			
	trigonometric	trigonometric ratios:	Lecture Note			
	ratios; cosecant,	cosecant, secant and	,			
	secant and	cotangent using the				
	cotangent using the					
	basic trigonometric	ratios in 11.1 above				
	ratios in 11.1					
	above.					
		N				
	11.3 Derive identities	Explain identities				
	involving the	involving the				
	trigonometric ratios	trigonometric ratios of				

of the form;	the form:	
$\cos^2 + \sin^2 = 1$,	$\cos^2 + \sin^2 = 1$,	
$Sec^2=1=tan2$, etc.	$Sec^2=1=tan2$, etc.	
11.4 Derive the	Explain the compound	
	angle formulae for sin	
formulae for sin	A-B), Cos (A-B) and	
(A-B), Cos (A-B)	Tan (A-B).	
and Tan (A-B).		

EVALUATION

C/A:40%

EXAMS: 60% TOTAL: 100%

ASSESSMENT STRUCTURE

TYPE OF	YPE OF PURPOSE AND NATURE OF ASSESSMENT	
ASSESSMENT		
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feedback.	20
Course Work	At least 5 home works to be assessed by the teacher	20
TOTAL		100

Technical Drawing

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY					
COURSE TITLE: Technical Drawing	COURSE CODE: MEC 111	CONTACT HOURS: 4			
	CREDIT UNITS: 3	THEORETICAL: 1			
YEAR: SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 3			

GOAL: This course is designed to acquaint students with the fundamentals of technical drawing and its applications in engineering technology

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

- 1.0 Know different drawing instrument, equipment and materials
- 2.0 Understand the essentials of graphical communications
- 3.0 Know the construction of simple geometrical figures and sections
- 4.0 Know the Construction of isometric and oblique drawing and projection
- 5.0 Understand principles of orthographic projections.
- 6.0 Understand the intersections of regular solids

PROGE	PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY					
COURSE TITLE: Technical Drawing			COURSE CODE: MEC 111 C		ONTACT HOURS: 4	
			CREDIT UN	NITS: 3	THEORETICAL: 1	
YEAR:	SEMESTER: I		PRE-REQU	ISITE:	PRACTICAL: 3	
GOAL:	This course is designed to acquain	students with the fundam	entals of techn	ical drawing and its	applications in engineering	ng technology
COURS	SE SPECIFICATION: THEORE	TICAL AND PRACTICA	AL CONTEN	T		
General	Objective 1.0: Know different dra	wing instruments, equipm	ent and materi	als		
THEOR	ETICAL			PRACTICAL		
Week	Specific Learning	Teachers Activities	Resources	Specific Learning	Teachers Activities	Resources
	Outcomes			Outcomes		
	1.1 List different types of	Explain different types	Marker		Guide students to:	Complete set
	drawing instruments,	of drawing instruments,	Whiteboard	Identify the	Identify the different	of drawing
	equipment and materials.	equipment and materials	Journals	different types of	types of drawing	instruments
1-2			Textbooks	drawing	instruments, equipmen	
	1.2 Outline the uses of the	Explain the uses of the	Computer	instruments,	and materials.	Drawing
	various instruments,	various instruments,	Internet	equipment and		Boards
	equipment and materials	equipment and	Projector	materials.		
		materials			Observe the	
	1.3 State the precautions			Observe the	precautions necessary	
	necessary to preserve items	Explain the precautions		precautions	to preserve the items	
	1.1 above.	necessary to preserve		necessary to	identified above.	
		items 1.1 above		preserve the items		
				identified above.		
					Use each of the items	

Use each of the

items mentioned

mentioned above.

				above.		
					Maintain the various	
				Maintain the	instruments and	
				various	equipment.	
				instruments and		
				equipment.		
Genera	al Objective 2.0: Understand the ess	entials of graphical comm	unications			1
	2.1 Explain different types of	Explain different types	Marker		Guide students to:	Complete set
3-4	graphic Communications.	of graphic	Whiteboard	Illustrate the	Illustrate the various	of drawing
		Communications.	Journals	various	conventions present	instruments
	2.2 Describe various conventions		Textbooks	conventions	in graphical	
	present in graphical	Explain various	Computer	present in	productions of	Drawing
	productions of construction	conventions present in	Internet	graphical	construction lines,	Boards
	lines, finished lines, hidden	graphical productions of	Projector	productions of	finished lines, hidden	
	and overhead details	construction lines,	-	construction lines,	and overhead details	
	projections, centre lines, break	finished lines, hidden		finished lines,	projections, centre	
	lines, dimensioning of plane,	and overhead details		hidden and	lines, break lines,	
	elevation and sections of	projections, centre lines,		overhead details	dimensioning of	
	objects.	break lines,		projections, centre	plane, elevation and	
	-	dimensioning of plane,		lines, break lines,	sections of objects.	
		elevation and sections of		dimensioning of	-	
	2.3 State the various standards of	objects.		plane, elevation		
	drawing sheets.			and sections of		
		Explain the various		objects.	Prepare drawing	
		standards of drawing			sheets with the	
	2.4 Explain how to print letters	sheets.		Prepare drawing	following:	
	and figures of various forms			sheets with the	• Margins	
	and characters.	Explain how to print		following:	Title block etc.	

	2.5 Describe conventional signs,	letters and figures of		 Margins 		
	symbols and appropriate	various forms and		Title block	State the various	
	lettering characters	characters.		etc.	standards of drawing sheets.	
		Explain conventional		State the various		
		signs, symbols and		standards of	Print letters and	
		appropriate lettering		drawing sheets.	figures of various	
		characters			forms and characters.	
				Print letters and		
				figures of various		
				forms and	Illustrate	
				characters.	conventional signs,	
					symbols and	
				Illustrate	appropriate lettering	
				conventional signs,	characters.	
				symbols and		
				appropriate		
				lettering		
				characters.		
lenera	Objective 3.0: Know the construction	ction of simple geometrica	l figures and se	ections		
	3.1 Explain the purpose of	Explain the purpose of	Marker		Guide students to:	Complete set
	geometrical construction in	geometrical construction		Construct parallel	Construct parallel	of drawing
	drawing parallel lines.	in drawing parallel lines.	Journals	and perpendicular	and perpendicular	instruments
			Textbooks	lines.	lines.	
	3.2 Define geometric figures:	Explain geometric	Computer			Drawing
5-7	• Circle	figures	Internet	Construct and		Boards
	Quadrilateral	• Circle	Projector	bisect lines, angles	Construct and bisect	
	Polygon, etc.	 Quadrilateral 		and areas.	lines, angles and	
			40			

3.3 Explain the properties of	Polygon, etc.		areas.
geometric figures, e.g.:		Divide a straight	
• Sides	Explain the properties of	line into given	
 Diagonal 	geometric figures, e.g.:	number of equal	Divide a straight line
• Radius	• Sides	parts.	into given number of
• Diameter	 Diagonal 		equal parts.
 Normal 	• Radius	Identify polygons	
• Tangent	• Diameter	(regular or	Identify polygons
Circumference etc.	 Normal 	irregular).	(regular or irregular).
3.4 Explain the steps in construction of simple geometrical figures and sections	 Tangent Circumference etc. Explain the steps in construction of simple geometrical figures and sections 	Construct regular polygons with N sides in a given circle, given: • Distance across flats	Construct regular polygons with N sides in a given circle, given: • Distance across
3.4 Define an ellipse.		Distance	flats
 3.5 Explain the following drafting techniques: Projection method Measurement method Transposition method. 	Explain an ellipse. Explain the following drafting techniques: • Projection method • Measurement method • Transposition method.	across corners. Carryout simple geometrical constructions on circles e.g.: • Diameter of a circle of a given circumferenc	 Distance across corners. Carryout simple geometrical constructions on circles e.g.: Diameter of a circle of a circle of a given circumference. The

e. circumference	
• The to a circle of a	
circumferenc given diameter	
e to a circle • A circle to pass	
of a given through 3 points	
diameter • A circle to pass	
• A circle to through 2 points	
pass through and touch a	
3 points given line	
• A circle to • A circle to	
pass through touch a given	
2 points and smaller circle	
touch a given and a given line	
line • Tangents to	
A circle to circles at	
touch a given various points	
smaller circle • An arc of	
and a given radius tangent	
line to two lines at	
• Tangents to an angle to	
circles at less than and	
various more than 90	
points • An arc externally	
An arc of tangent to two	
radius circles:	
tangent to inscribing and	
two lines at circumscribing	
an angle to circles	

				less than and		
				more than 90		
				• An arc		
				externally		
				tangent to two		
				circles:		
				inscribing and	Construct ellipse by	
				circumscribing	using:	
				circles	 Trammel method 	
					 Concentric 	
				Construct ellipse	circle method.	
				by using:		
				 Trammel 		
				method	Construct plane	
				 Concentric 	scales and diagonal	
				circle	scales, using	
				method.	appropriate	
					instruments.	
				Construct plane		
				scales and diagonal		
				scales, using		
				appropriate		
				instruments.		
Genera	al Objective 4.0: Know the construct	tion of isometric and oblic	que drawing an	d projection		
8-10	4.1 Explain isometric and oblique	_	Marker		Guide students to:	Complete set
	projections.	oblique projections	Whiteboard			of drawing
			Journals	Draw a square in	Draw a square in	instruments
	4.2 Explain steps in construction	Explain steps in	Textbooks	isometric and	isometric and oblique	
			43			
	<i>(D)</i>		.5			
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of isometric and oblique	construction of	Computer	oblique forms.	forms.	Drawing
drawing and projection	isometric and oblique	Internet			Boards
	drawing and projection	Projector	Draw a circle in	Draw a circle in	
			Isometric and	Isometric and oblique	
			oblique forms.	forms.	
			Draw an ellipse in	Draw an ellipse in	
			Isometric and	Isometric and oblique	
			oblique forms.	forms.	
			Draw a polygon	Draw a polygon with	
			with a minimum of	a minimum of eight	
			eight sides in	sides in Isometric	
			Isometric and	and oblique forms.	
			oblique forms.		
				Dimension holes,	
			Dimension holes,	circles, arcs and	
			circles, arcs and	angles correctly on	
			angles correctly on	isometric and oblique	
			isometric and	projections.	
			oblique		
			projections.	Use appropriate convention symbols	
			Use appropriate	and abbreviations.	
			convention		
			symbols and		
			abbreviations.		
WATIL					
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Genera	l Objective 5.0: Understand princip			T		T
	5.1 Explain the principle of	Explain the principle of			Guide students to:	Complete set
	orthographic projection.	orthographic	Whiteboard	Project views of	Project views of	of drawing
		projection.	Journals	three-dimensional	three-dimensional	instruments
	5.2 Illustrate the principle planes		Textbooks	objects on to the	objects on to the	
	of projection:	Explain the principle	Computer	basic planes of	basic planes of	Drawing
11-13	 Vertical plane 	planes of projection:	Internet	projection in both	projection in both	Boards
	 Horizontal plane. 	 Vertical plane 	Projector	first and third	first and third angle	
		Horizontal plane.		angle to obtain:	to obtain:	
	5.3 Explain why the first and third			• The front view	• The front view	
	angles are used and the second	Explain why the first		or elevation	or elevation	
	and fourth angles not used.	and third angles are		• The top view	• The top view or	
		used and the second		or plan.	plan.	
		and fourth angles not		• The side view	• The side view	
		used.				
Genera	l Objective 6.0: Understand the inte	ersections of regular solids				•
	6.1 Explain interpretation or	Explain interpretation or	Marker	Draw the lines of	Guide students to:	Complete set
12 - 15	intersections of solids	intersections of solids.	Whiteboard	intersections of the	Draw the lines of	of drawing
			Journals	following regular	intersections of the	instruments
	6.2 Explain the intersections of	Explain the	Textbooks	solids and planes	following regular	
	regular solids	intersections of regular	Computer	in both first and	solids and planes in	Drawing
		solids	Internet	third angles.	both first and third	Boards
			Projector	Two square-	angles.	
				prisms	Two square-	
				meeting at	prisms meeting	
				right angles.	at right angles.	
				• Two	Two dissimilar	

	square prisms meeting at an
	meeting at an angle.
	angle. • Two dissimilar
	• Two square prisms
	dissimilar meeting to an
	square prisms angle
	meeting to an • A hexagonal
	angle prism meeting a
	A hexagonal square prism at
	prism right angles.
	meeting a • Two dissimilar
	square prism cylinders
	at right meeting at an
	angles. angle.
	Two Two dissimilar
	dissimilar cylinders
	cylinders meeting at right
	meeting at an angle, their
	angle. centres not being
	• Two in the same
	dissimilar vertical plane
	cylinders
	meeting at
	right angle,
	their centres
	not being in
	the same
	vertical plane
**	46
WALL	

Basic Workshop Practice and Technology

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY				
COURSE TITLE: Basic Workshop Practice and	COURSE CODE: MEC 113	CONTACT HOURS: 4		
Technology	CREDIT UNITS: 3	THEORETICAL: 1		
YEAR: SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 3		

GOAL: This course is designed to acquaint students with knowledge and skills of workshop safety practices as well as the use and care of basic tools and equipment in workshop operations

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

- 1.0 Know General Factory Acts, Safety Regulations and safety precautions
- 2.0 Understand safety inspection
- 3.0 Use basic marking out, metal removal and filing tools
- 4.0 Use basic measuring and testing equipment
- 5.0 Perform drilling operations
- 6.0 Perform various metal joining operations
- 7.0 Perform the various wood working tools and operations
- 8.0 Perform reaming operations
- 9.0 Perform tapping operations
- 10.0 Perform basic operations on plastics

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY					
COURSE TITLE: Basic Workshop Technology and	COURSE CODE: MEC 113	CONTACT HOURS: 4			
Practice	CREDIT UNITS: 3	THEORETICAL: 1			
YEAR: SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 3			
COURSE SPECIFICATION: THEORETICAL AND PRACE	TICAL CONTENT				

GOAL: This course is designed to acquaint students with knowledge and skills of workshop safety practices as well as the use and care of basic tools and equipment in workshop operations

General Objective 1.0: Know General factory acts, safety Regulations and safety precautions

THEOF	RETICAL	· · · · ·	. ()	PRACTICAL		
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning	Teachers'	Resources
				Outcome	Activities	
	1.1 Explain Nigeria Factories	Explain Nigeria Factories	Lecture notes		Guide students to:	Videos of safe
	Acts and Safety	Acts and Safety	Textbooks	Demonstrate all	Demonstrate all safety	and unsafe
	Regulations	Regulations	Whiteboard	safety rules and	rules and regulations	acts
			Marker	regulations in the	in the workshop	
		Explain safety Rules and	Computer	workshop		Safety charts
	1.2 Explain safety Rules and	Regulations.	Projector		Use safety equipment	
	Regulations.		Internet	Use safety	and Personal	Personal
		Explain standard		equipment and	Protection Equipment	Protective
1-2	1.3 Explain standard	housekeeping and its		Personal Protection		equipment
	housekeeping and its	procedures		Equipment	Follow safety	
	procedures				procedures and	
		State safety precautions		Follow safety	precautionary	
	1.4 State safety precautions			procedures and	measures	
		Provide list of safety		precautionary		

					\sim	<u>.</u>
	1.5 Provide list of safety	precautions in the		measures		
	precautions in the	workshop			·CX	
	workshop					
		Explain some unsafe acts				
		in the workshop.				
	1.6 Explain some unsafe acts					
	in the workshop.	List out protective wears				
		in the workshop.				
	1.7 List out protective wears					
	in the workshop.	Explain Personal				
		Protective Equipment		•		
	1.8 Explain Personal	(PPE) such as:		*		
	Protective Equipment					
	(PPE) such as:	• Safety boots				
	 Safety boots 	• Goggles	}			
	Goggles	• Coverall				
	• Coverall	 Hand gloves, etc. 				
	 Hand gloves, etc. 	0,				
Genera	al Objective 2.0: Understand safe	ty inspection	1	l	l	1
	2.1 Define safety inspections	Explain safety	Lecture notes		Guide students to:	Videos of safe
		inspections	Textbooks	Inspect the following	Inspect the following	and unsafe
	2.2 Describe different types of		Whiteboard	equipment in the	equipment in the	acts
	safety inspections	Explain different types	Marker	workshops:	workshops:	
		of safety inspections	Computer	• Air receivers	Air receivers	Safety charts
	2.3 Explain the importance of		Projector	 Ropes and 	• Ropes and	
	safety inspection in the	Explain the importance	Internet	Chains	Chains	Personal
3	workshop	of safety inspection in				Protective

	 2.4 State frequency of safety inspections and personnel to be involved 2.5 Explain how to carry out safety inspections on the following equipment: Air receivers Ropes and Chains Pulley blocks Forklift carriage Mobile and overhead cranes Derricks and gantries 2.6 Emphasize the use of relevant personal protective equipment while on inspection 	the workshop Explain frequency of safety inspections and personnel to be involved Explain how to carry out safety inspections on the following equipment: • Air receivers • Ropes and Chains • Pulley blocks • Forklift carriage • Mobile and overhead • Derricks and gantries Explain the use of relevant personal		 Pulley blocks Forklift carriage Mobile and overhead cranes Derricks and gantries 	 Pulley blocks Forklift carriage Mobile and overhead cranes Derricks and gantries 	equipment
	,	protective equipment while on inspection				
Gener	ral Objective 3.0: Use basic marki	-	iling tools		l	<u> </u>
Gener	3.1 Describe types of	Explain types of	Lecture notes		Guide students to	Work bench
				Differentiate		WOIK DELICIT
	marking-out tools and	marking-out tools and	Textbooks	Differentiate	Differentiate between:	D 1 .
4-5	how to use it on the bench	how to use it on the	Whiteboard	between:	Hand tools and	Bench vice

		1			
correctly	bench correctly	Marker	 Hand tools 	machine tools	
		Computer	and machine	Bench tools	Hammers
3.2 Explain the need for care	•	Projector	tools	and machine	
in the use of the tools	in the use of the tools	Internet	 Bench tools 	cutting tools	Set of drills
			and machine		
3.3 Explain the effect of not	Explain the effect of not		cutting tools	Identify marking out	Steel rule
using this tools properly	using this tools properly			tools used on the	
and keeping them in good	and keeping them in		Identify marking out	bench typical	Scribers
working condition	good working condition		tools used on the	workshop practical	
			◆bench typical	exercises.	Scribing
3.4 Explain how to maintain:	Explain how to maintain:		workshop practical		blocks
• Files	• Files		exercises.	Use marking-out tools	
 Dividers 	 Dividers 			on the bench correctly	
• Saws	 Saws 		Use marking-out	Identify this bench	Inside and
 Gauges 	• Gauges		tools on the bench	cutting tools	outside
Tri squares	 Tri squares 		correctly		calipers
 Bevel edge square etc. 	Bevel edge		Identify this bench	Produce simple	
	square etc.		cutting tools	objects using	Surface plate
3.5 Explain the role of the	Explain the role of the			bench/hand tools such	
following tools in the	following tools in the		Produce simple	as:	Dividers
mechanical workshop:	mechanical workshop:		objects using	• Files	Centre punches
• Scribers	 Scribers 		bench/hand tools	• Chisels	
• Inside and outside	Inside and		such as:	 Scrapers 	Files
caliper	outside caliper		• Files	• Saws etc.	
• Centre	Centre		 Chisels 		Scrapers
• Files	• Files		 Scrapers 	Maintain files,	
• Scrapers	 Scrapers 		• Saws etc.	dividers, saws, gauges	
	•			try squares, bevel	

	• File card	• File card		Maintain files, ed	ge square etc.	
				dividers, saws,		
				gauges try squares, W	rite process sheet or	
				bevel edge square op	eration layout for	
				etc. the	e component to be	
				pr	oduced.	
				Write process sheet		
				or operation layout		
				for the component to		
				be produced.		
Gener	al Objective 4.0: Use basic measu	uring and testing equipment				
	4.1 Explain the methods of	Explain the methods of	Lecture notes		Guide students to:	Micrometers-
	using the measuring	using the measuring	Textbooks	Identify the differences	Identify the	external &
	equipment	equipment	Whiteboard'	and similarities between	differences and	internal
			Marker▶	measuring and testing	similarities between	
		Explain the advantage of	Computer	equipment in mechanical	measuring and	Vernier
	4.2 Explain the advantage of	using the equipment	Projector	workshop with regards	testing equipment in	calipers
6-7	using the equipment	properly and keeping	Internet	to:	mechanical	
	properly and keeping them	them in good working		 Principle of 	workshop with	Steel rule
	in good working condition	condition		operation	regards to:	
				 Construction 	• Principle of	
		Explain:		• Use	operation	Test
	4.3 Explain:	The principle of			 Constructio 	mandrel/test
	• The principle of	operation and			n	bar
	operation and	construction of a			• Use	
	construction of a	micrometer screw				070 x 300 mm
	micrometer screw	gauge		Perform simple measuring	Perform simple	long
	gauge	• The least count of		exercises using steel rules	, measuring	dial indicator

• The least count of	micrometer		vernier calipers and	exercises using	with stand
micrometer	 Principle of 		micrometers.	steel rules,	spirit level
 Principle of operation 	operation and			vernier calipers	surface
and construction of a	construction of a			and micrometers.	
Vernier caliper and the	Vernier caliper				Roughness
least count.	and the least		Use dial indicators to:	Use dial	tester
• The types of	count.		 Set up jobs on the 	indicators to:	(portable
micrometers	 The types of 		lathe	• Set up	type)
• The types of Vernier	micrometers		Roundness testing	jobs on	
calipers	• The types of		etc.	the lathe	SURF TEST,
 Accuracy of a steel 	Vernier calipers			 Roundnes 	
rule	 Accuracy of a 	. ()		s testing	90° angle
	steel rule		Carry out exercises	etc.	gauge
			involving flatness,		straight edge
	Evalsia the animainte an		squareness, straightness	Carry out exercises	
	Explain the principle and construction of a dial		and surface finish test.	involving flatness,	Vernier
4.2 E1-in 4h - main -in 1 1	indicator, their types and			squareness,	protractor.
4. 2 Explain the principle and construction of a dial	their accuracy			straightness and	
	men accuracy		Perform taper	surface finish test.	
indicator, their types and	Differentiate between the		measurement on jobs		
their accuracy	use of vernier protractor		using vernier protractor	Perform taper	
4.3 Differentiate between the	and sine bar and their		and sine bars.	measurement on	
use of vernier protractor	limitations.			jobs using vernier	
and sine bar and their				protractor and	
limitations.				sine bars.	
miniauons.			Inspect jobs using simple		
			comparators	Inspect jobs using	
				simple comparators	

Genera	d Objective 5.0: Perform drilling	operations				
	5.1 Explain the nomenclature	Explain the	Lecture notes		Guide students to:	Radial drilling
	of a twist drill	nomenclature of a twist	Textbooks	Operate different types of	Operate different	machine
		drill	Whiteboard	drilling machine	types of drilling	
	5.2 Explain types of drilling		Marker		machine	Bench drilling
	machine	Explain types of drilling	Computer			machine
	 Pillar 	machine	Projector	Carry out drilling,	Carry out drilling	
	 Column 	• Pillar	Internet	operations such as:	operations such	Pillar drilling
	• Multi spindle etc.	• Column		Counter-boring	as:	machine
		• Multi spindle etc.		Counter-sinking	• Counter-	
	5.3 Explain the type of drilling				boring	Column type
	operation that can be	Explain the type of			• Counter-	drilling
	carried out on the	drilling operation that can			sinking	machine
	following:	be carried out on the		Grind drill bits accurately		
8-9	 Radial drilling 	following:			Grind drill bits	Counter
	machine	Radial drilling			accurately	boring drills
	 Bench drilling machine 	machine /	Ť	Select correct drilling		G .
	 Pillar drilling machine 	 Bench drilling 		speeds	Select correct	Counter
	 Column type drilling 	machine			drilling speeds	sinking drills
	machine	 Pillar drilling 				C 4 1 11
		machine		Indicate the	Indicate the	Centre drills
		Column type		nomenclature of a twist	nomenclature of a	D - 1 4 - 1
		drilling machine		drill:	twist drill:	Pedestal
				Clearance angle	• Clearance	grinding
		Explain the differences		Rake angle	angle	machine attached with
	5.4 Differentiate between:	between:		• Point angle etc.	• Rake	attached with a twist drill
	 Drilling and boring 	Drilling and boring			angle	
					• Point	grinding

		T	1			,
	operations	operations			angle etc.	attachment
	 Radial drilling and 	 Radial drilling and 				
	sensitive drilling	sensitive drilling		Calculate the speeds of	Calculate the	
	machine	machine		various sizes of drills	speeds of various	
		Explain the formulae for		using appropriate	sizes of drills	
	5.5 Explain the formulae for	calculation of speed of		formulae.	using appropriate	
	calculation of speed of	various sizes of drills			formulae.	
	various sizes of drills					
Genera	l Objective 6.0: Perform various	metal joining operations		.4U		
	6.1 Explain the various metal	Explain the various	Lecture notes		Guide students to:	Various types
	joining methods	metal joining methods	Textbooks	Identify various metal	Identify various	of Fasteners
			Whiteboard	joining operations	metal joining	Brazing rods
	6.2 Describe the process of	Explain the process of	Marker	Ť	operations	
	joining metals using the	joining metals using the	Computer			Flash gas
	following methods:	following methods:	Projector	Fabricate metal container	Fabricate metal	lighter
	 Brazing 	Brazing	Internet	by Knock-up joining	container by	
	 Threaded Fasteners 	Threaded			Knock-up joining	Soldering flux
	 Soldering 	Fasteners				Stock and dies
10-11	C	 Soldering 		Join metals by the	Join metals by the	(set) metric
		QV		grooving technique	grooving	
	6.3 Explain how to carry out	Explain how to carry out			technique	
	soft soldering	soft soldering				
				Fabricate metal container	Fabricate metal	
	•			by knock-up joining	container by	
					knock-up joining	
				Carry out soft soldering	Carry out soft	
	NO.				soldering	

Genera	General Objective 7.0: Perform the various wood working tools and operations							
	7.1 Explain the applications	Explain the applications	Lecture notes	Identify the tools used for	Identify the tools	Tri Square		
	of the following:	of the following:	Textbooks	wood work	used for wood			
	 Geometric/marking 	 Geometric/markin 	Whiteboard		work	Divider		
	out tools e.g. tri	g out tools e.g. tri	Marker					
	square, dividers and	square, dividers	Computer	Mark out and prepare	Mark out and	Gauges		
	gauges	and gauges	Projector	wood for various	prepare wood for			
		 Planning tools 	Internet	operations as described	various	Jack planes		
	Planning tools e.g.:	e.g.: Jack, smooth,		in 7.2	operations as	Smooth		
	Jack, smooth, spoke	spoke shaves, etc.			described in 7.2	plane		
	shaves, etc.	• Cutting tools e.g.:						
	• Cutting tools e.g.:	saws, chisels,		Carry out various	Carry out various	Panel saws		
	saws, chisels,	knives, boring		woodwork operations	woodwork			
1.0	knives, boring tools	tools		using the tools in 7.1 -7.3	operations using	Chisels		
12	• Impelling tools e.g.:	 Impelling tools 			the tools in 7.1 -	Knives		
	hammer and	e.g.: hammer and			7.3			
	mallets, Pneumatic	mallets, Pneumatic	Ť		3.6.1.1.1.1	Boring tools		
	tools	tools		Maintain all tools and	Maintain all tools	**		
				machines used	and machines	Hammers		
	7.2 Describe portable electric	Explain portable electric		T1 ('C (1) 1	used	N 6 11 .		
	hand tools in wood work,	hand tools in wood		Identify the steps and	T1 (C (1)	Mallets		
	e.g.:	work, e.g.:		tools involved in making	Identify the steps	D 4 11		
	Portable saw	Portable saw		a simple machine part	and tools	Portable saw		
	Portable planer	Portable		using wood as material	involved in	D		
	Portable drill	planer			making a simple	Portable		
	 Portable sander 	 Portable drill 			machine part	planer		
	• Jig saw.	 Portable 			using wood as	Portable drill		
					material	Portable drill		

	sander				
7.3 Explain the operations of	• Jig saw.				Portable
basic wood working					sander
machines such as:	Explain the operations of			J	
 Surface plaining and 	basic wood working				Jig saw
thickening machine:-	machines such as:				
Circular sawing	 Surface plaining 				
Machine	and thickening				
Mortising machine:-	machine:-		(V).		
Drilling machine	Circular sawing	•			
 Single ended plaining 	Machine				
machine	 Mortising 	.(3			
 Band sawing machines 	machine:-Drilling				
and safety precaution	machine				
in their operations	Single ended				
	plaining				
	 Band sawing 				
	machines and				
7.4 Explain the need for care in	safety precaution				
the use of the tools and	in their				
machines listed in $7.1 - 7.3$	operations				
	_()/				
	Explain the need for care				
	in the use of the tools and				
	machines listed in 7.1 –				
7.3	7.3				
	Explain the methods of				

	1		1	T		
	7.6 State the safety precaution	maintenance of the tools				
	on the tools and machines	and machines listed in				
	listed in $7.1 - 7.3$	7.1 - 7.3			O '	
		Explain the safety				
		precaution on the tools				
		and machines listed in 7.1				
		- 7.3				
Gener	al Objective 8.0: Perform reamin	g operations	1	.40		
	8.1 Describe reaming	Explain reaming	Lecture notes		Guide students to:	Hand reamers
	Operations	Operations	Textbooks	Carry out reaming	Carry out reaming	
			Whiteboard	operations:	operations:	Machine
	8.2 Explain how to carry out	Explain how to carry out	Marker	• on the bench	• on the	reamers
	reaming operations	reaming operations	Computer	• on drilling/lathe	bench	
	8.3 Explain the need for care in	Explain the need for care	Projector		• on	Tap wrench
	the use of the tools and	in the use of the tools	Internet		drilling/lath	_
	machines for reaming	and machines for			e	Jacobs chuck
	operations	reaming operations		Select correct speeds for		and key
13				reaming small and large	Select correct	Reduction
	8.4 Explain the methods of	Explain the methods of		holes	speeds for	sleeves
	maintenance of the tools	maintenance of the tools		110100	reaming small	
	and machines for reaming	and machines for			and large holes	Radial drilling
	operations	reaming operations			and large notes	machine
	8.5 Explain the conditions for	Explain the conditions				Reamers
	using the following tools in					
	reaming operations:	tools in reaming				
	 Hand reamers 	operations:				

	 Machine reamers 	 Hand reamers 							
	 Tap wrench 	 Machine reamers 							
	 Radial drilling 	 Tap wrench 			\mathcal{O}'				
	machine	 Radial drilling)				
		machine							
Gene	General Objective 9.0: Perform tapping operations								
	9.1 Explain tapping and the	Explain tapping and the	Lecture notes		Guide students to:	Taps and			
	purpose of tapping	purpose of tapping	Textbooks	Select correct tapping	Select correct	wrenches			
	operation.	operation.	Whiteboard	drill size	tapping drill size				
			Marker			Drill chuck			
		Explain the need for care	Computer	Select correct taps	Select correct	and key			
	9.2 Explain the need for care in	in the use of the tools and	Projector		taps				
	the use of the tools and	machines for tapping	Internet	Carry out tapping		Lathe			
	machines for tapping	operations		operation:	Carry out tapping	machine			
	operations			 On the work 	operation:	medium size			
		Explain how to calculate		bench	• On the				
14	9.3 Explain how to calculate	tapping drill sizes		 On drilling 	work	Pillar drilling			
	tapping drill sizes			machine	bench	machine			
		Explain the		 On lathe 	• On				
	9.4 Explain the characteristics	characteristics of threaded			drilling				
	of threaded fasteners:	fasteners:			machine				
	• Pitch	Pitch			 On lathe 				
	 No. of starts 	No. of starts							
	 Profile of thread 	Profile of		Calculate tapping drill	Calculate tapping				
	 Direction of thread 	thread		sizes	drill sizes				
		 Direction of 							
		thread							

		_	1		,
9.5 State the correct tapping					
drill size.	Explain the correct				
	tapping drill size.			()'	
-	Explain how to correct				
	*				
al Objective 10.0: Perform basic	1				
	* *	Lecture notes		Guide students to:	Set of drill
1 21			Identify various types of		Set of diffi
				1	Waadtamina
		•	plastic groups		Wood turning
Thermo-plastic				groups	lathe
	setting	* -			
10.2 Explain characteristics of	• Thermo-		_	_	HSS cutting
each type of plastic.	plastic	Internet	characteristics of each	characteristics of	tools
			type of plastic.	each type of	
10.3 Explain the three	Explain characteristics of			plastic.	Evostic glue
processes of joining	each type of plastic.				
				Use conventional	Thermo-
r	Explain the three		Use conventional metal	metal cutting	setting and
10.4 Differentiate between			cutting tools to perform		thermo-plastic
				*	1
	plastics together		operations on plastics.	*	
1	(F1-i4) - 1'CC			plastics.	
				Communication	
	*				
tools to perform operations			operations using plastics	plastics	
on plastics.	Explain how to use				
AO,	conventional metal				
	9.6 Explain how to correct Taps al Objective 10.0: Perform basic 10.1 Explain various types of plastic groups such as: Thermo-setting Thermo-plastic 10.2 Explain characteristics of each type of plastic. 10.3 Explain the three processes of joining plastics together 10.4 Differentiate between thermo-setting and thermo-plastics. 10.5 Describe how to use conventional metal cutting tools to perform operations'	drill size. 9.6 Explain how to correct Taps Explain how to correct Taps Explain how to correct Taps al Objective 10.0: Perform basic operations on plastics 10.1 Explain various types of plastic groups such as: • Thermo-setting • Thermo-plastic 10.2 Explain characteristics of each type of plastic. 10.3 Explain the three processes of joining plastics together 10.4 Differentiate between thermo-setting and thermo-plastics. 10.5 Describe how to use conventional metal cutting tools to perform operations on plastics. Explain the correct tapping drill size. Explain how to correct Taps Explain various types of plastic groups such as: • Thermo-setting • Thermo-setting • Thermo-setting • Explain characteristics of each type of plastic. Explain the three processes of joining plastics together Explain the differences between thermo-setting and thermo-plastics. Explain how to correct tapping drill size.	drill size. drill size. Explain the correct tapping drill size. 9.6 Explain how to correct Taps Explain how to correct Taps al Objective 10.0: Perform basic operations on plastics 10.1 Explain various types of plastic groups such as: Thermo-setting Thermo-plastic Thermo-plastic 10.2 Explain characteristics of each type of plastic. 10.3 Explain the three processes of joining plastics together 10.4 Differentiate between thermo-setting and thermo-plastics. 10.5 Describe how to use conventional metal cutting tools to perform operations on plastics. Explain the correct tapping drill size. Explain how to correct Taps Explain various types of plastics Explain various types of plastic groups such as: Textbooks Whiteboard Marker Computer Projector Internet Explain the three processes of joining plastics together Explain the three processes of joining plastics together Explain the differences between thermo-setting and thermo-plastics. Explain how to use Explain the correct tapping drill size.	drill size. Explain the correct tapping drill size.	drill size. Explain the correct tapping drill size.

	operations on plastics.		
tools for operation on			
thermo-setting and	Explain the result of)
thermo-setting plastic.	using conventional metal		
	cutting tools for operation		
	on thermo-setting and		
	thermo-setting plastic.		
		.10'	
EVALUATION		197	
CA: 60%			
EXAMINATION: 40%			
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WALLO			

Electrical Drawings

PROGRAMME: NATIONAL DIPLOMA IN	ELECTRICAL AND ELECTRONICS	ENGINEERING TECHNOLOGY
COURSE TITLE: Electrical Drawings	CODE: EEC 111	CONTACT HOURS: 4
	CREDIT UNITS: 3	THEORETICAL: 1
YEAR: I SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 3

GOAL: This course is designed to acquaint student with the knowledge and skills to draw and interpret electrical and electronics engineering drawings.

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

- 1.0 Understand symbols of electrical and electronic components
- 2.0 Know how to read and interpret Electrical and Electronic drawings.
- 3.0 Know how to draw diagrams for electrical and electronic circuits using standard symbols.
- 4.0 Understand how to draw diagrams using dedicated Computer Aided Design (CAD) software.

DDOCD AMME, NATIONAL DIDLOMA IN ELECTRICAL AND ELECTRONICS ENCINCEDING

PROGRAMME: NATIONAL DIPLOMA IN EI	LECTRICAL AND ELECTRONICS ENGIN	IEERING TECHNOLOGY
COURSE TITLE: Electrical Drawings	CODE: EEC 111	CONTACT HOURS: 4
COURSE TITLE: Electrical Drawings	CREDIT UNITS: 3	THEORETICAL: 1
YEAR: I SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 3
COURSE SPECIFICATION: THEORETICA	L AND PRACTICAL CONTENT	

GOAL: This course is designed to acquaint student with the knowledge and skills to draw and interpret electrical and electronics engineering drawings.

GENERAL OBJECTIVE 1.0: Understand symbols of electrical and electronics components

GEIVEI	THE OBJECTIVE 1.0. ORGC	istana symbols of electrical a	na ciccironnes e	1		
THEO	RETICAL			PRACTICAL		
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers'	Resources
	Outcome			Outcome	Activities	
1-2	1.1 Define electrical	Explain electrical	Textbooks		Guide students	Different
	symbols:	symbols:	Journals		to:	symbols
	 Machines 	 Machines 	Whiteboard	Identify electrical and		standards
	 Wiring diagrams 	Wiring diagrams	Marker	electronic symbols	Identify	
	with codes	with codes	Computer		electrical and	Videoclips
	• Switch gear, fuses,	Switch gear	Projector		electronic	
	relays etc.	fuses, relays etc.		Identify different	symbols	Pictorials
	 Voltage sources 	 Voltage sources 		standards of symbols		
	and current	and current			Identify different	Free Version
	sources	sources			standards of	for students PC
	• Transformer.	Transformer.			symbols	Schematic
		6				software
	1.2 Define electronics	Explain electronics				
	symbols:	symbols:				Free Version
	Semi-conductor	Semi-conductor				for students E-
	devices.	devices.				plan software

		1	·			1
	• Integrated chips of	 Integrated chips 				
	the 74 series.	of the 74 series.			CY	
	• Resistors,	• Resistors,				
	Capacitors,	Capacitors,				
	Inductors	Inductors				
		Explain types of electrical				
	1.3 Explain types of	and electronics symbols				
	electrical and					
	electronics symbols	Explain different standards				
		of symbols:				
	1.4 Explain different	• IEC	CX			
	standards of symbols:	• IEEE				
	• IEC	• ANSI				
	• IEEE	• JEC				
	• ANSI					
	• JEC		•			
Genera	al Objective 2.0: Know how to	read and interpret Electrical	and Electronic o	drawings.	•	
3-5	2.3 Explain electrical and	Explain electrical and	Textbooks		Guide students	Templates,
	electronic drawings	electronic drawings	Journals	Interpret Electrical,	to:	Drawing
			Whiteboard	Building and		Materials and
	2.4 Explain types of	Explain types of electrical	Marker	Electronic diagrams.	Read and	equipment,
	electrical drawings:	drawings:	Computer		interpret	Computer
	Single Line	 Single Line 	Projector	Draw Symbolic	Electrical,	Systems
	Multi Line	Multi Line		Electrical circuits	Building and	
					Electronic	Sample
	2.5 Explain types of	Explain types of electronic		Draw Building wiring	diagrams.	electrical
	2.5 Explain types of	•		•	•	<u> </u>
			64			

	electronic drawings	drawings		diagrams showing all		drawings
	2.6 Distinguish between			components, wiring,	Draw Symbolic	
	SYMBOLIC and	Explain the differences		conduits, switch	Electrical circuits	Sample
	COMPONENT	between SYMBOLIC and		boxes, wall plugs,	J	electronic
	diagrams.	COMPONENT diagrams.			Draw Building	drawings
					wiring diagrams	
	2.7 Explain how to read	Explain how to read			showing all	
	electrical and electronic	electrical and electronic		Draw a simple	components,	
	drawings	drawings		electrical circuit with	wiring, conduits,	
				voltage and current	switch boxes,	
	2.8 Explain how to	Explain how to interpret		source and other	wall plugs.	
	interpret electrical and	electrical and electronic	CX	circuit elements.		
	electronic drawings	drawings			Draw a simple	
					electrical circuit	
	2.9 Explain the importance	Explain the importance of			with voltage and	
	of reading and	reading and interpreting	2		current source	
	interpreting electrical	electrical and electronic			and other circuit	
	and electronic drawings	drawings appropriately			elements.	
	appropriately					
GENE	RAL OBJECTIVE 3.0: Kno	w how to draw diagrams for e	electrical and ele	ectronic circuits using sta	ndard symbols	
6-10	3.1 Explain standard	Explain standard symbols	Textbooks		Guide students	Templates
	symbols		Journals	Identify standard	to:	
		Explain simple electrical	Whiteboard	symbols		Drawing
	3.2 Explain simple electrical	installation diagrams using	Marker		Identify standard	Materials and
	installation diagrams	standard symbols.	Computer		symbols	equipment
	using standard symbols.		Projector			
	3.3 Explain electronic	Explain electronic circuits		Perform Power	Perform Power	Computer
	circuits using standard	using standard symbols		experiments" from the	experiments"	Systems
			65			
			05			

symbols		symbolic diagrams to	from the	
	Explain Machine diagrams	wiring diagrams	symbolic	Sample
3.4 Explain Machine		showing terminals and	diagrams to	electrical
diagrams	Explain redline drawings	earth points and how"	wiring diagrams	drawings
	and as-built	2 channel	showing	
O E Evaloin nodlino		Oscilloscopes" should	terminals and	Sample
3.5 Explain redline		be connected without	earth points and	electronic
drawings and as-built		shorting the circuit.	how " 2 channel	drawings
			Oscilloscopes"	
			should be	Sample
			connected	standard
		CK	without shorting	symbols
			the circuit.	
				Sample redl
		Draw a typical	Draw a typical	markings
		electrical installation	electrical	
		project using standard	installation	
		symbols.	project using	
			standard	
			symbols.	
		Draw electronic	Draw electronic	
		circuits using standard	circuits using	
•		symbols	standard symbols	
.0				
		Identify machine	Identify machine	
A())		diagrams	diagrams	
	66			•
	66			
W.				

		T		T 1 10 111		T
				Identify redline		
				drawings	Identify redline	
					drawings	
				Carryout redline		
				drawings marking	Carryout redline	
				drawings marking	drawings	
					marking	
Genera	l Objective 4.0: Understand h	ow to draw diagrams using de	edicated Compu	ter Aided Design (CAD)	software.	
11–14	3.1 Explain CAD	Explain CAD	Textbooks	Use computer software	Guide students	Computers
			Journals	to draw electrical	to:	1
	3.2 Explain how to use	Explain how to use CAD	Whiteboard	installation diagrams	Use computer	AutoCAD
	CAD in creating	in creating electrical and	Marker	a sumuron unugrums	software to draw	114000112
	electrical and electronic	electronic drawing			electrical	Electronic
		ciccionic diawing	Computer			
	drawing		Projector		installation	Workbench
		Explain the common			diagrams	
	3.3 Explain the common	software used for electrical		Draw machine		EPlan
	software used for	and electronic drawings:		diagrams using		
	electrical and electronic	AutoCAD		computer software	Draw machine	Circuit maker
	drawings:	• EPlan			diagrams using	2000
	AutoCAD	PC Schematic			computer	
	• EPlan			Draw electronic circuit	software	PC Schematic
		• Circuit maker 2000,		diagrams using	Software	1 & Sellematic
	 PC Schematic 	etc.			Draw electronic	C 1 -
	• Circuit maker 2000,			computer software	circuit diagrams	Sample
	etc.				using computer	drawings
	10				software	
	ACCECCMENT, The Date of	ral class will be awarded 60%	of the total see	The continuous casess		zzag will talza
					=	zzes wiii take
	10% of the total score, while	the remaining 30% will be for	or the end of ser	nester examination score.		

Introduction to Digital Electronics

PROGRAMME: NATIONAL DIPLOMA ELECTRICA	AL AND ELECTRONICS ENGINEE	ERING TECHNOLOGY
COURSE TITLE: Introduction to Digital Electronics	COURSE CODE: EEC 112	CONTACT HOURS: 3
	CREDIT UNIT: 3	THEORETICAL: 2
YEAR: I SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 1

GOAL: This course is designed to equip student with the knowledge and skills of digital electronics system

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

- 1.0 Know the basic concept of Number System
- 2.0 Understand Logic Gates
- 3.0 Know Logic Simplification and its Applications
- 4.0 Know Multiplexers and De-Multiplexers
- 5.0 Understand Latches, flip-flops, and Counters
- 6.0 Understand Microcontrollers and Programming

PROG	RAMME: NATIONAL DIP	LOMA ELECTR	CICAL AN	D ELECTRONI	CS ENGINEERI			
COURSE TITLE: Introduction to Digital		COURS	SE CODE: EEC	112	CONT	ACT HOURS: 3		
Electro	nics		CREDI	T UNIT: 3		THE	ORETICAL: 2	
YEAR	: I SEMESTER: I		PRE-RI	EQUISITE:		PRAC	CTICAL: 1	
COUR	SE SPECIFICATION: TH	EORETICAL A	ND PRACT	ΓICAL				
GOAL	: This course is designed to e	equip student with	the know	ledge and skills	of digital electron	nics syst	em	
Genera	al Objective 1.0: Know the	basic concept of I	Number Sy	stem				
THEC	PRETICAL CONTENT				PRACTICAL O	CONTE	NT	
Week	Specific Learning Outcome	Teacher's Activ	vities	Resources	Specific Learni Outcome	ng	Teacher's Activities	Resources
1-3	1.1 Explain analog and digital signals	Explain analog a signals	and digital	Textbooks Journals Charts	Demonstrate confrom decimal an		Guide students to: Demonstrate conversion from	Digital Logic Trainers
	1.2 Explain applications of digital and analog signals.	Explain applicat digital and analo		Animations Computer Projector Marker	hexadecimal		decimal and hexadecimal	DMM. Bench Power Supply.
	1.3 Explain the advantages of analog and digital signals.	Explain the adva		Marker Board				Function Generator. Breadboard.
	1.4 Explain binary, octal, and hexadecimal number system	Explain binary, of hexadecimal nur system						Oscilloscope.
	1.5 Explain conversion from decimal and hexadecimal to binary	Explain conversion decimal and hex to binary and vice	adecimal					

	_					
	1.6 Explain binary addition					
	and subtraction	and subtraction,			CY	
	1.7 Examining the	Erralain dha				
	1.7 Explain the addition/subtraction of	Explain the addition/subtraction of 1's				
	1's and 2's complement				<u> </u>	
	ral Objective 2.0: Understand	T - C	Tr. 41 1		G :1 G(1 ()	D: ', 1T :
4-6	2.1 Explain logic gate	Explain logic gate	Textbooks	Toward and the state of	Guide Students to:	Digital Logic
	225 1: 4 1 :		Journals	Investigate the logical	Investigate the	Trainer.
	2.2 Explain the basic	Explain the basic concept	Computer	behavior of AND, OR,	logical behavior of	т
	concept of negative and	1	Internet	NOT, NAND, NOR,	AND, OR, NOT,	Logic gates.
	positive logic,	logic,	Projector	and EX-OR gates.	NAND, NOR, and	D) () (
	227 6 4 4 4 11		Marker		EX-OR gates.	DMM.
	2.3 Define truth table.	Explain truth table.	Marker Board	01 (1 NIAND)		D 1 D
				Show the NAND gate	Demonstrate and	Bench Power
	0.45			as a Universal Gate	show the NAND	Supply.
	2.4 Explain the symbols and		\circ		gate as a Universal Gate	D' ' 11 '
	truth tables of NOT,	truth tables of NOT, AND,		T 1.1	Gale	Digital Logic
	AND, OR,	OR, NAND, NOR, EXOR)	Interpret truth tables	Interpret truth tables	Trainer.
	NAND, NOR, EXOR	Gates		for logic gates	for logic gates	
	Gates				for logic gates	Function
	255 1 1 1 14 14 15					Generator.
	2.5 Describe the NAND and					D 11 1
	NOR as universal gates.	NOR as universal gates.				Breadboard.
						0 '11
	2.6 Explain interpretation	Explain interpretation truth				Oscilloscope.
	truth tables for logic	tables for logic gates				
	gates					
	2.7 Describe the interval					
	2.7 Describe the integrated	=				
	circuit logic	circuit logic				
	~ ~ ~ ~ ~		70			
			-			
	*					

			_						
	2.8 Explain the concept of	Explain the concept of							
	integrated circuit Logic	integrated circuit Logic							
	families.	families.							
	2.9 Explain the TTL and	Explain the TTL and							
	CMOS logic families	CMOS logic families							
General Objective 3.0: Know Logic Simplification and its Applications									
7-8	3.1 Explain the concept of	Explain the concept of	Textbooks		Guide the students	Digital Logic			
	Boolean algebra	Boolean algebra	Journals		to:	Trainer.			
		5	Computer	Verify Boolean Laws	Verify Boolean				
	3.2 Explain the	Explain the	Internet	using the various logic	Laws using the	Logic gates.			
	implementation of the	implementation of the	Projector	gates	various logic gates	6 - 6			
	Boolean (logic)	Boolean (logic) equation	Marker		valie as regio gares	DMM.			
	equation with gates	with gates	Marker Board	Construct the truth	Construct the truth	D1/11/1.			
	equation with guites	Willi gates		table of various logic	table of various	Bench Power			
	3.3 Explain Karnaugh map	Explain Karnaugh map up		gates and combination	logic gates and	Supply.			
	up to 4 variables	to 4 variables		circuits using logic	combination circuits	Suppiy.			
	up to 1 variables	to i variables		gates.	using logic	Function			
	3.4 Explain the simplicity	Explain the simplicity of		gates.	gates.	Generator			
	of Karnaugh map	Karnaugh map application	D'	Evaluate various	gaics.	Generator			
	application in	in developing		combinational circuits	Design, test, and	Breadboard.			
	developing	combinational logic		such as adders,	evaluate various	Dicadobard.			
	combinational logic	circuits		subtractors,	combinational	Oscilloscope.			
	circuits	circuits		subtractors,	circuits such as	Oscilloscope.			
	circuits			Dagian and implement					
	2 5 Eventain that half addan	Evel a that also did an and		Design and implement adders and subtractors	adders, subtractors,				
	3.5 Explain the half-adder and full-adder circuit	Explain the half-adder and			Danian and				
	and full-adder circuit	full-adder circuit		using logic gates	Design and				
	265 1: 4 1 16 16 1	1 1 1 10 10 1		T 1 4 11 1	implementation of				
	3.6 Explain the half and full			Implement adders and	adders and				
	subtractor circuit.	subtractor circuit.		subtractors using logic	subtractors using				
				gates	logic gates				
			71						
			/ 1						
	•								

	3.7 Explain the design and	Explain the design and			Design and	
	implementation of half	implementation of half and		Design and implement	implementation of	
	and full subtractor	full subtractor circuits		of 4-bit binary	4-bit binary	
	circuits using the	using the Karnaugh map		adder/subtractor and	adder/subtractor and	
	Karnaugh map			BCD adder using	BCD adder using	
				digital ICs	digital ICs	
	3.8 Explain the design and	Explain the design and				
	implementation of half	implementation of half and		Implement of 4-bit		
	and full subtractor	full subtractor circuits		binary adder/subtractor		
	circuits using the	using the Karnaugh map		and BCD adder using		
	Karnaugh map			digital ICs		
Gener	al Objective 4.0: Know Mult	iplexers and De-Multiplexer	rs			
9-11	4.1 Explain multiplexers	Explain multiplexers and	Textbooks		Guide the students	Digital Logic
	and de-multiplexers	de-multiplexers	Journals		to:	Trainer.
			Computer	Interpret truth tables	Interpret truth tables	
	4.2 Explain the basic	Explain the basic functions	Internet	for multiplexers and	for multiplexers and	Logic gates.
	functions and block	and block diagram of	Projector	de-multiplexers	de-multiplexers	
	diagram of multiplexers	multiplexers and de-	Marker			DMM.
	and de-multiplexers	multiplexers	Marker Board	Implement multiplexer	Implement	
				and demultiplexer	multiplexer and	Bench Power
				using logic gate	demultiplexer using	Supply.
	4.3 Explain the different	Explain the different types			logic gate	
	types and IC	and IC configurations.				Function
	configurations.			Design multiplexer and	Design multiplexer	Generator
		20.		demultiplexer using	and demultiplexer	
	4.4 Explain interpretation of	Explain interpretation of		logic gates and study	using logic gates	Breadboard.
	truth tables for	truth tables for		of IC 74150 and IC	and study of IC	
	multiplexers and de-	multiplexers and de-		74154	74150 and IC 74154	Oscilloscope
	multiplexers	multiplexers				
	\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\					
			1	1	JI	

Genera	al Objective 5.0: Understand	Latches, flip-flops, and Cor	unters			
12-13	5.1 Describe the concept of	Explain the concept of the	Textbooks		Guide students to:	Digital Logic
		latch and flip-flop	Journals			Trainer.
	1 1		Computer	Evaluate flip-flops,	Construct, test, and	
	5.2 Explain the difference	Explain the difference	Internet	counters, and shift	evaluate flip-flops,	IC TRAINER
	between a latch and a	between a latch and a flip-	Projector	registers.	counters, and shift	kit
	flip-flop	flop	Marker		registers.	
			Marker Board	Implement SISO,		Bench Power
	5.3 Explain the working	Explain the working		SIPO, PISO, and PIPO	Implement SISO,	Supply
	principle of latch	principle of latch		shift registers using	SIPO, PISO, and	
				flip-flops.	PIPO shift registers	Logic Gates,
		Explain the types of			using flip-flops.	Oscilloscope
	latches	latches		Verify of 4-bit ripple		
				counter and Mod-10,	Construct, test, and	Connecting
	5.5 Explain the applications			Mod-12, and Mod-N	verify of 4-bit	Probes
	of latches	latches		ripple counters	ripple counter and	
					Mod-10, Mod-12,	Logic gates.
		Explain the circuit			and Mod-N ripple	
	structure of different	structure of different flip		Simulate various	counters	DMM.
		flops and their applications		combinational circuits,		
	applications			sequential circuits flip-		Bench Power
				flops, and counters.	Simulate various	Supply.
	5.7 Explain the operation of			using relevant software		
		D, and Master/Slave JK			circuits, sequential	Function
		flip flops using waveforms		Interpret Truth Tables	circuits flip-flops,	Generator
		and truth tables.		for latches, flip flops,	and counters. using	
	tables.			and counters	relevant software	Breadboard.
	5.8 Explain the basic	Explain the basic concept			Interpret Truth	Oscilloscope
	concept of counters	of counters			Tables for latches,	Светновеоре
	tendept of country				flip flops, and	
	5.9 Explain the following	Explain the following			counters	

s synchronous counters nters • Binary counters • Divide by N rippl counters nter • Decade counter • Timers		CALL		
tables for truth tables for latches, flops, and flops, and counters				
				_
	1 1		Guide the students	Computer
s. Microcontrollers.	Journals		to:	
		1	_	Arduino Uno
		Microcontrollers.	Microcontrollers.	kits
	3			Rasbery Pi
				Microcontroll
	Marker-Board			er Trainer.
		1 1 1 1		er framer.
S and ATMEGAS and		-	-	IC
PIC		ciock pins.	and clock pins.	Programmer.
		Perform Racio	Perform Rasic	
mtw11a Evalois Missassatus 11 su				Bench Power
		i iogiaiiiiiiig.	i rogianining.	supply.
Frogramming		Load the program from	Load the program	
* • • • • • • • • • • • • • • • • • • •			from PC to	Breadboard.
	ous and synchronous and synchronous counters Inters N ripple Divide by N ripple counters Decade counter Timers Shift registers Explain how to interpret truth tables for latches, fl flops, and counters Inderstand Microcontrollers and Proposes. Explain the Concept Microcontrollers. Chitecture Explain the Architecture the following Microcontrollers; Arduino Uno	ous and synchronous and synchronous counters N ripple Divide by N ripple counters Decade counter Timers Shift registers Explain how to interpret truth tables for latches, flip flops, and counters Inderstand Microcontrollers and Programming forcept Explain the Concept Microcontrollers. Explain the Architecture of the following Microcontrollers, Microcontrollers, Marker Marker-Board ATMEGAS and PIC Projector Marker-Board ATMEGAS and Projector Marker-Board Explain Microcontroller	ous and synchronous and synchronous counters • Binary counters • Divide by N ripple counters • Decade counter • Timers • Shift registers to Explain how to interpret tables for truth tables for latches, flip ops, and flops, and counters Inderstand Microcontrollers and Programming flops, and counters Inderstand Microcontrollers. In	ous and synchronous and synchronous counters • Binary counters • Divide by N ripple counters • Decade counter • Decade counter • Timers • Shift registers to Explain how to interpret tables for truth tables for latches, flip flops, and counters Inderstand Microcontrollers and Programming Inderstand Microcontrollers and Programming Incept of the following

6.4 Explain Microcontroller	Explain Microcontroller	via programmer.	microcontroller via	
Programming	Programming	via programmer.	programmer.	Vero Board
Instruction set	Instruction set	Setup the hardware	programmer	, ere Beara
Programming	Programming	(vero board,	Setup the hardware	Serial Cable
Language	Language	breadboard,	(vero board,	
• C++	• C++	microcontroller, led,	breadboard,	Sensors.
 Python 	Python	sensors, e.t.c)	microcontroller, led,	
			sensors, e.t.c)	Soldering
6.5 Explain how to interface	Explain how to interface	Interface		kits.
with microcontrollers	with microcontrollers and	microcontrollers with	Interface	
and sensors	sensors	sensors.	microcontrollers	Computer
			with sensors.	with .
6.6 Explain how to interface				appropriate
microcontrollers with	microcontrollers with			software
ADC, DAC, or other	ADC, DAC, or other	V , Y		
microcontrollers	microcontrollers			
ALUATION: CA 60% EXAM	IINATION: 40%	·		
	CARD			
	IINATION: 40%			

Technical Documentation and Report Writing

PROGRAMME: NATIONAL DIPLOMA ELECTRICA	L AND ELECTRONIC ENGINEE	RING TECHNOLOGY
COURSE TITLE: Technical Documentation and Report	COURSE CODE: EEC 113	CONTACT HOURS: 4
Writing	CREDIT UNIT: 3	THEORETICAL: 1
YEAR: I SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 3
GOAL: This course is designed to equip students with the k	nowledge and skills in writing profes	sional, and effective technical documentation

GOAL: This course is designed to equip students with the knowledge and skills in writing professional, and effective technical documentation and reports.

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

- 1.0 Understand the principles of technical communication.
- 2.0 Know tools and software for creating and editing technical documents.
- 3.0 Understand the structure and formatting of technical documentation.
- 4.0 Know professional technical report writing.
- 5.0 Understand logbooks, work reports, risk assessments and method statements.
- 6.0 Create project documentation.

PROGR	AMME: NATIONAL DIPL	OMA ELECTRICAL	AND ELECTRO	ONIC ENGINEERING T	TECHNOLOGY	
	E TITLE: Technical Docume	ntation and Report	COURSE CODE	: EEC 113	CONTACT HOURS: 4	
Writing			CREDIT UNIT: 3		THEORETICAL: 1	
YEAR:	YEAR: I SEMESTER: I			E:	PRACTICAL: 3	
	E SPECIFICATION: THE					
GOAL:	This course is designed to equ	ip students with the kn	owledge and skills	in writing professional, a	nd effective technical docu	imentation and
reports.						
General	Objective 1.0: Understand the	e principles of technica	l communication			
THEOR	RETICAL CONTENT		•	PRACTICAL CONTEN	IT	
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1	of technical documentation. 1.3 Define general purpose writing 1.4 Explain differences	Explain technical documentation Explain the importance technical documentation Explain general purpowriting Explain differences between technical and general-purpose writing Explain types of technical	e of Markers on. Projector Computer Internet se	Identify types of technical documentation	Guide students to: Identify types of technical documentation	Sample Technical documentation Sample reports Sample datasheets
		documents in engineer Datasheets				

		110			-
 Datasheets Manuals Project reports Project documentation, Risk assessments Method statements. 1.6 Explain principles of: Clarity 	 Manuals Project reports Project documentation, Risk assessments Method statements. Explain principles of: Clarity 				
• Conciseness	 Conciseness 				
• Coherence.	• Coherence.				
1.7 Explain audience analysis	Explain audience analysis				
of audience analysis.	e Explain the importance of audience analysis				
General Objective 2.0: Know tools a			cal documents.		
 2-4 2.1 Explain tools/software for creating and editing technical documentation Microsoft Office OpenOffice LaTeX PDF editors. 2.2 Explain tools/software 	Explain tools/software for creating and editing technical documentation: Microsoft Office OpenOffice LaTeX PDF editors. Explain tools/software for	Journals White Board Markers Projector Computer	Operate text editors:	Guide students to: Operate text editors: Microsoft Word, LaTeX. Prepare simple drawings, diagrams using AutoCAD.	Computer with appropriate software.

for diagramming and technical drawings: • AutoCAD • BricsCAD • Matlab visualization, • Microsoft Visio • Microsoft Excel • Microsoft PowerPoint 2.3 Explain collaborative platforms for document creation and editing — teamwork and remote cooperation: • Google Docs • Microsoft 365 • Overleaf.	diagramming and technical drawings:		Conduct simple calculations and prepare graphs using Microsoft Excel. Use collaborative platform. • Google Docs.	Conduct simple calculations and prepare graphs using Microsoft Excel. Use collaborative platform. Google Docs	
General Objective 3.0: Understand th	e structure and formatting of	f technical do	cumentation.		
5-7 3.1 Explain general structure for documents, reports: • Title • List of changes • Objectives • Background Information – • Theory, • Components, • Equipment,	Explain general structure for documents, reports Title List of changes Objectives Background Information – Theory, Components, Equipment,	Textbooks Journals White Board Markers Projector Computer Internet	Prepare project proposal including its specific sections:	Guide students to: Prepare project proposal including its specific sections:	Sample project proposal

 Procedures, Schematic diagram(s), Result Analysis, Answers to questions, Summary, Content List (for Tables, Graphs, Diagrams, etc.) Appendices. 3.2 Explain how to write project proposal including its specific sections: Client requirements Specification Proposed drawings Bill of materials Material and labour cost estimation Execution period 3.3 Explain text formatting and arrangements on page. 3.4 Explain page structure. 	 Procedures, Schematic diagram(s), Result Analysis, Answers to questions, Summary, Content List (for Tables, Graphs, Diagrams, etc.) Appendices. Explain how to write project proposal including its specific sections: Client requirements Specification Proposed drawings Bill of materials Material and labour cost estimation, Execution period Explain text formatting, and arrangements on page. Explain page structure.		 Material and labour cost estimation Execution period 	• Material and labour cost estimation • Execution period	
3.5 Explain how to use styles	Explain how to use styles	80			

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	to format text and	to format text and				
	paragraphs.	paragraphs.				
	3.6 Explain usage of tables,	Explain usage of tables,				
	drawings, math	drawings, math equations.				
	equations.					
General	Objective 4.0: Know professi	ional technical report writin	ıg.		•	
General 8-9	Objective 4.0: Know profession 4.1 Explain the purpose of each of the following sections of a project report: • Cover page • Title page • Approval page • Declaration page • Table of contents • Acknowledgements • Abstract/Summary • List of Symbols and Abbreviation • List of Tables • List of Figures • Body of the project report, divided into chapters • References • Appendices.	Explain the purpose of each of the following sections of a project report:	Textbooks Journals White Board Markers Projector Computer Internet	Write a project report based on list of project sections. Identify mistakes in technical report and correct them. Identify guidelines for document calculations. Identify guidelines for graphs and numerical data preparation and representation.	Guide students to: Write a project report based on list of project sections. Identify mistakes in technical writing and correct them. Identify guidelines for document calculations. Identify guidelines for graphs and numerical data preparation and representation.	Sample project report Sample technical report
	ONA.	ReferencesAppendices.				

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 4.2 Explain technical writing style guidelines: Writing objective and factual content. Using engineering-specific terminologies effectively. Ensuring grammatical correctness and consistency in style. 	style guidelines:				
4.3 Explain common mistakes in technical writing and how to avoid them.	Explain common mistakes in technical writing and how to avoid them.	7			
4.4 Explain guidelines for document calculations.	Explain guidelines for document calculations.				
4.5 Explain guidelines for graphs and numerical data preparation and representation.	Explain guidelines for graphs and numerical data preparation and representation.				
General Objective 5.0: Understand lo	gbooks, work reports, risk a	ssessments an	d method statements.		
10-13 5.1 Define Logbook	Explain Logbook	Textbooks		Guide students to	Assessment
		Journals	Fill a Logbook based on	Fill a Logbook based on	charts
5.2 Explain risk assessment	Explain risk assessment		work carried out.	work carried out.	

		Markers			Sample
5.3 Explain how to fill a	Explain how to fill a	Projector	Write a laboratory	Write a laboratory	RAMS.
Logbook based on work	_	Computer	experiment report.	experiment report.	
carried out.	carried out.	Internet			
			Write a non-technical	Write a non-technical	
5.4 Explain how to write	Explain how to write		report for:	report for:	
laboratory experiment	laboratory experiment		 Progress report 	 Progress report 	
report.	report.		New Development	 New Development 	
			 Recommendation 	 Recommendation 	
5.5 Explain the purpose of	Explain the purpose of				
non-technical report	non-technical report		Prepare complete RAMS	Prepare complete RAMS	
writing:	writing:		document.	document	
Background	• Background				
information on	information on project				
project	 Progress report 				
Progress report	 New Development 				
 New Development 	• Response to				
 Response to 	correspondence				
correspondence	 Recommendation 				
Recommendation					
5.6 Explain the purpose for	Explain the purpose for				
Risk Assessment (RA).	Risk Assessment (RA).				
	Explain how to prepare				
5.7 Explain how to prepare	Risk Assessment.				
Risk Assessment.					
	Explain method statement				
5.8 Explain method	▼				
statement					
	Explain the purpose for				
5.9 Explain the purpose for	Method Statement (MS).				
Method Statement (MS)					

		Explain how to prepare				
	1 1 1	Method Statement.				
	Method Statement.				()'	
		Explain reasons for				
	5.11 Explain reasons for	RAMS preparation.				
	RAMS preparation.					
eneral	Objective 6.0: Create project	documentation.				•
14-15	6.1 Explain meaning of	Explain meaning of	Textbooks		Guide students to:	Sample
	international standards	international standards	Journals	Prepare of a	Prepare of a	Technical
	(ISO, IEEE).	(ISO, IEEE).	White Board	comprehensive technical	comprehensive technical	report
			Markers	project related to	project related to	
	6.2 Explain purpose for	Explain purpose for	Projector .	hypothetical or real-	hypothetical or real-	
	regulatory compliance	regulatory compliance	Computer	world scenarios in	world scenarios in	
	documentation.	documentation.	-	Electrical and Electronics	Electrical and Electronics	
			International	Engineering - individual	Engineering - individual	
	6.3 Explain how to write	Explain writing quality	standards	or group projects.	or group projects.	
	quality assurance reports.	assurance reports.				
				Present the projects to	Present the projects to	
				the class for	the class for	
			1	Peer and teacher	Peer and teacher	
					evaluation based on	
				clarity, accuracy, and	clarity, accuracy, and	
				professionalism.	professionalism.	

EVALUATION: CA: 70%

EXAMINATION: 30%

Electrical Engineering Science I

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY						
COURSE TITLE: Electrical Engineering Science I	CODE: EEC 114)	CONTACT HOURS: 3			
	CREDIT UNIT: 3		THEORETICAL: 1			
YEAR: I SEMESTER: I	PRE-REQUISITE:		PRACTICAL: 2			

GOAL: This course is designed to equip student with knowledge of how electric current flows, the relationships between various types of energy and their behaviours in resistive and capacitive systems.

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

- 1.0 Understand the concept of the electric current flow.
- 2.0 Understand simple DC circuits.
- 3.0 Understand types of energy and their inter-relationships.
- 4.0 Understand the concept of electrostatics, electric charge and capacitance of a capacitor.

PROGI	RAMME: NATIONAL DIPLO						
COURS	SE TITLE: Electrical Enginee	ring Science I	CODE: EEC 11	4	CONTACT HOURS: 3		
			CREDIT UNIT	: 3	THEORETICAL: 1		
YEAR:	I SEMESTER: I		PRE-REQUISI	TE:	PRACTICAL: 2		
COURS	SE SPECIFICATION: THE	ARETICAL AND PRAC	CTICAL CONT	ENT			
GOAL:	This course is designed to eq	uip student with knowled	ge of how electr	ric current flows, the relations	hips between various ty	pes of energy	
	and their behaviours in resist	ive and capacitive system	S.				
Genera	l Objective 1.0: Understand th	e concept of the electric	current flow.				
THEO	RETICAL CONTENT			PRACTI	CAL CONTENT		
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning	Teachers' Activities	Resources	
				Outcome			
1 – 2	1.1 Define an atom	Explain atomic	Textbooks		Guide students to:	Resistor	
			Journals	Determine the effect of	Determine the effect		
	1.2 Explain with aid of	Explain with aid of	White	variable EMF on single	of variable EMF on	Voltmeter	
	diagram, the structure	diagram, the structure	board	loop DC circuit.	single loop DC		
	and composition of an	and composition of an	Marker,		circuit.	Ammeter	
	atom	atom.	Computer				
		· · ·	Charts	Measure current and	Measure current and	Ohmmeter	
	1.3 Explain the concepts of	Explain the concepts of					
	conventional current	conventional current	Projector.	simple circuit using a	source in a simple	Cables	
	flow and electron flow.	flow and electron flow.		multimeter	circuit using a		
					multimeter	Power	
	1.4 Differentiate between	Explain the differences				source	
	conductors, insulators	between conductors,					
	and semi-conductors.	insulators and semi-				EMF source	
		conductors.				Multimeter	
	1.5 Define electric current	Explain electric current					

Bulb.

1.6 Explain potential difference (PD) and	Explain potential difference (PD) and			CA	Video clips
, , ,					
Symbols	Symbols		V.V		
1.7 Explain resistance, its	Explain resistance, its				
_	•				
difficulties and by moons	and symeons		4		
1.8 Explain multiples and	Explain multiples and				
sub-multiples of electric	sub-multiples of electric				
quantities; (e.g. Mega	quantities; (e.g. Mega		Y		
10^6 , kilo- 10^3 , etc.)	10^6 , kilo- 10^3 , etc.)		O '		
Objective 2.0: Understand si	mple D.C. circuits.				
2.1 Define direct current	Explain direct current	Textbooks		Guide students to:	Resistor
(DC).	(DC).	Journals	Verify Ohm's law.	Verify Ohm's law.	
		White			Voltmeter
2.2 State the analogy	-	board	Demonstrate series and	Demonstrate series	
between current flow	between current flow and	Marker,	parallel circuits.	and parallel circuits.	Ammeter
and water flow.	water flow.	-			
			'	1	Ohmmeter
	_				
		Projector.	in a conductor.		Cable
using diagram.	diagram.			conductor.	
					EMF
2.4 Explain Ohm's law	Explain Ohm's law.		1	1	sources
			Laws with DC circuits.		
2.5 Explain how to solve	Explain how to solve			with DC circuits.	Thermomete
		87			
<i>'D'</i>		-			
	electromotive force (EMF), their units and symbols 1.7 Explain resistance, its units and symbols 1.8 Explain multiples and sub-multiples of electric quantities; (e.g. Mega 10 ⁶ , kilo-10 ³ , etc.) 1 Objective 2.0: Understand si 2.1 Define direct current (DC). 2.2 State the analogy between current flow	electromotive force (EMF), their units and symbols 1.7 Explain resistance, its units and symbols 1.8 Explain multiples and sub-multiples of electric quantities; (e.g. Mega 10 ⁶ , kilo-10 ³ , etc.) 1 Objective 2.0: Understand simple D.C. circuits. 2.1 Define direct current (DC). 2.2 State the analogy between current flow and water flow. 2.3 Describe basic DC circuits with source using diagram. 2.4 Explain Ohm's law electromotive force (EMF), their units and symbols Explain resistance, its units and symbols Explain multiples and sub-multiples of electric quantities; (e.g. Mega 10 ⁶ , kilo-10 ³ , etc.) Explain direct current (DC). Explain the analogy between current flow and water flow. Explain the basic DC circuit with source using diagram. Explain Ohm's law.	electromotive force (EMF), their units and symbols 1.7 Explain resistance, its units and symbols 1.8 Explain multiples and sub-multiples of electric quantities; (e.g. Mega 10 ⁶ , kilo-10 ³ , etc.) 1 Objective 2.0: Understand simple D.C. circuits. 2.1 Define direct current (DC). 2.2 State the analogy between current flow and water flow. 2.3 Describe basic DC circuits with source using diagram. 2.4 Explain Ohm's law electromotive force (EMF), their units and symbols Explain resistance, its units and symbols Explain multiples and sub-multiples of electric quantities; (e.g. Mega 10 ⁶ , kilo-10 ³ , etc.) Explain direct current (DC). Explain the analogy between current flow and water flow. Computer Charts Animations Projector.	electromotive force (EMF), their units and symbols 1.7 Explain resistance, its units and symbols 1.8 Explain multiples and sub-multiples of electric quantities; (e.g. Mega 10 ⁶ , kilo-10 ³ , etc.) 1 Objective 2.0: Understand simple D.C. circuits. 2.1 Define direct current (DC). 2.2 State the analogy between current flow and water flow. 2.3 Describe basic DC circuits with source using diagram. 2.4 Explain Ohm's law Explain twitis and symbols Explain multiples and sub-multiples and sub-multiples of electric quantities; (e.g. Mega 10 ⁶ , kilo-10 ³ , etc.) Explain direct current (DC). Explain direct current (DC). Explain the analogy between current flow and water flow. Explain the board Demonstrate series and Marker, Computer Charts Charts Animations Projector. Explain the basic DC circuits with source using diagram. Explain Ohm's law. Explain Ohm's law. Explain Ohm's law. Explain how to solve Explain how to solve	electromotive force (EMF), their units and symbols 1.7 Explain resistance, its units and symbols 1.8 Explain multiples and sub-multiples of electric quantities; (e.g. Mega 10°, kilo-10³, etc.) 1.9 Define direct current (DC). 2.1 Define direct current (DC). 2.2 State the analogy between current flow and water flow. 2.3 Describe basic DC circuits with source using diagram. 2.4 Explain Ohm's law 2.5 Explain Ohm's law 2.5 Explain how to solve Explain how to solve Explain multiples and sub-multiples and sub-multiples of electric quantities; (e.g. Mega 10°, kilo-10³, etc.) Explain multiples and sub-multiples and sub-multiples of electric quantities; (e.g. Mega 10°, kilo-10³, etc.) Explain multiples and sub-multiples and sub-multiples of electric quantities; (e.g. Mega 10°, kilo-10³, etc.) Explain multiples and sub-multiples and sub-multiples of electric quantities; (e.g. Mega 10°, kilo-10³, etc.) Explain multiples and sub-multiples and sub-multiples of electric quantities; (e.g. Mega 10°, kilo-10³, etc.) Explain direct current (DC). Explain direct current flow and water flow. Explain the analogy between current flow and water flow. Explain the basic DC circuits with source using diagram. Explain the basic DC circuit the basic DC circuit with source using diagram. Explain the basic DC circuit the basic DC circuit with source using diagram. Explain the basic DC circuit the basic DC circuit with source using diagram. Explain the basic DC circuit the basic DC circuit with source using diagram. Explain the basic DC circuit t

problems using Ohm's	problems using Ohm's				r
law.	law.		Verify superposition	Verify superposition	
			principle.	principle.	Electronic
2.6 Define resistivity and	Explain resistivity and			O	trainer
conductivity of a	conductivity of a		Determine the temperature	Determine the	
conductor.	conductor.		coefficient of a resistance	temperature	Video clips
				coefficient of a	
2.7 Explain the relationship	Explain the relationship			resistance	
between resistance of a	between resistance of a				
conductor, its resistivity,	conductor, its resistivity,		Verify the heating effect.	Verify the heating	
length and area.	length and area.			effect.	
2.8 Differentiate between	Explain the differences				
series and parallel	between series and				
circuits.	parallel circuits.				
		0			
2.9 Explain how to solve	Explain how to solve				
problems involving	problems involving				
resistivity and	resistivity and				
conductivity	conductivity				
2.10 Deduce the equivalent	_				
resistance of series and	resistance of series and				
parallel circuits.	parallel circuits.				
2.11 Explain Kirchhoff's	Explain Kirchhoff's				
Laws (KCL, KVL).	Laws (KCL, KVL).				
Edws (RCE, 1215).	Laws (RCL, R v L).				
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2.12 Explain the	Explain the Superposition			$\overline{}$	
Superposition	Principle.				
Principle.	i interpre.		•		
rinicipie.					
2.13 Explain how to solve	Explain how to solve				
problems involving	problems involving				
series and parallel	series and parallel				
circuits using	circuits using				
Kirchhoff's Laws and	Kirchhoff's Laws and				
superposition	superposition principles				
principles.	superposition principles	113			
principles.					
2.14 Define temperature	Explain temperature				
coefficient of	coefficient of resistance.	XX			
resistance.					
	Use the expression for				
2.15 Use the expression for	resistance at temperature				
resistance at	T°k and calculate change				
temperature T°k and	in resistance.				
calculate change in					
resistance.	See from (2.15) the				
	change in resistance due				
2.16 See from (2.15) the	to change in temperature.				
change in resistance du	_				
to change in	Explain how to solve				
temperature.	problems involving				
temperature.	effect of temperature on				
	resistance.				
	resistance.				<u> </u>
WALL		89			
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General	Objective: 4.0 Understand the	he concept of electrostatics,	electric charg	ge and capacitance of a capacit	or.	
11-14	4.1 Explain electric charge	Explain electric charge	Textbooks		Guide students to:	Resistor
	and state its unit.	and state its unit.	Journals		(0'	
			White	Verify Coulombs' Law	Verify Coulombs'	Capacitor
	4.2 State Coulomb's law	State Coulomb's law	board	using experiment.	Law using	
			Marker		experiment.	Voltmeter
	4.3 Explain how to solve	Explain how to solve	Computer	Perform experiment on		
	problems involving	problems involving	Internet	charging and discharging of	Perform experiment	Ammeter
	coulomb's law.	coulomb's law.	Charts	a capacitor.	on charging and	
			Animations		discharging of a	Ohmmeter
	4.4 Explain:	Explain:	Projector.		capacitor.	
	• Electric field strength	• Electric field				Cable
	• Electric flux density	strength				
	 Permittivity 	• Electric flux				EMF
	 Relative permittivity 	density	0			source
	 Field intensity 	Permittivity	11/-			
	 Potential difference 	Relative	O,			Electronic
	• Electric flux	permittivity				trainer
		 Field intensity 				
		 Potential difference 				
	4.5 Explain how to solve	 Electric flux 				
	problems involving the					
15	terms in (4.4) above.	Explain how to solve				
15	•	problems involving the				
	4.6 Define capacitance.	terms in (4.4) above.				
	4.7 Derive an expression for	Explain capacitance.				
	WALL		91			

the capacitance of				
parallel plate capacitors	Explain how to derive an			
in terms of area, the	expression for the			
distance between plates	capacitance of parallel			
and permittivity of the	plate capacitors in terms			
dielectric.	of area, the distance			
	between plates and			
	permittivity of the			
4.8 Derive an expression	dielectric.		•	
for the capacitance of a				
capacitor with	Explain how to derive an	1//4		
composite dielectrics.	expression for the	· ()		
	capacitance of a capacitor	O '		
4.9 Derive an expression for	with composite			
the voltage distribution	dielectrics.			
between series				
connected capacitors.	Explain how to derive			
	an expression for the			
	voltage distribution			
4.10 Deduce an expression	between series			
for the equivalent	connected capacitors.			
capacitance for				
capacitors connected in	Explain how to deduce			
series and in parallel.	an expression for the			
	equivalent capacitance			
4.11 Derive an expression				
for the energy stored in	in series and in parallel.			
a capacitor				
 			l .	

4.12 Explain how to solve	Explain how to derive	
problems involving	an expression for the	
(4.8 - 4.11).	energy stored in a	. 10'
	capacitor.	
	Explain how to solve	
	problems involving (4.8	
	- 4.11).	

ASSESSMENT: The practical class will be awarded 60% of the total score. The continuous assessments, test and quizzes will take 10% of the total score, while the remaining 30% will be for the end of the semester examination score

PROGRAMME: NATIONAL DIPLOMA IN ELEC	CTRICAL AND ELECTRONICS EN	IGINEERING TECHNOLOGY				
COURSE TITLE: Industrial Health and Safety	CODE: EEC 115	CONTACT HOURS: 2				
	CREDIT UNIT: 2	THEORETICAL: 1				
YEAR: I SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 1				
GOAL: This course is designed to equip student with	h knowledge and skills to observe He	alth and Safety in an Industrial field				
GENERAL OBJECTIVES: On completion of this	course, the students should be able to					
1.0 Integrate health and safety procedures into the we	ork environment.					
2.0 Relate legislation from the Occupational Health	and Safety Act and regulations.	•				
3.0 Know how to deal with hazards.						
4.0 Know the methods of control that will reduce exposure to hazards.						
5.0 Understand health and safety practices	~ ·					
6.0 Understand the concept of First Aid	\(\)\					

PROGRAMME: NATIONAL DIPLOMA IN IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY							
COURSE TITLE: Industrial Health and Safety	CODE: EEC 115	CONVACT HOURS: 2					
	CREDIT UNIT: 2	THEORETICAL: 1					
YEAR: I SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 1					
COLIDGE CRECIEICATION THE ARTICAL AND	ND A COLO AL CONTENT						

COURSE SPECIFICATION: THEARETICAL AND PRACTICAL CONTENT

GOAL: This course is designed to equip student with knowledge and skills to observe Health and Safety in an Industrial field

General Objective 1.0: Integrate health and safety procedures into the work environment.

THEO	THEORETICAL CONTENT			PRACTICAL CONTENT			
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources	
1-3	1.1 Explain accidents 1.2 Explain injury	Explain between accidents and injury	Textbook Journals	Identify different types of safety signs.	Guide learners on a site inspection to identify hazards.	Checklist templates	
	1.3 Define health and safety	Explain health and safety	Marker, Whiteboard	Identify and document workplace hazards in a real or simulated environment.	-	Risk	
	1.4 Differentiate between health and safety	Explain the differences between health and safety	Projector,	Perform risk assessments and recommend control	Supervise learners as they carry out a risk assessment on a	assessment forms	
	1.5 Explain the importance of health and safety.	Explain the importance of health and safety.	Computer health and safety	strategies. Select, use, and maintain	workstation or task.	Helmets, gloves,	
	1.6 Differentiate between accidents and injury	Explain the differences between accidents and	policy Governmen	correct PPE for specific tasks.	Demonstrate how to inspect, wear, and maintain PPE.	masks, safety glasses	
	1.7 Explain the functions of the Health Safety (HSE) Officer	injury Explain the functions of	t regulations,	Select and install appropriate signage according to location-			
	1.8 Describe the elements	the Health Safety (HSE) Officer		specific hazards.	Supervise student practice	Fire alarm, extinguisher	

	of a successful health and safety programme	Explain the elements of				, evacuation plan
		a successful health and		•		1
	1.9 Explain the causes of	safety programme				
	accidents and injuries	Explain the causes of				Safety sign
		accidents and injuries				materials,
						tape, wall
	1.10 Describe the major	Explain the major items				surface
	items on a safety policy	on a safety policy				Surface
	1.11 Explain accident	Explain accident				
	reporting and the	reporting and the		102		Incident
	preparation of an	preparation of an				report
	accident	accident Report	(forms, role-
	report					play
		Explain the safety audit				scenarios
	1.12 Explain the safety	process				Scenarios
	audit process					
		Explain sampling and				
	1.13 Explain sampling and monitoring	monitoring				
	1.14 Explain risk	Explain risk				
	identification and	identification and				
	assessment process.	assessment process.				
General	Objective 2.0: Relate legisla	tion from the Occupation	al Health and	Safety Act and regulations		
4-6	2.1 Explain the basic rights	Explain the basic rights	Textbook	Apply relevant legislative	Guide students to:	compliance
	of workers under the	of workers under the		requirements to assess	·	checklist
	Occupational Safety	Occupational Safety and	Journals	workplace compliance.		template
	and Health	Health Administration	Marker,	1	Apply relevant	1
	Administration	(OSHA)	Whiteboard		legislative	
	(OSHA)		,, integould		10513141110	

	Explain who is covered	Projector,	Interpret 1	key legislative	requirements to	Video clips
2.2 Explain who is covered	and who is not	Projector,	_		_	video clips
and who is not	and who is not	Computer	-	signage and	assess workplace	
and who is not	Explain the process for	health and	documents.		compliance.	
2.3 Explain the process for	the steps to follow under	safety				
the steps to follow	the right to refuse work	policy				
under the right to refuse	and the right to stop	P		gal reporting	Interpret key	
work and the right to	work		procedures		legislative safety	
stop work	Well		conditions	under OHS law.	signage and	
step well			,(documents.	
	Explain workplace					
2.4 Explain workplace	hazardous materials		10,			
hazardous materials	(industry-specific)				Practice legal	
(industry-specific)	 Manufacturing 	(reporting procedures	
 Manufacturing 	• Construction				for unsafe	
 Construction 	Agriculture				conditions under	
 Agriculture 	• Extractive				OHS law.	
 Extractive 						
 Energy 	Explain workplace					
	hazardous materials					
2.5 Explain workplace	information systems.					
hazardous materials						
information systems.	Explain how workplace					
	hazardous materials					
2.6 Explain how workplace	information is relayed to					
hazardous materials	workers.					
information is relayed						
to workers.	Explain the six					
2.7 Evaloin the six	categories of controlled					
2.7 Explain the six	substances e.g.					
categories of controlled substances e.g.	Chemical.					
substances e.g.						

	Chemical.					
Conoral	Objective 2 Or Understand	hovy to dool with howards				
	Objective 3.0: Understand I	1	1			1
7-8	 3.1 Explain the steps to deal with hazards 3.2 Describe the factors to determine the degree of hazard 3.3 Differentiate between the terms; Hazardous and toxic 	Explain the steps to deal with hazards Explain the factors to determine the degree of hazard Explain the terms;	Textbook Journals Marker, Whiteboard , Projector,	Identify and record hazards in a work environment. Conduct a basic risk assessment and suggest control measures. Apply appropriate hazard control methods using the	Guide students to: Identify and record hazards in a work environment. Conduct a basic risk assessment and suggest control	Hazard spotting checklist PPE instruction posters
	Acute and chronic 3.4 Explain the terms related to health hazards	 Hazardous and toxic Acute and chronic 	Computer health and safety policy	hierarchy of controls. Report on hazards to supervisors or safety reps.	measures.Apply appropriate hazard control	Floor plan templates,
	3.5 Explain the types of hazards	Explain the terms related to health hazards Explain the types of	8		methods using the hierarchy of controls. Report on hazards to	colored markers, legend guides
	3.6 Describe noise production, measurement, and control	hazards Describe noise production, measurement, and			supervisors or safety reps.	Incident reports, analysis
	3.7 Explain how to protect the worker from noise hazards3.8 Explain how to protect the worker from heat	Explain how to protect the worker from noise hazards				templates

		T	1	I		
	stress and cold stress.	Explain how to protect				
		the worker from heat			CV	
		stress and cold stress.				
General	Objective 4.0: Know the mo	ethods of control that will	reduce expos	ure to hazards	J	
9-11	4.1 Define general	Explain general	Textbook	Identify control measures	Guide students to:	Video clips
	ventilation and exhaust systems to maintain	ventilation and exhaust systems to maintain safe	Journals	in place and assess their adequacy and	Identify control	Emergency
	safe work environments	work environments	Marker, Whiteboard	effectiveness.	measures in place and assess their	procedure charts,
	4.2 Describe work	Explain work practices and controls that can	, willieboard		adequacy and effectiveness.	sample evacuation
	practices and controls that can reduce	reduce exposure levels	Projector,	HIL	Apply the hierarchy	maps.
	exposure levels		Computer health and	Apply the hierarchy of control to select appropriate	of control to select	
		Explain qualitative and	safety	measures for specific	appropriate measures for specific hazards.	
	4.3 Describe qualitative and quantitative	quantitative respirator systems	policy	hazards.	-	
	respirator systems	Explain different				
	4.4 Explain different protective devices to minimize exposure to	protective devices to minimize exposure to hazards				
	hazards	Explain lock-out and isolation systems				
	4.5 Explain power outage and isolation systems	Explain Lock-Out Tag-				
	Explain Lock-Out Tag-Out and Try-Out	Out and Try-Out (LOTOTO) systems				

	(LOTOTO) systems					
General	Objective 5.0: Understand	Lealth and safety practices	<u> </u> 		CY	
	 					
12-13	5.1 Explain safety and	Explain safety and health	Textbook	Identify safety and health	Guide students to:	Safety
	health requirements.	requirements.	Journals	requirements.	Identify safety and health requirements.	Charts
	5.2 Explain Safety signs and symbols.	Explain Safety signs and symbols.	Marker, Whiteboard	Identify Safety signs and symbols.	Identify Safety signs	Safety boots
	5.3 Describe the	Explain Safety signs and	,	Demonstrate the use of	and symbols.	Helmets
	importance of using personal protective	symbols.	Projector,	PPH	Demonstrate the use of PPE	Goggle
	equipment (PPE)	Explain PPE related	Computer health and	Safety boots		Coverall
	5.4 Explain PPE related procedures	procedures	safety	HelmetsGoggle	Safety bootsHelmets	Earmuff
	5.5 Explain the safety	Explain the safety principles for working	policy	Face ShieldCoverall	GoggleFace Sheild	Harness
	principles for working on and around	on and around electrical equipment;		• Earmuff • Harness	CoverallEarmuff	Nose Mask
	electrical equipment; • Effects of electric	Effects of electric current		Nose Mask Hand glove	HarnessNose Mask	Hand glove
	current on the	on the human body.		Tiunu gio ve	Hand glove	Evacuation
	 human body. Factors that affect the severity of an electric shock. 	Factors that affect the severity of an		Organize a simulated fire drill.	Organize a simulated fire drill.	maps, alarms, stopwatch
	The effects of arc and blast on the	electric shock. The effects of arc and blast on		Debrief students post-exercise.	Debrief students post-exercise.	Safety equipment,
	human body and equipment. Working with	the human body and equipment.		Demonstrate safe manual	Demonstrate safe manual handling or	load lifting aids,

		I			T.
energized	 Working with 		handling or machinery use.	machinery use.	demonstrati
equipment.	energized				on items
5.6 Explain fire safety	equipment.		Conduct role-play of an	Conduct role-play of	
principles in the			incident and reporting.	an incident and	Incident
workplace.				reporting.	report
-	Explain fire safety				forms, role
5.7 Explain hazards in	principles in the				cards
confined spaces and the	workplace.				
preparation needed to	•				Cleaning
work in a confined	Explain hazards in				tools,
space.	confined spaces and the				labeling
	preparation needed to				materials
5.8 Explain how to protect	work in a confined				1110000110010
the worker and others	space.				
when working in traffic					
paths (walkways)	Explain how to protect				
5.9 Explain safety	the worker and others				
measures related to	when working in traffic				
walkways, stairs, and	paths (walkways)				
floor openings					
noor openings					
5.10 Explain the					
importance of	Explain safety measures				
industrial housekeeping	related to walkways,				
by applying (5S) Total	stairs, and floor				
Productive	openings				
Management (TPM)					
methodology	Explain the importance				
	of industrial				
• Sort	housekeeping by				
	applying (5S) Total				
	Productive Management				

	• Set	(TPM) methodology				
	• Shine	• Sort				
	Standardize and	• Set			9	
	Sustain	• Shine				
		Standardize and Sustain		., CAL		
General	Objective 6.0 Understand the	e concept of First Aid	I	10)	l	
14-15	6.1 Define first aid	Explain first aid	Textbook	Perform first aid	Guide students to:	• Standard
	6 2 E1-i4hi		Journals			first aid
	6.2 Explain the aims of First Aid	Explain the aims of First	Journars	Carry out CPR	Perform first aid and	box
	riist Ald	Aid	Marker,	T1 .: C 1	Carry out CPR	
	6.3 Explain the essentials		Whiteboard	Identify and use first aid	Supervise handling	
	of a first aid kit	Explain the essentials of	,	materials and tools.	and identification of	• CPR
		a first aid kit		A		accessorie
	6.4 Explain the mechanics	Explain the mechanics	Projector,	Apply appropriate procedures for treating	kit components.	s.
	of injury	of injury	Computer	minor bleeding and		• First aid
		of injury	health and	wounds.		kits,
	6.5 Explain the priorities of	Explain the priorities of	safety	wounds.	Demonstrate	checklists
	treatment	treatment	policy	Immobilize limbs in cases	immobilization	
	6.6 Explain Resuscitation		F - 22-3	of suspected fractures or	techniques using	
	Cardiopulmonary	Explain Resuscitation		sprains.	splints or slings.	
	Resuscitation	Cardiopulmonar			1	• Gauze,
	(CPR)	y Resuscitation		Perform abdominal thrusts		gloves,
	Resuscitation for	(CPR)		for choking victims (adults		fake
	babies and children	Resuscitation for		and children).	Demonstrate and	wounds,

 Resuscitation with 	babies and			supervise Heimlich	antiseptic
chest compressions	children			technique on	
only	 Resuscitation 		. •	training manikins.	
 hygiene during 	with chest				
resuscitation	compressions			Organize mock	• Splints,
6.7 Explain the main	only			emergency drills and	bandages,
causes of	 hygiene during 			evaluate student	mannequin
unconsciousness in a	resuscitation			responses.	S
casualty	Explain the main causes				
	of unconsciousness in a				
6.8 Explain first aid	casualty				Choking
practices for the					manikins,
following conditions;	Explain first aid		·VII		instruction
• Asthma	practices for the				al posters.
emergencies	following conditions;				ar posters.
 Anaphylaxis 	• Asthma				
• Burns	emergencies	0			
 Choking 	 Anaphylaxis 				• CPR
 Fainting 	Burns				manikins,
 Hyperventilation 	 Choking 				AED
 Diabetic 	• Fainting				trainer (if
emergencies	 Hyperventilation 				available)
 External bleeding 	• Diabetic				
and severe trauma	emergencies				
 Environmental 	External				
emergencies	bleeding and				• Burn kits,
Heart Attack	severe trauma				water
Poisoning	Environmental				basins,
 Neck, head and 	emergencies				dressings
spinal injuries	 Heart Attack 				
Stroke	 Poisoning 				
		1			1

Seizure	Neck, head and		Simulation
	spinal injuries		space,
	• Stroke	, 10'	props,
	Seizure		assessment
			sheets.

ASSESSMENT: The practical class will be awarded 60% of the total score. The continuous assessments, test and quizzes will take 10% of the total score, while the remaining 30% will be for the end of the semester examination score

VEAR ONE, SEMESTER TWO

Electrical Power I

PROGRAMME: NATIONAL DIPLOMA	IN ELECTRICAL AND ELECTRONICS	ENGINEERING TECHNOLOGY
COURSE TITLE: Electrical Power I	COURSE CODE: EEC 121	CONTACT HOURS: 3
	CREDIT UNIT: 2	THEORETICAL: 1
VEAR· I SEMESTER· II	PRE-REQUISITE:	PRACTICAL: 2

GOAL. This course is designed to acquaint the students with the knowledge and skills of the principles of generation, transmission and distribution of electrical energy to consumers.

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

- 1.0: Understand the principles of generation and transmission of electrical energy
- 2.0 Understand the basic principles of distribution systems
- 3.0 Understand the basic principles of protection in power systems.
- 4.0: Understand types of insulators and support structures

PROGRAMME: NATIONAL DIPLOMA IN F	ELECTRICAL AND ELECTRONICS ENGINE	ERING TECHNOLOGY
COURSE TITLE: Electrical Power I	COURSE CODE: EEC 121	CONTACT HOURS: 3
	CREDIT UNIT: 2	THEORETICAL: 1
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GOAL: This course is designed to acquaint the students with the knowledge and skills of the principles of generation, transmission and distribution of electrical energy to consumers.

General Objective 1.0: Understand the principles of generation and transmission of electrical energy.

	<u> </u>	ne principles of generation and	ı transımssion			
T	HEORETICAL CONTEN	T		PRACTICAL CONTE	NT	
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers'	Evaluation
	Outcome			Outcome	Activities	
	1.1 Define power plant.	Explain power plant.	Textbooks		Guide to students:	Drawing
			Journals	Organize Industrial	Organize	materials
1 – 3	1.2 Explain generation	Explain generation system	Whiteboard	visits to observe the	Industrial visits to	
	system		Marker	layout of Generation,	observe the layout	Transmission
		Explain the layout of:	Charts	Transmission and	of Generation,	and
	1.3 Explain the layout of:	Steam plant	Animations	Distribution of power	Transmission and	distribution
	 Steam plant 	 Diesel plant 	Computer	systems.	Distribution of	line trainers'
	 Diesel plant 	 Gas plant 	Projector		power systems.	short and
	 Gas plant 	 Hydro power plant 				medium
	 Hydro power 	 Solar and wind 			Draw the layout	transmission
	plant	plant		Draw the layout of	of Steam plant,	line model
	 Solar and wind 	V)		Steam plant, Diesel	Diesel plant, Gas	
	plant	· ·		plant, Gas plant, Solar	plant, Solar and	Conductors
				and wind plant.	wind plant.	
	1.4 Explain the general	Explain the generation,				
	layout for the	transmission and distribution				

	generation	of electrical power systems.			Draw the layout	
	transmission and			Draw the layout of	of generation,	
	distribution of			generation, transmission	transmission and	
	electrical energy.			and distribution of	distribution of	
		Explain the differences		electrical power	electrical power	
	1.5 Differentiate between	between transmission and		systems.	systems.	
	transmission and	distribution networks.				
	distribution networks.				Draw the diagram	
		Explain the voltage levels			of generating	
	1.6 State the voltage	of generating station,		Draw the diagram of	station,	
	levels of generating	transmission and		generating station,	transmission and	
	station, transmission	distribution networks.		transmission and	distribution	
	and distribution			distribution networks	networks with	
	networks.	Explain the short and		with voltage levels.	voltage levels.	
		medium transmission lines				
	1.7 Distinguish between		—			
	short and medium					
	transmission lines.	Explain the principles of	,			
		power protection schemes.				
	1.8 Explain the principles	\circ				
	of power protection					
	schemes.	Discuss the types and sizes				
		of conductors used for				
	1.9 Explain the types and	transmission, distribution				
	sizes of conductors	and utilization of electrical				
	used for transmission.	power.				
	distribution and					
	utilization of					
L						1

	T	I	T			
	electrical power	Explain how to determine				
		the short transmission line			CY	
	1.10 Explain how to	parameters.				
	determine the short transmission line parameters.	Explain the construction of underground cables.			3	
	1.11 Explain the					
	construction of underground cables.	Explain how to solve problems involving short		MICALEI		
	1.12 Explain how to	transmission lines.				
	solve problems					
	involving short					
	transmission lines.					
General (Objective 2.0: Understand	the basic principles of distrib	ution systems			
	2.1 Explain distribution	Explain distribution	Textbooks	Identify the basic	Guide students to:	Distributors
7 – 9	system networks	system networks	Journals	components of	Identify the basic	
			Whiteboard	distribution systems	components of	Feeders and
	2.2 Explain the difference	Explain the difference	Marker		distribution	protection
	between distributors	between distributors and	Charts		systems	devices.
	and feeders	feeders	Animations	Determine balancing		
			Computer	situations of connected	Determine	Paper
	2.3 Describe the basic	Explain the basic	Projector	grid to distribution	balancing	
	components of	components of distribution		network to ensure	situations of	Calculators
	distribution systems	systems		power and load demand	connected grid to	
				are equal via calculation	distribution	
	2.4 Explain how to solve	Explain how to solve the			network to ensure	
	problems involving	problems involving			power and load	

	volto ao duoma in	voltono duona in			dantand are agual	
	voltage drops in	voltage drops in			demand are equal	
	simple distribution	distribution systems			via calculation	
	systems.					
	2.5 Describe the	Explain the principles of				
	principles of	protection				
	protection in	in distribution system				
	distribution system					
General	Objective 3.0: Understand t	he basic principles of protecti	on in power sy	stems		
	3.1 Define a fuse	Explain a fuse	Textbooks		Guide students to:	Fuse
10 -13			Journals 🔪	Identify the parts a	Identify the parts	
	3.2 Describe the parts of a	Describe the parts of a	Whiteboard	fuse.	a fuse.	Isolator
	fuse.	fuse.	Marker		Demonstrate the	
	3.3 Explain the purpose of		Charts	Demonstrate the	function of a fuse.	Circuit breaker
	a fuse.	Explain the purpose of a	Animations	function of a fuse.		
		fuse.	Computer		Identify the	Video clips
	3.4 Define fusing		Projector	Identify the moulded	moulded case circuit	•
	currents, current	Explain fusing currents	, ,	case circuit breaker.	breaker.	
	rating and fusing	current rating and fusing				
	factor.	factor.		Demonstrate the function	Demonstrate the	
				of an isolator.	function of an	
	3.5 Describe the moulded	Explain the moulded case			isolator.	
	case circuit breaker.	of a circuit breaker.				
		V		Identify the difference	Identify the	
	3.6 Define the	Explain the interruption		between a circuit	difference	
	interruption capacity	capacity of a circuit		breaker and an isolator	between a circuit	
	of a circuit breaker	breaker		STORIGHT WITH WITH ISOTATOL	breaker and an	
	of a circuit breaker	oreaner			isolator	
					15014101	

		T	ı			
	3.7 Define an isolator.	Explain an isolator.			CA	
	3.8 Explain the difference					
	between a circuit	Explain the difference				
	breaker and an	between a circuit breaker				
	isolator	and an isolator				
General	Objective 4.0: Understand ty	ypes of insulators and support	structures			
	1.1 Define insulator.	Explain insulator.	Textbooks	Identify types of	Guide students to:	Post type
14 -15			Journals	insulators.	Identify types of	
	1.2 Describe with the aid	Explain with the aid of	Whiteboard		insulators.	Pin type and
	of diagrams types of	diagrams types of	Marker 🔪	Demonstrate the		shackle ring
	insulators	insulators	Charts	applications of	Demonstrate the	insulators
	 Post type 	Post type	Animations	insulators in distribution	applications of	
	• Pin type	• Pin type	Computer	network	insulators in	
	Shackle ring, etc.	• Shackle ring, etc.	Projector		distribution	
			}		network	
	1.3 State the applications					
	of the insulators in 4.2	Explain the applications of				
	01 1220 2220 2220 222 222 222	the insulators in 4.2				
	1.4 Describe types of	the institutors in 1.2				
	insulating materials	Explain types of insulating				
	and their applications.	materials and their				
	and then applications.	applications.				
	1.5 Describe support	принатонь.				
	structures:	Explain support structures:				
	Wooden (Treated)	Wooden (Treated)				
	• Concrete Steel	• Concrete				
	(Galvanized)					

Steel (Galvanized)		

ASSESSMENT: The continuous assessment; tests and quizzes will be awarded 60% of the total score. The end of Semester Examination will make up for the remaining 40% of the total score.

Electrical Machine I

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY						
COURSE TITLE: Electrical Machine I	CODE: EEC 122	CONTACT HOURS: 3				
	CREDIT UNIT: 2	THEORETICAL: 1				
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2				

GOAL: This course is designed to equip the student with the knowledge and skills of the principles of operations, construction and maintenance of electrical machines

GENERAL OBJECTIVES: At the end of the course the student should be able to:

- 1.0 Understand the concept of magnetism
- 2.0 Understand the basic principle of DC Generator
- 3.0 Understand the basic principle of DC Motor
- 4.0 Understand the principle of Single-phase Induction Motor

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE TITLE: Electrical Machine I

CREDIT UNIT: 2

THEORETICAL: 1

YEAR: I SEMESTER: II

PRE-REQUISITE: PRACTICAL: 2

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GOAL: This course is designed to equip student with the knowledge of the principles of operations, construction and maintenance of electrical machines

General Objective 1.0: Understand the concept of magnetism

	Objective 1.0: Understand th	e concept of magnetism				
THEORETICAL CONTENT			PRAČTICAL CONTENT			
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers' Activities	Resources
	Outcome			Outcome		
	1.1 Explain Magnetism.	Explain Magnetism.	Textbooks		Guide the student to:	Magnet
1			Journals	Determine direction	Determine direction of	Iron particles
	1.2 Explain	Explain	Whiteboard	of magnetic field.	magnetic field.	
	electromagnetic fields	electromagnetic fields	Marker			Video clips
			Charts			
	1.3 Explain	Explain	Animations			
	electromagnetic	electromagnetic	Computer			
	induction	induction	Projector			
		00				

General	Objective 2.0: Understand the	ne basic principles of DC	Generator			
	2.1 Explain basic	Explain basic	Textbooks		Guide students to:	DC generator
2 - 4	principles of a DC	principles of a DC	Journals	Disassemble and	Disassemble and	
	Generator	Generator	Whiteboard	assemble a DC	assemble a DC	Separately
			Marker	Generator.	Generator.	excited DC
	2.2 Explain construction	Explain construction	Charts			generator
	of a DC Generator	of a DC Generator	Animations	Determine a DC	•	
			Computer	Generator terminal.	Determine a DC	Voltmeter
	2.3 Describe armature	Describe armature	Projector	Determine the	Generator terminal.	Ammeter
	reaction and emf	reaction and emf		characteristics of	Determine the	
	equations.	equations.		separately excited	characteristics of	Voltage
			. (DC Generator.	separately excited DC	source
	2.4 Explain classification	Explain classification		O'	Generator.	
	of generators.	of generators.		Perform an		
				experiment to show	Perform an experiment	
	2.5 Describe Voltage	Explain Voltage	1 /-	the relationship	to show the relationship	
	regulation	regulation		between armature	between armature	
				voltage and load	voltage and load current	
	2.6 Explain generator	Explain generator		current		
	power losses.	power losses.				
General	Objective 3.0: Understand the		lotor			
	3.1 Explain DC motor	Explain DC motor	Textbooks		Guide the students to:	DC motor
			Journals	Interpret a Motor	Interpret a Motor name	
	3.2 Describe operational	Explain the operational	Whiteboard	name plate	plate	Sample
5 -9	principle of a DC motor	principle of a DC	Marker			motor name
		motor	Charts	Conduct an	Conduct an experiment	plate
	3.3 Explain the	Explain the	Animations	experiment on DC	on DC Shunt motor	
	construction of DC	construction of DC	Computer	Shunt motor	Characteristics.	Series motor

	motor.	motor.	Projector	Characteristics.		
					Carry out experiment on	Shunt motor
	3.4 State Characteristics of	Explain Characteristics		Carry out experiment	DC Series motor	
	DC Motor.	of DC Motor.		on DC Series motor	Characteristics.	Compound
				Characteristics.		motor
	3.5 Outline starting	Explain starting			Perform an experiment	relay
	methods of DC Motor.	methods of DC		Perform an	on DC Compound motor	
		Motor.		experiment on DC	Characteristics.	
	3.6 Describe reversal of			Compound motor		
	rotation of a DC	Explain reversal of		Characteristics.	Carry out an experiment	
	motor	rotation of a DC motor			on starting DC motor	
			.(Carry out an	using a relay	
		Explain the procedure		experiment on		
	_	for the Inspection and		starting DC motor		
	1	maintenance of DC		using a relay		
		Motors	1/-			
	Motors		•			
General C	Objective 4.0: Understand the			tion Motor		
	3.1 Explain a single	Explain a single phase	Textbooks		Guide the students to:	Split phase
	phase induction motor	induction motor	Journals	Perform experiment	Perform experiment on	induction
			Whiteboard	on the Characteristic	the Characteristic of	motor
10 - 15	3.2 Describe operational	Describe operational	Marker	of Split phase	Split phase induction	
	principle of a Single	principle of a Single	Charts	induction motor.	motor.	Capacitor
	Phase induction	Phase induction motor	Animations			Start motor,
	motor		Computer	Carry out experiment		
		Explain the	Projector	on Characteristic of	Carry out experiment on	Capacitor run
	3.3 Explain the	construction of a		Capacitor Start	Characteristic of	motor
	construction of a	Single Phase		motor and Capacitor	Capacitor Start motor	

Single Phase	induction motor	run motor	and Capacitor run motor	Single-phase
induction motor				induction
	Explain types of	Inspect and maintain	. 10"	motor
	single-phase	a	Inspect and maintain a	
3.4 Describe types of	Induction motor.	Motor	Motor	
single-phase				
Induction motor.	Explain motor speed	Perform	Perform troubleshooting	
	of asynchronous	troubleshooting and	and repair of AC motors	
3.5 Describe motor speed	motor	repair of AC motors		
of asynchronous				
motor	Explain power losses			
	and efficiency			
4.6 Describe power losses				
and efficiency.				

ASSESSMENT: Assessment: The practical class will be awarded 60% of the total score. The continuous assessments, tests and quizzes will be 10% the total score, while the remaining 30% will be for the end of semester examination.

ELECTRONICS I

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY
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COURSE TITLE: ELECTRONICS I	COURSE CODE: EEC 123	CONTACT HOURS: 3
	CREDIT UNIT: 2	THEORETICAL: 1
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2

GOAL: This course is designed to equip the student with the knowledge and skills of passive and active electronic components and their applications

GENERAL OBJECTIVES: At the end of the course the student should be able to:

- 1.0 Understand the concept of passive components
- 2.0 Understand the concept of active components
- 3.0 Understand the characteristics of a PN Junction and Zener Diode
- 4.0 Understand application of Bipolar Junction Transistor
- 5.0 Understand the basic structure and application of thyristor

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICA	45		
COURSE TITLE: ELECTRONICS I	COURSE CODE: EEC 123	CONTAC	CT HOURS: 3
	CREDIT UNIT: 2	THEORE	ETICAL: 1
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTI	CAL: 2
COURSE CRECIFICATION, THEORETICAL AND DE	ACTICAL		

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GOAL: This course is designed to equip the student with the knowledge and skills of passive and active electronic components and their applications

General Objective 1.0: Understand the concept of passive components

THEOR	THEORETICAL CONTENT			PRACTICAL CONTENT			
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers' Activities	Resources	
	Outcome			Outcome			
1-2	1.1 Define matter and	Explain matter and	Textbook		Guide students to:	Breadboard	
	basic structure of	basic structure of Atom.	Journal	Construct a simple	Construct a simple		
	Atom.		Chart	electronic circuit	electronic circuit	Resistor	
			Animations	consisting of two	consisting of two		
	1.2 Define passive	Explain passive	Computer	resistors in series as a	resistors in series as a	DC Power	
	electronic	electronic components:	Projector	voltage divider	voltage divider	source	
	components:	• Resistors	Whiteboard				
	 Resistors 	 Capacitors 	Marker			Multimeter	
	 Capacitors 	 Inductors 					
	 Inductors 						
		Explain color codes in					
	1.3 Explain color codes	accordance with EIA					
	in accordance with	standards					
	EIA standards						
	1.4 Explain variable	Explain variable					
	1.4 Explain variable	resistor:					

	resistor:	• Potentiometer				
	 Potentiomet 	 Rheostat 				
	er					
	 Rheostat 					
General C	Objective 2.0: Understand th	e concept of active compo	nents		J	
	2.1 Define a	Define a semiconductor	Textbook		Guide students to:	Semiconduct
3 – 4	semiconductor		Journal	Identify Semiconductor	Identify Semiconductor	or
		Explain matter and	Chart	components with their	components with their	components
	2.2 Explain matter and	basic structure of Atom.	Animations	circuit symbol.	circuit symbol.	
	basic structure of		Computer	(1)		Breadboard
	Atom.	Describe electrons and	Projector	Carry out an experiment	Carry out an	
		holes as carriers of	Whiteboard	on breadboard to	experiment on	Sample
	2.3 Explain electrons and	electric charges.	Marker	implement circuit from	breadboard to	schematic
	holes as carriers of			the schematic diagram.	implement circuit from	diagram
	electric charges.	Describe energy levels	\circ		the schematic diagram.	
		in material, Valence and		Perform experiment on		Soldering
	2.4 Describe energy levels	Conduction)	how to solder and	Perform experiment on	iron
	in material, Valence			unsolder components on		
	and Conduction	Describe Conductors,		a printed wiring circuit	unsolder components	Printed
		Insulators and		board	on a printed wiring	wiring
	2.5 Describe Conductors,	Semiconductors.			circuit board	circuit board
	Insulators and			Demonstrate soldering		
	Semiconductors.	Describe Conduction in		techniques	Demonstrate soldering	Power
		Metals and Gas.			techniques	source
	2.6 Describe Conduction in					Soldering
	Metals and Gas.	Describe the concept of				Lead
		doping in				
	2.7 Describe the concept of	semiconductors				Soldering

		T	1	T	ı		1
	doping in						paste
	semiconductors						Suck
		Explain Intrinsic and) '	
	2.8 Explain Intrinsic and	Extrinsic					
	Extrinsic	Semiconductor					
	Semiconductor						
General	Objective 3.0: Understand	characteristics of a PN Jur	nction and Zener	Diode			
	3.1 Define a PN junction	Explain a PN junction	Textbook				
5 -7	Diode.	Diode.	Journal				
			Chart				
	3.2 Define Zener Diode.	Explain Zener Diode.	Animations	112.			
		1	Computer	X / ,			
	3.3 Describe Avalanche	Explain Avalanche	Projector				
	Breakdown (Zener	Breakdown (Zener	Whiteboard				
	diode).	diode).	Marker				
	<i>310 33)</i> .						
	3.4 Describe applications	Explain applications of					
	of Semiconductor	Semiconductor diode					
	diode						
		Explain Voltage					
	3.5 Describe Voltage	Stabilisation and					
	Stabilisation and	Reference.					
	Reference.	20 ,					
		Explain Voltage					
	3.6 Describe Voltage	Shifting.					
	Shifting.						
	3.7 Define transistor	Define transistor					

	 3.8 Explain the applications of transistor: Amplification Switching 3.9 Explain transistor biasing 	Explain the applications of transistor: • Amplification • Switching Explain transistor biasing				
	3.10 Explain transistor	Explain transistor	.(
	saturation and cut-off	saturation and cut-off				
General (Objective 4.0: Understand the	ne application of Bipolar Ju	ınction Transist	or		
	4.1 Describe the Bipolar	Describe the Bipolar	Textbook		Guide students to:	Breadboard
	Junction Transistor.	Junction Transistor.	Journal	Conduct an experiment	Conduct an	
			Chart	on measurement of	experiment on	Oscilloscope
	4.2 Explain the working	Explain the working	Animations	direct current in a	measurement of direct	
	principle of Bipolar	principle of Bipolar	Computer	circuit.	current in a circuit.	Electrolytic
	Junction Transistor	Junction Transistor	Projector			capacitor
8 - 11	using 2 diode model	using 2 diode model	Whiteboard	Carry out experiment to	Carry out experiment	
			Marker	measure the effect of	to measure the effect	Small
	4.3 Describe Common	Explain Common		resistance and observe	of resistance and	voltage
	Emitter	Emitter Configuration		the effect of voltage in	observe the effect of	transformers
	Configuration	 Voltage gain 		controlling current in a	voltage in controlling	
	 Voltage gain 	Current Gain		circuit.	current in a circuit.	Resistors
	Current Gain	• Power Gain.				

• Power Gain.		Perform an experiment	Perform an experiment
	Explain Common	to observe and measure	to observe and
4.4 Describe Common	Collector Configuration	input and output	measure input and
Collector	 Voltage gain 	waveforms of a full –	output waveforms of a
	• Current gain	wave rectifier	full – wave rectifier
Configuration	• Power gain		
• Voltage gain		Carry out experiment to	Carry out experiment
• Current gain	Explain Common Base	determine the time	to determine the time
 Power gain 	Configuration	constant of a Capacitor	constant of a Capacitor
	Voltage gain		
4.5 Describe Common	• Current gain	Perform an experiment	Perform an experiment
Base Configuration	Power gain	to show Zener diode as	to show Zener diode as
 Voltage gain 	1 ower gam	a Voltage regulator.	a Voltage regulator.
 Current gain 	Describe Field Effect.		
 Power gain 	Explain Basic FET		
4.6 Describe Field	Operation	Carry out experiment	Carry out experiment
Effect.	/ ()	to show Static	to show Static
	Explain Maximum	Characteristic of a PNP	Characteristic of a
4.7 Explain Basic FET	Transistor Rating.	Transistor in the	PNP Transistor in the
Operation		Common base	Common base
4.8 Define Maximum	Explain Waveform	configuration	configuration
	Distortion		
Transistor Rating.	VO,	Test Bipolar Junction	Test Bipolar Junction
4.0 Describe Wassefram	Explain the importance	Transistor.	Transistor.
4.9 Describe Waveform	of input Resistance at		
Distortion	Transistor Base.	Test PN Junction diode	Test PN Junction
		with Multimeter	diode with Multimeter

	4.10 Describe the	Explain:				
	importance of input	Base Bias				
	Resistance at	Emitter Bias				
	Transistor Base.	G 11				
	Transistor Base.					
	4.11 Describe:	feedback bias.		MICALLI		
	Base Bias	Explain Q – Point				
	 Emitter Bias 	Stability over				
	 Collector 	temperature.				
	feedback bias.					
	4.12 Define Q – Point		. (
	Stability over)		
	temperature.					
General (Objective 5.0: Understand the	he basic structure and appli	cation of Thyris	stor		
12 -15	5.1 Explain thyristor	Explain thyristor	Textbook		Guide students to:	Thyristor
			Journal	Perform experiment to	Perform experiment to	
	5.2 Explain two transistor	Explain two transistor	Chart	determine the	determine the	IGBT
	model of a thyristor	model of a thyristor	Animations	Characteristic of	Characteristic of	
		.07	Computer	thyristors	thyristors	SCR
	5.3 Describe Forward	Explain Forward break	Projector			
	break over voltage	over voltage and	Whiteboard			
	and Switching	Switching Current	Marker	Carry out experiment to	Carry out experiment	Solid state
	Current.			show Static	to show Static	relay
		Explain working		Characteristic	Characteristic	
	5.4 Describe working	principles of the		Thyristors	Thyristors	Breadboard
	principles of the	thyristor				
	thyristor					Oscilloscope

			Carry out experiment	Carry out experiment	
5.5 Describe Holding	Explain Holding		to investigate thyristor	to investigate thyristor	
Current and Switching	Current and Switching		switching	switching	
Current.	Current.				
5.6 Describe the Silicon					
Controlled Rectifier	Explain the Silicon				
(SCR)	Controlled Rectifier				
	(SCR)				
5.7 Describe the insulated					
gate bipolar transistor	Explain the insulated				
(IGBT)	gate bipolar transistor				
	(IGBT)) *		
5.8 Describe Turning ON					
the SCR	Explain Turning ON the				
	SCR				
5.9 Describe Half-wave) `			
Controlled	Explain Half-wave				
rectification	Controlled rectification				
	QV				
5.10 Describe full-	Explain full-wave				
wave Controlled	Controlled rectification				
rectification					
5.11 D 1	Explain Lighting				
5.11 Describe	System for Power				
Lighting System for	Interruption				
Power Interruption					

5.12 Describe an	Explain an overvoltage	
overvoltage protection	protection circuit	
circuit		
5.13 Describe DIAC	Explain DIAC	
5.14 Explain the	Explain the switching	
switching function of	function of DIAC	
DIAC		
5.15 Outline the	Explain the Advantages	
Advantages of the	of the Thyristor.	
Thyristor.		

ASSESSMENT: Assessment: The practical class will be awarded 60% of the total score. The continuous assessments, tests and quizzes will be 10% the total score, while the remaining 30% will be for the end of semester examination.

Electrical Engineering Science II

PROGRAMME: NATIONAL DIPLOMA IN ELECTR	RICAL AND ELECTRONICS ENGINEERING	G TE	CHNOLOGY
COURSE TITLE: Electrical Engineering Science II	CODE: EEC 124		CONTACT HOURS: 3
	CREDIT UNIT: 3	/	THEORETICAL: 1
YEAR: I SEMESTER: II	PRE-REQUISITE: EEC 114		PRACTICAL: 2

GOAL: This course is designed to equip students with the knowledge of fundamentals of Alternating Current (AC) theory.

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

- 1.0 Understand the concepts of magnetism and magnetic circuits.
- 2.0 Understand the concepts of electromagnetism and electromagnetic induction
- 3.0 Understand the concepts of inductance and its applications.
- 4.0 Understand the fundamentals of AC theory.

PROGRAMME: NATIONAL DIPLOMA IN IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY								
COURSE TITLE: Electrical Engineering Science II	COURSE CODE: EEC 124	CONTACT HOURS: 3						
	CREDIT UNIT: 3	THEORETICAL: 1						
YEAR: I SEMESTER: II	PRE-REQUISITE: EEC 114	PRACTICAL: 2						
COURSE SPECIFICATION: THEORETICAL AND	COURSE SPECIFICATION: THEORETICAL AND PRACTICAL							

GOAL: This course is designed to equip students with the knowledge of fundamentals of Alternating Current (AC) theory

General Objective 1.0: Understand the concepts of magnetism and magnetic circuits.

	THEORETIC	CAL CONTENT		PRACTICAL CONTENT			
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers'	Resources	
	Outcome			Outcome	Activities		
1 – 3	1.1 Explain:	Explain:	Textbooks		Guide students	Magnetic	
	 Magnetic flux, 	 Magnetic flux, 	Journals	Determine the B-H	to: Determine the	materials	
	 magnetic flux density 	 magnetic flux density 	Whiteboard	curve for magnetic	B-H curve for		
	• Electro-motive force	 Electro-motive force 	Marker	material (Hysteresis	magnetic	Magnet	
	 Magnetomotive force 	 Magnetomotive force 	Charts	curve)	material		
	 Magnetic field strength, 	 Magnetic field 	Animations		(Hysteresis	Inductor	
	• Reluctance,	strength,	Computer	Determine the	curve).		
	 Permeability of free 	 Reluctance, 	Projector	magnetic energy loss		Voltmeter	
	space (magnetic	 Permeability of free 		in magnetic materials	Determine the		
	constant)	space (magnetic			magnetic energy	Ammeter	
	Relative permeability.	constant)			loss in a		
		Relative permeability.			magnetic	Flux meter	
					material		
	1.2 Explain the concept of	Explain the concept of				Electronic	
	Hysteresis and B-H	Hysteresis and B-H curve				trainer	
	curve	•					

	 Describe the symbols, units and relationships of terms in (1.1) above. Explain the electrical equivalent of magnetic circuits with or without air-gap. Explain the analogies between electrical and magnetic circuits. Explain how to solve simple magnetic circuit 	Explain the symbols, units and relationships of terms in (1.1) above. Explain the electrical equivalent of magnetic circuits with or without air-gap. Explain the analogies between electrical and magnetic circuits. Explain how to solve simple magnetic circuit problems.				
Company	problems. 1.7 Distinguish between soft and hard magnetic materials.	Distinguish between soft and hard magnetic materials				
4 -8	Objective 2.0: Understand the 2.1 Explain heating and		Textbooks	gnetic induction	Guide student to:	Magnetia
4 -0	magnetic effects on	Explain heating and magnetic effects on	Journals	Verify Faraday's law	Verify Faraday's	Magnetic material(para-
	current carrying	current carrying conductor	Whiteboard	of electromagnetic	law of	magnetic
	conductor	current carrying conductor	Marker	induction	electromagnetic	magnetie
	John Market Comment of the Comment o	Explain with aid of	Charts	inauction	induction	Diamagnetic
	40	diagram the magnetic	Animations			and fero-

2 2 51-1	£.11 1.	C	V: C - I! - 1 C	V- ∴C- I	
2.2 Explain with aid of	fields around:	Computer	Verify Lenz's law of	Verify Lenz's law	magnetic)
diagram the magnetic	 Straight conductors 	Projector	electromagnetic	of	
fields around:	 Adjacent parallel 	•	induction.	electromagnetic	Magnet,
 Straight conductors 	Conductors			induction.	Inductor
 Adjacent parallel 	Solenoids.		Determine the		
Conductors			inductance of a coil	Determine the	Voltmeter
Solenoids.				inductance of a	
	Explain the force on a			coil.	Ammeter
2.3 Explain the force on a	current carrying conductor		Determine energy loss		Flux meter
current carrying	in a magnetic field.		in an inductor.	Determine	
conductor in a magnetic				energy loss in an	Electronic
field.	State the direction of the	CX		inductor.	trainers
	force in (2.3) above.				
2.4 State the direction of the	(=.0)				
force in (2.3) above.					
(2.0) (2.1)	Derive the expression for	2			
2.5 Derive the expression for	the magnitude of the force				
the magnitude of the	in 2.4 above.				
force in 2.4 above.	Explain the concept of				
10100 III 2.4 400 vc.	electromagnetic induction.				
2.6 Explain the concept of	electromagnetic materion.				
electromagnetic	State Faraday's and Lenz's				
induction.	Laws of electromagnetic				
mauction.	induction.				
2.7 State Faraday's and	muuchon.				
Lenz's Laws of	Derive the expressions for				
electromagnetic	the magnitude of Electro-				
induction.	motive Force (EMF)				

	2.10 Derive the	induced in a conductor or				
	expressions for the	a coil.			CV	
	magnitude of Electro-					
	motive Force (EMF)	Explain how to solve			J	
	induced in a conductor	problems involving				
	or a coil.	electromagnetic induction				
		and the magnitude of				
	2.11 Explain how to	induced EMF.				
	solve problems					
	involving	Explain the applications of				
	electromagnetic	electromagnetic induction.				
	induction and the		CX			
	magnitude of induced					
	EMF.					
	2.10 State the applications		—			
	of electromagnetic					
	induction.					
General	Objective: 3.0 Understand th	e concepts of inductance and	its applications			
9-11	3.1 Define self and mutual	Define self and mutual	Textbooks		Guide students	Magnetic
	inductance and their	inductance and their	Journals	Determine the energy	to: Determine the	material (para-
	symbols.	symbols.	Whiteboard	loss in an inductor.	energy loss in an	magnetic
			Marker		inductor.	
	3.2 Explain the expression	Explain the expression for	Charts			Diamagnetic
	for the equivalent	the equivalent inductance	Animations	Determine the	Determine the	and fero-
	inductance of	of inductances connected	Computer	equivalent inductance	equivalent	magnetic)
	inductances connected in	in series and parallel.	Projector	of serial and parallel	inductance of	
	series and parallel.			inductive circuits.	serial and parallel	Magnet
	Objective: 3.0 Understand the 3.1 Define self and mutual inductance and their symbols. 3.2 Explain the expression for the equivalent inductance of inductances connected in	Define self and mutual inductance and their symbols. Explain the expression for the equivalent inductance of inductances connected	Textbooks Journals Whiteboard Marker Charts Animations Computer	loss in an inductor. Determine the equivalent inductance of serial and parallel	to: Determine the energy loss in an inductor. Determine the equivalent inductance of	material (para magnetic Diamagnetic and fero- magnetic)

				1		,
		Explain the expression for			inductive circuits.	(neodymium)
	3.3 Explain the expression	the induced voltage across			CV	
	for the induced voltage	an inductor.		Determine the	Determine the	Inductor
	across an inductor.			magnetic coupling in	magnetic	
		Explain the expression for		a transformer	coupling in a	Voltmeter
	3.4 Explain the expression	mutual inductance in			transformer	
	for mutual inductance in	coupled coils connected in				Ammeter
	coupled coils connected	series aiding or opposing.				
	in series aiding or					Flux meter
	opposing.	Explain how to calculate				Transformer
		the stored energy in an				
	3.5 Explain how to calculate	inductor.	CX			Coil
	the stored energy in an					
	inductor.					Electronic
		Explain how to solve				trainers
	3.6 Explain how to solve	problem involving series,	_			
	problem involving	parallel inductive circuits.				
	series, parallel inductive	V				
	circuits.	Explain using diagram the				
		operation of the induction				
	3.7 Explain using diagram	coiled in a car ignition				
	the operation of the	system				
	induction coiled in a car	60 .				
	ignition system.					
General	Objective 4.0: Understand the	e fundamentals of Alternating	Current (AC) T	heory		
12- 15	4.1 Describe the production	Describe the production of	Textbooks	Determine the	Guide student to:	Magnetic
	of an alternating EMF by	an alternating EMF by a	Journals	frequency, period and	Determine the	material (para-
	a rotating coil in a	rotating coil in a magnetic	Whiteboard,	amplitude of a	frequency, period	magnetic

magnetic field.	field.	Marker	sinusoidal signal.	and amplitude of	
magnetic field.	Tiora.	Charts	Sinusoraur signar.	a sinusoidal	Diamagnetic
4.2 Explain AC waveforms	Explain AC waveforms	Animations	Determine the series	signal.	and fero-
both to scale and not to	both to scale and not to	Computer	and parallel resonance	3	magnetic)
scale.	scale.	Projector	of an AC circuit.	Determine the	
				series and	Oscilloscope
4.3 Define:				parallel	
 Root Mean Square 	Define:		Determine the	resonance of an	Signal
(RMS)	Root Mean Square		Quality-factor (Q-	AC circuit.	generator
 Instantaneous, 	(RMS)		factor) of series and		
Average value	• Instantaneous,		parallel RLC circuits.	Determine the	Voltmeter
 Peak value 	 Average value 	.(``		Quality-factor	
 Period 	 Peak value 			(Q-factor) of	Ammeter
• Frequency of an AC	• Period			series and	
waveform.	• Frequency of an AC			parallel RLC	Resistor
	waveform.			circuits	* 1
4.4 State the relationships					Inductor
between instantaneous	State the relationships				C
and peak values of a	between instantaneous				Capacitors
sinusoidal wave signals.	and peak values of a				Connecting
	sinusoidal wave				cable
4.5 Explain how to solve	signals.				Cabic
problems involving (4.2 -					Electronic
4.4) above.	Explain how to solve				trainer.
A C Francis Is a read a sell	problems involving (4.2 -				
4.6 Explain how to solve	4.4) above.				
problems graphically on	Evaluia have to calve				
AC circuits with	Explain how to solve				

different combinations of	problems graphically on			
resistance, inductance	AC circuits with different			
and capacitance i.e. RLC	combinations of			
circuits.	resistance, inductance and			
	capacitance i.e. RLC			
4.6 Differentiate between	circuits.			
series and parallel				
resonances.				
	Differentiate between			
4.7 Explain phase lag or	series and parallel			
phase lead as applied to	resonances.			
AC circuits.		CX		
4.8 Explain the difference	Explain phase lag or phase			
between single and 3-	lead as applied to AC			
phase supply	circuits.			
4.10 State the advantages	Explain the difference			
and disadvantages of 3-	between single and 3-phase			
phase supply and single	supply.			
phase supply.				
	Explain the advantages			
	and disadvantages of 3-			
	phase supply and single			
	phase supply.			

ASSESSMENT: The practical class will be awarded 60% of the total score. The continuous assessments, test and quizzes will take 10% of the total score, while the remaining 30% will be for the end of semester examination score.

Electrical and Electronics measurement and Instrumentation

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY									
COURSE TITLE: Electrical and Electronics	CODE: EEC 125				CONTACT HOURS: 4				
measurement and Instrumentation	CREDIT UNIT: 2		-/		THEORETICAL: 1				
YEAR: I SEMESTER: II	PRE-REQUISITE:	4			PRACTICAL: 3				

GOAL: This course is designed to acquaint the students with the knowledge and skills of application of electrical/electronic instruments for laboratory and industrial measurements

GENERAL OBJECTIVES: At the end of the course the student should be able to:

- 1.0 Know electrical and electronic instruments.
- 2.0 Understand error in measurement.
- 3.0 Understand measurement instruments in electrical and electronics systems.
- 4.0 Understand the working principles and constructions of measuring instruments

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICA	AL AND ELECTRONICS ENGINEE	RING
COURSE TITLE: Electrical and Electronics	COURSE CODE: EEC 125	CONTACT HOURS: 4
measurement and Instrumentation	CREDIT UNIT: 2	THEORETICAL: 1
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 3
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GOAL: This course is designed to acquaint the students with the knowledge and skills of application of electrical/electronic instruments for laboratory and industrial measurements

General Objective: 1.0: Know electrical and electronic instruments.

	THEORETICA	L CONTENT		PRACTICAL CONTENT			
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers'	Resources	
	Outcome			Outcome	Activities		
	1.1 Explain commonly used	Explain commonly	Textbooks		Guide the Students	Digital	
1-2	Electrical and Electronic	used Electrical and	Journals	Identify the	to:	Oscilloscope	
	Measurement	Electronic	Whiteboard	instruments listed	Identify the		
	Instruments:	Measurement	Marker	below:	instruments listed	Signal	
	Digital	Instruments:	Charts	 Digital 	below:	generator	
	multimeter	 Digital 	Animations	multimeter	 Digital 		
	Analogue	multimeter	Computer	 Analogue 	multimeter	d.c/a.c	
	multimeter	 Analogue 	Projector	multimeter	 Analogue 		
	Voltage tester	multimeter		• Voltage	multimeter	Power	

Clamp meter	Voltage tester	tester	 Voltage tester 	supplies
 Oscilloscope 	Clamp meter	Clamp meter	 Clamp meter 	
 Insulation 	 Oscilloscope 	Oscilloscope	 Oscilloscope 	Probe
resistance	 Insulation 	Insulation	Insulation	
tester (Megger)	resistance	resistance	resistance	Voltage
Tachometer	tester (Megger)	tester	tester (Megger)	testers
• Wattmeter	• Tachometer	(Megger)	 Tachometer 	
Thermometer	• Wattmeter	Tachometer	 Wattmeter 	Clamp meters
 Frequency 	• Thermometer	Wattmeter	• Thermometer	F
Counters	• Frequency	Thermometer	 Frequency 	Frequency
Battery tester	Counters	Frequency	Counters	counter
	Battery tester	Counters	 Battery tester 	Resistors
1.2 Explain the applications	Explain the	Battery tester		Resistors
of the instruments	applications of the		Demonstrate ohm's	Cables
listed in 1.1 above.	instruments listed in	Demonstrate	law using variable	Cables
	1.1 above	ohm's law using	resistance and	Insulation
1.3 State the range of each		variable resistance	variable E.M.F	continuity
type of electrical and	Explain the range of	and variable		tester
electronics instruments.	each type of electrical	E.M.F		
	and electronics			Voltage
	instruments			sources.
General Objective: 2.0 Understand	error in measurement	1		

3-5	2.1 Define error in	Explain error in	Textbooks		Guide students to:	Capacitors
	measurement	measurement	Journals	Demonstrate	Demonstrate	
			Whiteboard	practical examples	practical examples	Inductor
	2.2 Explain types of errors	Explain types of	Marker	of error	of error	
	in measurement.	errors in	Charts			e.m.f sources
		measurement.	Animations	Determine the		
	2.3 Explain the differences		Computer	resistivity of	Determine the	Voltmeter
	between Random and	Explain the	Projector	materials	resistivity of	and ammeter
	Static error in electrical	differences between			materials	
	measurement.	Random and Static		Verify Kirchhoff's		
		error in electrical		current and	Verify Kirchhoff's	
	2.3 Define Resistance.	measurement.		voltage law	current and voltage	
					law	
	2.4 State Kirchhoff's	Explain Resistance.		Demonstrate		
	current and voltage law.			superposition	Demonstrate	
		Explain Kirchhoff's	~	Theorem	superposition	
	2.5 State Superposition	current and voltage			Theorem	
	theorem.	law.				
		0,				
		Explain Superposition				
		theorem.				
Genera	al Objective 3.0: Understand m	neasurement instruments	in electrical a	nd electronics system	S.	
6-8	3.1 Explain the following:	Explain the	Textbooks	Demonstrate the	Guide students to:	Digital
	Digital multimeter	following:	Journals	use of the	Demonstrate the use	multimeter
	Analogue	• Digital	Whiteboard	following using	of the following	
	multimeter	multimeter	Marker	different circuits:	using different	Analogue
	 Voltage tester 	Analogue	Charts	• Digital	circuits:	multimeter
	Clamp meter	multimeter	Animations	multimeter	• Digital	

• Oscilloscope • Voltage tester Computer • Analogue multimeter	Voltage tester
• Clamp meter Projector multimeter • Analogue	
3.2 Explain the operating • Oscilloscope • Voltage tester multimeter	Clamp meter
principles measuring • Clamp meter Voltage tester	
instruments Explain the operating • Oscilloscope Clamp meter	Oscilloscope
principles of Oscilloscope	
3.3 Explain the different measuring Measure voltage	
selector ranges on a instruments and current by	
digital multimeter to be connecting	
used as: Explain the different Multiplier and Measure voltage and	1
Ammeter selector ranges on a Shunt respectively. current by	
(AC/DC) digital multimeter to connecting	
Voltmeter. be used as Charge and Multiplier and	
(AC/DC) • Ammeter discharge a Shunt respectively.	
(AC/DC) capacitor, inductor	
3.4 Explain how a • Voltmeter.	
multiplier and Shunt (AC/DC) Calibrate and Charge and	
can be used to increase measure with discharge a	
the range of Voltmeter Explain how a multimeter. capacitor, inductor	
and ammeter multiplier and Shunt	
respectively. can be used to Measure direct	
increase the range of current (d.c) Calibrate and	
3.5 Explain how to Voltmeter and voltage in measure with	
calculate the Values of ammeter respectively. experiments using multimeter	
the multiplier and shunt multimeter	
Explain how to Measure direct	
calculate the Values Measure current (d.c) voltage	
of the multiplier and alternating current in experiments using	5

	T	T	ı			
		shunt.		(a.c) voltage in	multimeter	
				experiments using	CY	
				digital multimeter	Measure alternating	
					current (a.c) voltage	
				Calculate the	in experiments using	
				Values of the	digital multimeter	
				multiplier and	*	
				shunt.		
				رال). ال	Calculate the Values	
				Calibrate a moving	of the multiplier and	
				coil instrument	shunt.	
					Calibrate a moving	
					coil instrument	
Genera	al Objective 4.0: Understand the			s of meters and merge	er	
9-11	4.1 Explain the following	Explain the following	Textbooks		Guide students to:	Capacitors
	meters:	meters:	Journals	Use meters to	Use meters to	
	 Digital 	Digital Voltmeter	Whiteboard	measure	measure	Inductor
	Voltmeter	 Frequency 	Marker	 Voltage 	 Voltage 	
	 Frequency 	Counter	Charts	 Current 	• Current	e.m.f sources
	Counter	 Ohmmeter 	Animations	 Variable 	 Variable 	
	• Ohmmeter	• Ammeter	Computer	frequencies	frequencies	Resistors
	• Ammeter	Merger	Projector	• Earth	• Earth resistance	
	Merger	LCR meter		resistance	 Insulation 	Voltmeter
	• LCR meter			 Insulation 	resistance	and ammeter
				resistance	Current (Clamp	
	4.2 Explain earth point	Explain earth point		• Current	meter)	Insulation
	A ()'					resistance

			(Clamp meter)		tester
4.3 Explain the working principles of the	Explain the working principles of the		(Clamp meter)	· Ch.	LCR meter.
instruments in 4.1 above.	instruments in 4.1		Sketch a diagram	Sketch a diagram of	
4.4 Explain features of the	above.		of the following	the following	
instruments in 4.1 above.	Explain features of the		meters:	meters:	
	instruments in 4.1		• Digital	Digital	
4.5 Explain functions and	above.		Voltmeter	Voltmeter	
constructions of the			 Frequency 	 Frequency 	
instruments in 4.1 above.	Explain functions and		Counter	Counter	
	constructions of the		Ohmmeter	 Ohmmeter 	
	instruments in 4.1		Ammeter	• Ammeter	
	above.		Merger	 Merger 	
			• LCR meter	• LCR meter	
		-	Identify earth		
			point	Identify earth point	

ASSESSMENT: The practical class will be awarded 60% of the total score. The continuous assessments, test and quizzes will cover 10% of the total score, while the remaining 30% will be for the end of the semester examination.

Telecommunication I

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY						
COURSE TITLE: Telecommunication I	COURSE CODE: EEC 126	CONTACT HOURS: 3				
	CREDIT UNIT: 2	THEORETICAL: 1				
YEAR: I SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2				
GOAL: This course is designed to equip the students with the knowledge and skills of the principles of telecommunication techniques.						

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

- 1.0 Understand the basic principles of telecommunication system
- 2.0 Understand the principles of operation and application of various transducers
- 3.0 Understand the basic principles of modulation and demodulation of signals.
- 4.0 Understand the principles of receivers.

PROGRAMME: NATIONAL DIPLOMA IN IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY							
COURSE TITLE: Telecommunication I COURSE C		ODE: EEC 126		CONTACT HOURS: 3			
CREDIT U		NIT: 2		THEORETICAL: 1			
YEAR: I SEMESTER: II PRE-REQU			USITE:	PRACTICAL: 2		,	
	GOAL: This course is designed to equip the students with the knowledge and skills of the principles of telecommunication techniques.						
Genera	General Objective 1.0: Understand the basic principles of telecommunication system						
	THEORETIC	CAL CONTENT		PRACTICAL CONTENT			
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers' Activities	Resources	
	Outcomes			Outcome			
1 – 2	1.1 Define	Explain	Textbooks	Visit a	Guide students to:	Sample block	
	telecommunication	telecommunication	Journals	communication	Visit a communication	diagram of a	
			Whiteboard	service provider	service provider	communication	
	1.2 Explain the block	Explain the block	Marker	company	company	system	
	diagram of a simple	diagram of a simple	Charts				
	communication	communication system	Animations	Identify the basic	Identify the basic	Videoclips	
	system.		Computer	segments in the	segments in the block		
	105	Explain transducer	Projector.	block diagram of	diagram of the	Communication	
	1.3 Explain transducer			the communication	communication	trainer	
	145 1: 4	Explain the types of		system.	system.		
	1.4 Explain the types of transducers	transducers					
		Explain the functions					
	1.5 Explain the functions	of each of the					
	of each of the	segments in the block					
	segments in the block						
	0	above.					
General Objective 2.0: Understand the principles of operation and application of various transducers.							
3 – 5	2.1 Describe sound	Explain sound	Textbooks				

	transducers:	transducers:	Journals			
	 Microphones 	 Microphones 	Whiteboard			
	 Speakers 	 Speakers 	Marker		. 10'	
	1	1	Charts			
	2.2 Explain with the aid of	Explain with the aid of	Animations			
	diagrams the principles	diagrams the	Computer			
	of operation of sound	principles of operation	Projector.			
	transducers	of sound transducers				
				.4()		
	2.3 Explain the	Explain the				
	applications of sound	applications of sound				
	transducers.	transducers.				
				O'		
Genera	al Objective 3.0: Understand	the basic principles of mo	dulation and de	modulation of signals.		
6 – 8	3.1 Define modulation and	Explain modulation and	Textbooks	Visit AM and FM	Organize Visit to AM	Communication
	demodulation	demodulation	Journals	radio stations	and FM radio stations	trainer,
			Whiteboard			AM transmitter
	3.2 Explain the applications	Explain the applications	Marker	Demonst	Guide	and receiver
	of modulation and	of modulation and	Charts	rate	students to	trainer,
	demodulation in	demodulation in	Animations	modulati	Demonstrat	FM transmitter
	communication	communication	Computer	on and	e	and receiver
	systems.	systems.	Projector.	demodul	modulation	trainer,
				ation in	and	Oscilloscope,
	3.3 Explain the modulation	Explain the		AM and	demodulati	Oscillator,
	techniques.	modulation		FM	on in AM	
		techniques.		Modes	and FM	
	3.4 Explain the working				Modes	
	principles of amplitude	Explain the working				

demodulators.	principles of			
	amplitude			
3.4 Explain the following	demodulators		. 10'	
terms regarding amplitude				
modulation (AM):	Explain the following			
Carrier frequency	terms regarding			
Audio frequency	amplitude modulation			
• Side frequencies	(AM):			
Side hequenciesSide band	• Carrier frequency			
36.11.2.1.1	Audio frequency			
	 Side frequencies 			
• Modulation	Side hequenciesSide band			
envelope				
Bandwidth		XX		
	• Modulation			
	envelope	_0_		
3.5 Explain the working	Bandwidth			
principles of frequency				
demodulators.	Explain the working			
	principles of			
3.6 Explain the following	frequency			
terms regarding	demodulators.			
Frequency Modulation	- ()			
(FM):	Explain the following			
Modulation index	terms regarding			
Deviation ratio	Frequency Modulation			
• Frequency	(FM):			
deviation	Modulation index			

	 System deviation Frequency swing 3.7 Explain why FM has a wider bandwidth than AM. 3.8 Explain the differences between the parameters of FM with 	 Deviation ratio Frequency deviation System deviation Frequency swing Explain why FM has a wider bandwidth than AM. Explain differences between the 				
	AM.	parameters of FM with AM.				
	3.9 Explain how to solve problems involving (3.4) and (3.6) above.	Explain how to solve problems involving (3.4) and (3.5) above.	0/2			
Genera	al Objective 4.0: Understand	the principles of operation	n of receivers.			
12-15	4.1 Define a receiver4.2 Explain the types of	Explain receiver Explain the types of	Textbooks Journals Whiteboard	Visit AM and FM Radio stations	Guide students to: Visit AM and FM Radio stations	Communication trainer
	receivers	receivers	Marker Charts	Demonstrate the operation of	Demonstrate the	AM transmitter and receiver
	4.3 Explain by using	Explain by using	Animations	receivers using	operation of receivers	trainer
	diagram the function of	diagram the function	Computer	receiver trainer	using receiver trainer	
	receivers.	of receivers.	Projector.			FM transmitter and receiver

	4.4 Explain the choice of	Explain the choice of			trainer
	intermediate frequency	intermediate frequency			
	in receivers.	in receivers.			Oscilloscope
	4.5 Explain adjacent	Explain adjacent			Oscillator
	channel and image	channel and image			
	interferences in	interferences in		•	
	receivers.	receivers.			
		Explain the use of			
	4.6 Explain the use of	receiver to suppress			
	receiver to suppress	image and adjacent	. (
	image and adjacent	channel interferences.			
	channel interferences.				
		Explain the function of			
	4.7 Explain the function of	the automatic gain			
	Automatic Gain	control (AGC).			
	Control (AGC).				
		Explain with the aid of			
	4.8 Explain with the aid of	a block diagram, the			
	a block diagram, the	working principles of			
	working principles of	an FM radio receiver.			
	an FM radio receiver.				
-					

ASSESSMENT: The practical class will be awarded 60% of the total score. The continuous assessments, tests and quizzes will be 10% the total score, while the remaining 30% will be for the end of Semester examination.

Electrical Installation of Buildings

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL	AND ELECTRONICS ENGINER	ERING TECH	NOLOGY
COURSE TITLE: Electrical Installation of Buildings	COURSE CODE: EEC 127		CONTACT HOURS: 3
	CREDIT UNIT: 2		THEORETICAL: 1
YEAR: I SEMESTER: II	PRE-REQUISITE:		PRACTICAL: 2

GOAL. This course is designed to equip the students with knowledge and skills to implement electrical installations of buildings.

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

- 1.0 Understand electrical/electronic standard symbols.
- 2.0 Understand schematic, wiring diagrams and earthing system.
- 3.0 Interpret building drawings and symbols.
- 4.0 Understand cables and IEE wiring Regulations.
- 5.0 Understand the bill of quantities of materials for the electrical installation of building.
- 6.0 Understand Solar power installation, home automation and smart metering.

PROG	FRAMME: NATIONAL DIPLO	OMA IN ELECTRICAL	AND E	LECTRONIC	S ENGINEERI	NG TECHNOLOGY	•	
COURSE TITLE: Electrical Installation of Buildings			COURSE CODE: EEC 127			CONTACT HO	CONTACT HOURS: 3	
			CRED	IT UNIT: 2	2	THEORETICA	L: 1	
YEAR	: I SEMESTER: II		PRE-R	REQUISITE:		PRACTICAL:	2	
COUR	SE SPECIFICATION: THE	ORETICAL AND PRAC	CTICA	L				
GOAI	: This course is designed to equ	uip the students with kno	wledge	and skills to i	mplement electr	rical installations of b	uildings.	
Gener	al Objective 1.0: Understand ele	ectrical/electronic standa	rd syml	ools.				
	THEORETICAL CONTE	ENT			PRACTICAL	CONTENT		
Week	Specific Learning Outcome	Teachers' Activities		Resources	Specific	Teachers'	Resources	
					Learning	Activities		
					Outcome			
	1.1 Define standard symbol.	Explain standard symb	ol.	Textbook	Identify the	Guide students	Sample symbols	
				Journals	standard	to:		
1-2	1.2 Explain electrical drafting.	Explain electrical draft	ing.	Whiteboard	symbols	Identify the	Charts	
			S)	Marker		standard		
	1.3 Explain electrical standard	Explain electrical stand		Charts	Sketch the	symbols	Video clips	
	symbols of the following:	symbols of the following	ng:	Animation	standard	C1 4 1 41		
	• Resistor.	• Resistor.	•	Computer	symbols	Sketch the	Electrical	
	• Capacitor	 Capacitor 		Projector.		standard	training	
	• Inductor	Inductor				symbols	modules	
	• Diodes	Drodes					Safety	
	• Thyristor	Thyristor					charts/posters	
	• Diac	• Diac					charts/posters	
	• Triac	Triac					Fire	
	Operational	Operational					extinguisher	
	 Amplifier 	 Amplifier 						
	 Oscillator 	 Oscillator 						

Logic gates	• Logic gates	Sand bucket
• Linear	• Linear	, C X
• IC	• IC	First aid box
PV panel	• PV panel	
Charge Controller	Charge Controller	
Battery	• Battery	
• Inverter	• Inverter	
Surmisable water	Surmisable water	
• Pump	• Pump	O'
Power Switches	Power Switches	Y
• Sockets	• Sockets	
Isolator Switch	Isolator Switch	
Circuit Breakers	Circuit Breakers	
Electrical Motors	Electrical Motors	
Electrical	Electrical	
Generators	Generators	
• AC/Fans	• AC/Fans	
• ELCB.	• ELCB.	
Distribution Board	Distribution Board	
Junction box	Junction box	
Lamp holder	Lamp holder	
Camera	Camera	
• TV	• TV	
Audio cable	Audio cable	
• Single and Multi-	Single and Multi-	
core Power cables.	core Power cables.	
I VO'		

Gener	General Objective 2.0: Understand schematic, wiring diagrams and earthing system.								
3-4	2.1 Explain schematic and	Explain schematic and	Textbook		Guide students	Sample			
	Wiring Diagrams	Wiring Diagrams	Journals	Interpret a	to:	schematic			
			Whiteboard	schematic 🗸	Interpret a	diagrams			
	2.2 State the merits and	State the merits and demerits	Marker	diagram	schematic				
	demerits of schematic	of schematic Diagrams	Charts		diagram				
	Diagrams		Animation			Sample wiring			
			Computer	Interpret a wiring		diagrams			
	2.3 State the merits and	State the merits and demerits	Projector	diagram	Interpret a wiring				
	demerits of wiring	of wiring diagrams			diagram	Earth resistance			
	diagrams			Conduct earth		tester			
			·CX	resistance test to	Conduct earth				
	2.4 Explain the earth	Explain the earth continuity		ascertain the	resistance test to	Power source			
	continuity conductor,	conductor, earth electrode,		earth resistance	ascertain the				
	earth electrode, and	and consumer's earth		value	earth resistance	Chart of			
	consumer's earth	terminal.			value	electrical			
	terminal.	///				graphic			
						symbols.			
	2.5 Explain the earthling	Explain the earthling systems							
	systems (TT,TN and IT)	(TT,TN and IT) and their							
	and their relevance to	relevance to electrical							
	electrical installations.	installations.							
	2.6 Explain different	Explain different protection							
	-	devices of an installation such							
	installation such as fuses	as fuses and circuit breakers.							
	and circuit breakers.								
	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\								

	<u></u>				
2.7 Explain the difference	Explain the difference				
between solid earthling	between solid earthling				
practice and earth leakage	practice and earth leakage				
circuit breaker (ELCB)	circuit breaker (ELCB)				
protection.	protection.			y	
2.8 Explain the problems	Explain the problems				
associated with earth	associated with earth leakage				
leakage circuit breaker.	circuit breaker.		40°		
2.9 Explain how the human	Explain how the human body		7"		
body can become part of	can become part of an electric				
an electric circuit.	circuit.				
2.10 Explain how to prevent	Explain how to prevent				
electric shock.	electric shock.				
2.11 Explain the methods of	Explain the methods of				
treating electric shock.	treating electric shock.				
2.12 Enumerate the current	Explain the current and				
and voltage threshold for	voltage threshold for human				
human body	body				
	*				
~()'					

Genera	al Objective 3.0: Interpret Build	ing drawings and symbols.				
4-5	3.1 Explain electrical symbols.	Explain electrical symbols.	Textbook		Guide the	Sample building
			Journals		students to:	plan
	3.2 Explain building drawings	Explain building drawings	Whiteboard	Identify	Identify	
			Marker	electrical (electrical	Sample single
	3.3 Explain the role of	Explain the role of electrical	Charts	symbols	symbols	line diagram
	electrical engineers in	engineer in building	Animation			
	building drawings	drawings	Computer	Insert electrical	Insert electrical	Electrical
			Projector	symbols for the	symbols for the	graphic symbols
				installation	installation	
	3.4 Explain how to interpret	Explain how to interpret		layout in	layout in	Drawing
	building drawings	building drawings	.63	building	building	instruments
				drawings	drawings	
						Sample wiring
				Produce a single	Produce a single	diagrams
				line diagram	line diagram	
		<i>(</i> , <i>(</i>), <i></i>		based on the	based on the	Computers with
				layout	layout	installed
						drawing
		0.0		Interpret	Interpret	software
				building	building	
				drawings.	drawings.	
	RAL OBJECTIVE 4.0: Unders	3		,		
6-8	4.1Define a cable	Explain a cable	Textbook		Guide students	Cables
			Journals	Identify cables	to:	
	4.2 Explain types of cables	Explain types of cables	Whiteboard	and their sizes	Identify cables	Trunk
			Marker		and their sizes	
	4.3 Explain the differences	Explain the differences	Charts	Select		Electrical

	T				<u> </u>
between cable and a	between cable and a	Animation	appropriate	Select	graphic symbols
conductor	conductor	Computer	cables for	appropriate	
		Projector	different uses	cables for	Drawing
4.4 Explain cable sizes	Explain cable sizes			different uses	instruments
			Draft electrical		
4.5 Explain Service main and	Explain Service main and		services for a	Draft electrical	Sample wiring
consumer terminal	consumer terminal		residential	services for a	diagrams
			building e.g. 3-	residential	
4.6 Explain Circuit and Sub-	Explain Circuit and Sub-		bedroom flat	building e.g. 3-	Cable color
circuit.	circuit.			bedroom flat	code
			Demonstrate		
4.7 Explain electrical power	Explain electrical power	CX	installation of	Demonstrate	Computers with
diversity factor, ambient	diversity factor, ambient		various types of	installation of	installed
temperature, classes of	temperature, classes of excess.		joints using	various types of	drawing
excess current protection,	current protection, and		PVC flexible	joints using	software
and disposition of cable	disposition of cable		cables.	PVC flexible	
	/()			cables.	
4.8 Explain the IEE tables for	Explain the IEE tables for		Design an		
selecting cables.	selecting cables.		electrical	Design an	
	\circ		service for a	electrical	
4.9 Explain the thermal	Explain the thermal		3- bedroom	service for a	
durability of cables in case	durability of cables in case of		flat.	3- bedroom	
of short-circuit	short-circuit			flat.	
	V		Identify cable		
			colour coding	Identify cable	
4.10 Explain how to calculate	Explain how to calculate the		commonly used	colour coding	
the total load current for a	total load current for a final		in Nigeria.	commonly used	
final Sub-circuit in the	Sub-circuit in the building			in Nigeria.	

	<u> </u>				
building			Carryout laying		
			of cables using	Carryout laying	
			different	of cables using	
4.11 List the main types of	List the main types of		trunking	different	
insulation and conducting	insulation and conducting		methods.	trunking	
materials used in cables.	materials used in cables.			methods.	
			Apply I.E.E.		
4.12 Distinguish between	Distinguish between		wiring	Apply I.E.E.	
conductors and insulators.	conductors and insulators.		Regulations	wiring	
			related to cables	Regulations	
4.13 Describe with the aid of	Describe with the aid of		and their uses.	related to cables	
sketches, the construction	sketches, the construction of			and their uses.	
of different types of	different types of cables.		Identify types of		
cables.			joints	Identify types of	
				joints	
4.14 State the advantages and	Explain the advantages and				
disadvantages of the	disadvantages of the				
following:	following:				
• PVE – Insulated	 PVE - Insulated 				
PVC - sheathed cable.	PVC sheathed cable.				
Mineral - Insulated	 Mineral - Insulated 				
metal - sheathed	metal - sheathed				
cable	cable				
Armoured PVC –	Armoured PVC –				
insulated PVC -	insulated PVC -				
sheathed cable	sheathed cable				
 Flexible cable and 	 Flexible cable and 				
cord	cord				
		•	•		

	 Steel and PVC 	 Steel and PVC 				
	Conduits	Conduits			· C Y	
	 Steel and PVC 	 Steel and PVC 			10	
	trunking.	trunking.				
	XLPE insulator cable	XLPE insulator cable				
	4.15 Explain trunking and ducting	Explain trunking and ducting		ch.		
	4.16 Explain cable piping and laying	Explain cable piping laying				
	4.17 Explain the I.E.E. wiring	Explain the I.E.E. wiring	.(,(),			
	Regulations related to	Regulations related to cables				
	cables and their uses.	and their uses.				
	4.18 Explain the cable colour	Explain the cable colour				
	coding, commonly used	coding, commonly used in				
	in Nigeria.	Nigeria.				
	4.19 State various types of	Explain various types of				
	joints	joints				
Gener	al Objective 5.0: Understand b		the electrical	installation of build	ding	
9-11	5.1 Explain bill of quantity	Explain bill of quantity	Textbook		Guide students	Sample bill of
			Journals	Extract items	to:	quantity
	5.2 Explain items in bill of	Explain items in bill of	Whiteboard	for bill of	Extract items	
	quantities.	quantities.	Marker	quantities from	for bill of	Sample market
	1		Charts	drawings.	quantities from	survey report

				I		,
	5.3 Explain how to extract	Explain how to extract items	Animation		drawings.	
	items for bill of quantities	for bill of quantities from	Computer	Conduct market		
	from drawings.	drawings.	Projector	survey	Conduct market	
				(hypothetical)	survey	
	5.4 Explain the importance	Explain the importance of			(hypothetical)	
	of market survey in	market survey in creating a		Assess the cost		
	creating a bill of quantity	bill of quantity		of materials.	Assess the cost	
					of materials.	
	5.5 Explain the importance	Explain the importance of		Prepare typical		
	of bill of quantities for the	bill of quantities for the		bill of quantity	Prepare typical	
	electrical installation of	electrical installation of			bill of quantity	
	building	building				
	S	S				
	5.6 Explain how to assess the	Explain how to assess the				
	cost of materials.	cost of materials.				
	5.7 Explain how to prepare	Explain how to prepare				
	typical bills of engineering	typical bills of engineering				
	measurements and	measurements and materials				
	materials for an electrical	for an electrical installation				
	installation.	Tot un official accumunos				
Genera		lar power installation, home aut	omation and s	l mart metering		
12-15	6.1 Explain the concept of	Explain the concept of Solar	Textbook	limit metering	Guide students	PV panels
12-13	Solar power system.	power system.	Journals	Identify the	to:	1 v paneis
	Solai powei system.	power system.	Whiteboard	1		
	6.2 List the common and as	List the commonants of Salar		components of	Identify the	Charge
	6.2 List the components of	List the components of Solar	Marker	Solar power	components of	Charge
	Solar power system	power system	Charts	system.	Solar power	Controllers
	<u> </u>		Animation		system.	

6.3 Explain the functions of	Explain the functions of each	Computer	Install Closed-		Battery storag
each component in 6.2	component in 6.2 above	Projector	Circuit	Install Closed-	
above			Television	Circuit	Inverter Fuses
			(CCTV).	Television	
6.4 Explain TV cabling and	Explain TV cabling and			(CCTV).	Cables
installation	installation		Install a satellite	•	
			Television with	Install a satellite	Circuit breake
6.5 Explain Closed-Circuit	Explain Closed-Circuit		its accessories.	Television with	
Television (CCTV).	Television (CCTV).		(C)	its accessories.	For CCTV:
		. 5	Install Electrical		Cameras.
6.6 List the components of	List the components of		service mains	Install Electrical	
Closed-Circuit Television	Closed-Circuit Television	.(\)	for a premises	service mains	Lenses
(CCTV).	(CCTV).			for a premises	
			Install a prepaid		Mountings an
6.7 Explain the layout of a	Explain the layout of a		meter in a	Install a prepaid	covers
Closed-Circuit Television	Closed-Circuit Television		premises	meter in a	
(CCTV).	(CCTV).			premises	Communicati
					media such as
6.8 Explain the diagram of	Explain the diagram of				cables.
electrical service mains of	electrical service mains of				Main supply,
residential and	residential and				Video cables.
commercial/industrial	commercial/industrial				Switch and
premises	premises				synchronizers
6 0 Evulain manaid an anav	Evalsia annusi 4 sususus				TV monitors,
6.9 Explain prepaid energy	Explain prepaid energy meters in domestic and				Decoder, satellite
meters in domestic and	commercial/industrial				Television.
	premises.				Television.
commercial/industrial premises.					

		For Prepaid
		meter: Energy
		meter
		Optocoupler
		Relay
	1/Ch	Load
		Driver
		LED
		EEPROM
^k Ok		Microcontroller
		Display.

ASSESSMENT: The Practical class will be awarded 60% of the total score. The continuous assessments, tests and quizzes will take 10% of the total score while the remaining 30 % will be for the end-of-the-semester examination score.

VEAR TWO, SEMESTER ONF

Logic and Linear Algebra

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY						
COURSE: Logic and Linear Algebra	COURSE CODE: MTH 202	CONTACT HOURS: 2				
	CREDIT UNIT: 2	THEORETICAL: 2				
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 0				

GOAL: This course is designed to equip students with knowledge and skills to apply logical reasoning in engineering

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

- 1.0 Understand the concept of logic and abstract thinking
- 2.0 Understand the concept of permutations and combinations
- 3.0 Undertake the binomial expansion of algebraic expressions.
- 4.0 Understand the algebraic operations of matrixes and determinants

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY					
COURSE: Logic and Linear Algebra COURSE CODE: MTH 202 CONTACT HOURS: 2					
	CREDIT UNIT: 2	THEORETICAL: 2			
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 0			

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GOAL: This course is designed to equip students with knowledge and skills to apply logical reasoning in engineering

General Objective 1.0: Understand the Concept of Logic and Abstract Thinking

THEORETICAL CONTENT				PRACTICAL CONTENT		
Week	Specific Learning Outcomes	Teacher's activities	Learning Resources	Specific Learning Outcomes	Teacher's activities	Evaluation
1-4	 1.1 Define: Essential connectives Negation Conjunction Disjunction Implication Bi-implication. 1.2 Illustrate the essential connectives define in 1.1 above	Explain: Essential connectives Negation Conjunction Disjunction Implication Bi-implication. Explain the essential connectives define in 1.1 above	Whiteboard Marker Projection Computer Internet Textbooks Lecture Notes	Translate sentences into symbolic form using quantifiers. e.g.: "some freshmen are intelligent can be stated as "for some x,x is a freshman and x is intelligent" can be translated in symbols as (ix) (f x & ix)	Guide students to: Translate sentences into symbolic form using quantifiers. e.g.: "some freshmen are intelligent can be stated as "for some x,x is a freshman and x is intelligent" can be translated in symbols as (ix) (f x & ix)	

1.3 Des	scribe grouping and	Explain grouping and			
pare	enthesis in logic	parenthesis in logic			
				. 10"	
1.4 Exp	plain Truth tables.	Explain Truth tables.			
1.5 Det	fine tautology.	Explain tautology			
1.6 Illu	strate types of	Explain types of			
taut	cology.	tautology.			
			·40'		
1.7 Def	fine universal	Explain universal			
-	ntifier and	quantifier and			
exis	stential quantifier	existential quantifier			
			J '		
_	plain how to translate	Explain how to			
	ntences into	translate sentences			
_	mbolic form using	into symbolic form			
-	antifiers. e.g.: "some	using quantifiers. E.g.			
	eshmen are	"some freshmen are			
	telligent can be	intelligent can be			
	ated as "for some x,x	stated as "for some			
	a freshman and x is	x,x is a freshman and			
	telligent" can be	x is intelligent" can			
	inslated in symbols	be translated			
as	(ix) (f x & ix)	in symbols as (ix) (f x			
		& ix)			
105					
	fine the scope of a	Explain the scope of a			
qu	antifier. e.g.:	quantifier. e.g.:			

	D. C.	D C			
	R=Gauss was a	R=Gauss was a			
	contemporary of	contemporary of			
	Napoleon S=Napoleon	Napoleon			
	was a contemporary of	S=Napoleon was a			
	Julius Caesar (Thus P,	contemporary of			
	Q and R are true, and S	Julius Caesar (Thus P,			
	is false Then find the	Q and R are true, and			
	truth value of	S is false Then find			
	sentences: (a) (P and	the truth value of			
	Q) = R (b) (P - Q) (c)	sentences: (a) (P and			
	PAND Q = R - S	Q) = R(b)(P - Q)(c)		1/4.	
		PAND Q = R - S			
				O *	
	1.10 Define bond and	Explain bond and			
	"free" variables.	"free" variables.			
	1.11 Define term and	Explain term and			
	formula.	formula.			
	1.12 Explain the validity of	Explain the validity of			
	formulae	formulae			
General	Objective 2 : Understand the	Concept of Permutations	and Combinatio	ons	
5-7	2.1 Define permutation's	Explain permutation's	Whiteboard		Guide students to:
	and Combination	and Combination	Marker	Give illustrative	Give illustrative
			Projection	examples of the	examples of the
	2.2 Explain with illustrative	Explain with illustrative	Computer	fundamental principles	fundamental
	examples of each of 2.1	examples of each of 2.1	Internet	of permutations.	principles of
	above.	above.	Textbooks		permutations.

		· .		
		Lecture		
2.3 State the fundamental	Explain the fundamental	Notes	Establish the formula	Establish the
principle of	principle of		$nPr = \underline{n!}(n-r)!$	formula $nPr = \underline{n!}(n-$
permutations.	permutations.			
			Solve problems of	\mathbf{O}
2.4 Explain with illustrative	Explain with illustrative		permutations with	Solve problems of
examples of the	examples of the		restrictions on some	permutations with
fundamental principles	fundamental principles		of. the objects	restrictions on some
of permutations.	of permutations.			of. the objects
			Solve problems of	
2.5 Explain how to establish	Explain how to establish		permutations in which	Solve problems of
the formula $nPr = n ! (n-$	the formula $nPr = n! (n-1)$		the objects may be	permutations in
r)!	r)!		repeated.	which the objects
				may be repeated.
2.6 Prove that $nPr = (n-r+1)$			Solve problems of	Solve problems of
*nP _{r-1}			permutations of N	permutations of N
			identical objects.	identical objects.
2.7 Explain how to solve			·	
problems of			State and prove the	State and prove the
permutations with			theorem $nCr-1+ nCr =$	theorem nCr-1+ nCr
restrictions on some of.			^{n+1}Cr	$=$ $^{n+1}$ Cr
the objects				
2.8 Explain how to solve	V			
problems of				
permutations in which				
the objects may be				
repeated.				
repositos.				

		<u> </u>		<u> </u>	
	2.9 Describe circular permutations.				JCAI
	2.10 Explain how to solve problems of permutations of N identical objects.			CAL	
	2.11 Establish the formula: nCr = n! r!(n-r)!			HILL	
	2.12 State and prove the theorem nCr-1+ ⁿ Cr = ⁿ⁺¹ Cr		2/6		
	2.13 Explain problems of combinations with restrictions on some of		Or		
	2.14 Explain how to solve problems of combination of "n" different objects taken any number of it at a time.	O,			
Genera	l Objective 3: Undertake the b	inomial expansion of alg	ebraic expression	is.	•
8-11	3.1 Explain with illustrative examples the method of	Explain with illustrative examples	Whiteboard Marker	Illustrative with	Guide students to: Illustrative with

-	-				
	mathematical induction.	the method of	Projection	examples the method	examples the
		mathematical	Computer	of mathematical	method of
	3.2 State and prove binomial	induction.	Internet	induction.	mathematical
	theorem for positive		Textbooks		induction.
	integral index.	Explain and prove	Lecture		
		binomial theorem for	Notes	Identify the binomial	Identify the
	3.3 Describe the properties	positive integral index.		theorem for a rational	binomial theorem
	of binomial expansion.			number.	for a rational
		Explain the properties			number.
	3.4 State the binomial	of binomial expansion.		Identify the properties	
	theorem for a rational			of binomial	Identify the
	number.	Explain the binomial	. (coefficients	properties of
		theorem for a rational		O'	binomial
		number.			coefficients
	3.5 State the properties of			Apply binomial	
	binomial coefficients	Explain the properties		expansion in	Apply binomial
		of binomial		approximations	expansion in
	3.6 Explain how to apply	coefficients		(simple examples	approximations
	binomial expansion in			only).	(simple examples
	approximations (simple	Explain how to apply			only).
	examples only).	binomial expansion in			
		approximations (simple			
		examples only).			
Genera	Objective 4: Understand the	algebraic operations of m	atrixes and deter	minants	
12-15	4.1 Define Matrix	Explain Matrix	Whiteboard		Guide students to:
			Marker	Determine a determine	Determine a
	4.2 Define the special	Explain the special	Projection	the minors and	determine the
	matrixes of zero	matrixes of zero	Computer	cofactors 2 by 2 and 3	minors and

	1 .	I -		
matrixes e.g.:	matrixes e.g.:	Internet	by 3 matrixes	cofactors 2 by 2
 Zero matrix 	 Zero matrix 	Textbooks		and 3 by 3 matrixes
 Identity matrix 	 Identity matrix 	Lecture		, 10
 Square matrix 	 Square matrix 	Notes	State and prove the	State and prove the
Triangular matrix	 Triangular 		theorem "if two rows	theorem "if two
• Symmetric matrix.	matrix			rows or two
	• Symmetric		matrix are	columns of a matrix
	matrix.		interchanged, the sign	are interchanged,
			of the Value of its	the sign of
4.3 State examples for each	Explain examples for		determinant is changed	the Value of its
of the matrixes in 4.2	each of the matrixes in			determinant is
above	4.2 above	. (changed
			O'	
	Explain the laws of		Identify the minors	Identify the minors
4.4 State the laws of addition	addition and		and cofactors of a	and cofactors of a
and multiplication of	multiplication of		determinant	determinant
matrixes.	matrixes.			
	V V			Identify the method
	Explain the		Identify the method of	of evaluating
4.5 Illustrate the	commutative		evaluating	determinants.
commutative, associative			determinants.	
	distributive nature of			
the laws stated in 4.4	the laws stated in 4.4			
above.	above.			
above.				
4.6 Define the transpose of a	Explain the transpose			
matrix.	of a matrix.			
(())				
		I		

4.7 Determine the minors	Explain the minors and			
and cofactors 2 by 2 and	cofactors 2 by 2 and 3			
3 by 3 matrixes	by 3 matrixes		, 10,	
4.8 Define the minors and	Explain the minors and			
cofactors of a	cofactors of a			
determinants	determinants			
4.9 Explain the method of	Explain the method of	()		
evaluating determinants.	evaluating determinants.			
evaluating determinants.	evaluating determinants.	10,		
4.10 State and prove the	Explain and prove the			
theorem "two rows or	theorem "two rows or			
two columns of a matrix	two columns of a			
are identical, and then	matrix are identical,			
the value of its	and then the value of	_		
determinant is zero".	its determinant is	•		
	zero".			
4.11 State and prove the				
theorem "if two rows or	Explain and prove the			
two columns of a matrix	theorem "if two rows			
are interchanged, the	or two columns of a			
sign of the Value of its	matrix are			
determinant is changed	interchanged, the sign			
	of the Value of its			
	determinant is changed			
EVALUATION- EXAMINATION	: 40% C.A: 60%			
		169		
10,				

Electrical Power II

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY					
COURSE TITLE: Electrical Power II	COURSE CODE: EEC 211	CONTACT HOURS: 3			
	CREDIT UNIT: 2	THEORETICAL: 1			
YEAR: II SEMESTER: I	PRE-REQUISITE: EEC 121	PRACTICAL: 2			
COAT TILL	. 1 . 1.1 . 1 . 1 . 1 . 1 . 1				

GOAL: This course is designed to acquaint the students with the knowledge and skills of the principles of power system

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

- 1.0 Understand other methods of Electricity Generation
- 2.0 Understand the transmission lines and cable
- 3.0 Understand the performance of short, medium and long transmission lines.

PROGRAMME: NATIONAL DIPLO	MA IN ELECTRICAL AND ELECTRONICS EN	IGINEERING TECHNOLOGY
COURSE TITLE: Electrical Power II	COURSE CODE: EEC 211	CONTACT HOURS: 3
	CREDIT UNIT: 2	THEORETICAL: 1
YEAR: II SEMESTER: I	PRE-REQUISITE: EEC 121	PRACTICAL: 2

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GOAL: This course is designed to acquaint the students with the knowledge and skills of the principles of power systems

GENERAL OBJECTIVE 1.0: Understand other methods of Electricity Generation

	TH	IEORETICAL CONTEN	PRACTICAL CON	TENT		
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning Outcome	Teachers' Activities	Resources
1-6	 1.1 Describe the following: Hydro electricity Generation plant. Magneto- Hydro- 	 Explain the following: Hydro electricity Generation plant: Magneto- Hydro-Dynamic (MHD) power 	Textbooks Journals White board Marker	Visit a power plant Demonstrate the layout diagrams of power plants	Guide the students to: Visit a power plant	Chart of the Nigerian National Grid system
	Dynamic (MHD) power plant Combine cycle Gas power plant. Biomass power plant.	plant Combine cycle Gas power plant. Biomass power plant.	Charts Animations Computer	Assemble the components of the PV Power	Demonstrate the layout diagrams of power plants	PV panel Charge controller
	PV power plantWind power plant	PV power plantWind power plant.	Projector	generation system for domestic application.	Assemble the components of the PV Power	Battery storag

1.2 Explain the factors affecting the choice of site for plants in 1.1 above	Explain the factors affecting the choice of site for plants in 1.1 above		Draw a typical load curve	generation system for domestic application. Draw a typical	Inverter and energy saver lamp
1.3 Explain the advantages			CAL	load curve	Connecting cable
and disadvantages of	Explain the advantages				
power plants in 1.1	and disadvantages of power plants in 1.1				Switch
1.4 Explain a typical					
layout of a power	Explain a typical layout				Fuse and
generation system.	of a power generation system.	8			junction box.
1.5 Describe the Nigerian					
National Electric Power	Explain the Nigerian				
Grid system.	National Electric Power Grid system				
1.6 Describe a microgrid					
and state its benefits and					
challenges	Explain a microgrid and				
	state its benefits and challenges				
1.7 Describe Renewable					
Energy Sources (RES)					

with their benefits and	Explain Renewable		
challenges.	Energy Sources (RES)		
	with their benefits and		()
	challenges.)
1.8 Describe the layout of			
the PV Power generation			
system and its application	Explain the layout of the		
	PV Power generation		
100 1 41 1 4 6	system and its		
1.9 Describe the layout of the wind power generation	application		
system and its			
applications.	Explain the layout of the		
иррпеционь.	wind power generation		
	system and its		
1.10 Describe the types of	applications.	•	
generators that are			
commonly used for peak,	/()		
medium and base loads.			
	Explain the types of		
	generators that are		
1.11Explain how to	commonly used for		
calculate load factor, peak	peak, medium and base		
and base load costs in the	loads.		
distribution system applying per unit.			
apprying per unit.			

		T				1
	1.12 Explain a typical load	Explain how to calculate				
	curve.	load factor, peak and				
		base load costs in the				
		distribution system				
		applying per unit.				
		Explain a typical load curve.		, CAL		
Gener	al Objective 2.0: Understand	the transmission lines and o	cable	77	l	
7-11	2.1 Describe types of:	Explain types of:	Textbooks		Guide students to:	Samples of
	• Poles	• Poles	Journals	Visit a transmission	Visit a	poles
	Pole support	Pole support		substations	transmission	
	Insulators	Insulators	White board	Substations	substations	
	• Towers.	• Towers.	Marker,		Substations	Pole supports
	Towers.	16wers.	Ividiker,	Assemble poles,		
			Charts and	pole supports, and	Assemble poles,	
	2.2 Describe the line and	Explain the line and	animations	insulators in a dead	pole supports,	Towers
	route surveying.	route surveying	Commutan	substation.	insulators, and	
		\circ	Computer	substation.	towers in a dead	
			Projector		substation	Chart for
	2.3 Derive expressions for	Explain the derivation of	-		Substation	construction of
	resistance, inductance and	resistance, inductance				various
	capacitance for	and capacitance for		Connect voltage and	Cannact 14	conductors and
	transmission lines.	transmission lines.		current transformers	Connect voltage	cables
				for measurements in	and current	
				the transmission line	transformers for	
	2.4 Explain the short,	Explain the short,		model.	measurements in	Transmission

medium and long	medium and long			model.	and distribu
transmission models.	transmission models		Demonstrate the		line trainer
			stages of	Demonstrate the	
2.5 Explain problems	Explain problems		construction for	stages of	Video clips
involved in short and	involved in short and		conductors and	construction for	•
medium transmission lines.	medium transmission	.`	laying underground	conductors and	
	lines.		cables:	laying	
			Two-core cable	underground	
2.6 Describe the				cables:	
applications of voltage and	Explain the applications		Three core cable	T. 11	
current transformers in the	of voltage and current			Two-core cable	
transmission line.	transformers in the	.()	*	Three core cable	
	transmission line.				
2.7 Describe with the aid of					
diagrams, the construction	Explain with the aid of				
of various conductors and	diagrams, the				
their sizes.	construction of various				
	conductors and their				
	sizes.				
2.8 Describe with the aid of					
diagrams the construction					
of types of underground	Explain with the aid of				
cables and their	diagrams the				
advantages.	construction of various				
T 11	types of under				
Two-core cable	ground cable and state				
Three core cable	ground cable and state				
		175			
WALLO					

	their advantages	
2.9 Define dielectric stress	Two-core cable	
and ionization in cables.	Three core cable	
2.10 Derive expression for the capacitance dielectric stress, insulation resistance	Explain dielectric stress and ionization in cables	
and resistivity of a single core cable.	Explain the expression for the capacitance dielectric stress,	
2.11 State expression for the thermal resistance for single and three-core cables.	insulation resistance, and resistivity of a single-core cable.	
	Explain the expression for the thermal resistance for single and	
	three-core cables.	

	3.1 Describe the principles	Explain the modeling of	Textbooks		
	of modeling of short and medium transmission	short and medium transmission lines.	Journals		
12-15	lines.		White board	5	
			Marker		
	3.2 Describe the concept	Explain the concept of	Charts		
	of per unit system.	per unit system.	Animations		
			Computer		
	3.3 Describe the expressions for per unit	Explain expressions for	Projector		
	power, voltage, current	per unit power, voltage, current and impedance.			
	and impedance.	1			
			0		
	3.4 Describe the voltage at the sending end and	Explain the voltage at			
	receiving end of the	the sending and			
	transmission line.	receiving end of a			
		transmission line.			
	3.5 Describe the phasor				
	diagram of a short	20 ,			
	transmission line.	Explain the phasor			
		diagram of a short			
	3.6 Explain and solve	transmission line			
	problems in short				
			l .		

transmission lines for	Explain and solve	
voltage drop, voltage	problems in voltage	
regulation, transmission	drop, voltage regulation,	, (6)
efficiency and copper	transmission efficiency	
losses.	and copper losses in a	
	transmission line.	
	Explain the approximate	
3.7 Explain the	equivalent diagrams for	
approximate equivalent	nominal Π (Pi) and	A()
diagrams for nominal Π	nominal (T) networks	
(Pi) and nominal T	and calculate the	
networks and calculate the	parameters.	
parameters.		
3.8 Describe the phasor	Explain the phasor	
diagrams for nominal Π	diagrams for nominal Π	
(Pi) or nominal T network	(Pi) or nominal T	
systems.	network systems.	

ASSESSMENT: The practical class will be awarded 60% of the total score. The continuous assessments, test and quizzes will take 10% of the total score, while the remaining 30% will be for the end of the semester examination score.

Electrical Machine II

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY					
COURSE TITLE: Electrical Machine II	COURSE CODE: EEC 212	CONTACT HOURS: 3			
	CREDIT UNIT: 2	THEORETICAL: 1			
YEAR: II SEMESTER: I	PRE-REQUISITE: EEC 122	PRACTICAL: 2			

GOAL: This course is designed to equip the student with the knowledge and skills of the principles of operations, construction and maintenance of electrical machines

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

- 1.0 Understand the fundamental principles of electrical machines.
- 2.0 Understand the principles of electro-mechanical energy conversion.
- 3.0 Know the principles of operation and construction of transformers

PROGRAMME: NATIONAL DIPLOMA IN IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY							
COURSE TITLE: Electrical Machine II	COURSE CODE: EEC 212	CONTACT HOURS: 3					
	CREDIT UNIT: 2	THEORETICAL: 1					
YEAR: II SEMESTER: I	PRE-REQUISITE: EEC 122	PRACTICAL: 2					

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GOAL: This course is designed to equip the student with the knowledge and skills of the principles of operations, construction and maintenance of electrical machines

General Objectives 1.0: Understand the fundamental principles of electrical machines

THEORETICAL CONTENT			PRACTICAL CONTENT			
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers' Activities	Resources
	Outcome			Outcome		
1 – 5	1.1 Describe basic	Explain basic	Textbooks		Guide the students to:	Electrical
	principles of	principles of	Journals 🖊	Carryout experiments on	Carryout experiments	machine
	electrical machine	electrical machine	White board,	circuit characteristics of a	on circuit	
			Marker	3-phase induction motor.	characteristics of a 3-	Starter
	1.2 Describe the	Explain the principle	Charts		phase induction motor.	
	principle of:	of:	Animations			Voltmeter
	 Induction 	 Induction 	Computer	Carryout experiment on	Carryout experiment	
	 Alignment 	 Alignment 	Projector	circuit characteristics of	on circuit	Ammeter
	 Interaction 	 Interaction 		an alternator/A.C	characteristics of an	
	 Rotating 	 Rotating 		generator.	alternator/A.C	Tachometer
	magnetic field	magnetic field			generator.	
	_	V				Phase
	1.3 Describe with the aid	Explain with the aid		Perform experiment to	Perform experiment to	sequence
	of sketches how the	of sketches how the		determine relationship	determine relationship	indicator/mete
	principles are applied	principles are applied		between excitation	between excitation	r.
	to electrical	to electrical machines		current and output	current and output	

, , , , , , , , , , , , , , , , , , ,		T		T		T
	machines.	Explain Electro –		terminal voltage	terminal voltage	
	1.4 Describe Electro –	mechanical energy			Perform experiment to	
	mechanical energy	conversion.		Perform experiment to	determine relationship	
	conversion.			determine relationship	between speed and	
				between speed and output	output terminal	
				terminal voltage.	voltage.	
				Demonstrate the construction of electrical machines.	Demonstrate the construction of electrical machines	
Genera	l Objective 2.0: Understan			nergy conversion		
6 – 10	2.1 Describe the	Explain the	Textbooks		Guide the students to:	Sample name
	construction and	construction and	Journals /		Interpret name plate of	plates
	principle of Induction	principle of Induction	Whiteboard	Interpret name plate of	synchronous and	
	motor.	motor.	Marker	synchronous and induction	induction motors and	Electrical
			Charts	motors and generators	generators	machine
	2.2 Describe the	Describe the principle	Animations		generators	
	principle of operation	of operation of	Computer		Demonstrate the	Starters
	of synchronous	synchronous generator	Projector	Demonstrate the	conversion of energy	
	generator and motors.	and motors.		conversion of energy in	in singly excited	Generator
				singly excited systems.	systems.	
	2.3 Describe Stator and	Describe Stator and			systems.	Induction
	Rotor construction as	Rotor construction as		Determine the terminal of		motor
	applied to	applied to		a 3 – phase induction	Determine the terminal	
	synchronous	synchronous machine.		motor	of a 3 – phase induction	Synchronous
	machine.				motor	motor
	(/	Explain the major				

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2.4 State the major	energy conversion		Determine the terminal of	Determine the terminal	Ammeter
energy conversion	principles.		a 3 – phase synchronous	of a 3 – phase	
principles.			generator.	synchronous generator.	Voltmeter
	Explain how to derive				
	the energy in the		Measure the electrical	Measure the electrical	Clamp meter
2.5 Derive the energy in	magnetic field of a		quantities of 3 phase	quantities of 3 phase	Tachometer
the magnetic field of	singly excited system.		induction motor.	induction motor.	
a singly excited					Multimeter.
system.	State the need for		Identify the basic	Identify the basic	
	control and protection		difference between motors	difference between	
	of electric motors		and generators.	motors and generators.	
2.6 State the need for					
control and	Describe the		Demonstrate the	Demonstrate the	
protection of electric	techniques for motor		techniques for motor	techniques for motor	
motors	starting and control:		starting and control:	starting and control:	
	• Direct online		 Direct online 	 Direct online 	
2.7 Describe the	starter		starter	starter	
techniques for motor	Star-Delta	Y	Star-Delta starter	• Star-Delta	
starting and control:	starter		 Soft starter 	starter	
 Direct online 	Auto		 Variable frequency 	 Soft starter 	
starter	Transformer		drive	 Variable 	
Star-Delta starter	Part winding			frequency drive	
Auto Transformer	• Soft starter				
 Part winding 	Variable				
Soft starter	frequency				
Variable	drive				
frequency drive	•				
	Describe the types of				

		overcurrent				
		protective devices				
	2.8 Describe the types of	protective devices				
	overcurrent					
	protective devices					
Genera	al Objective 3.0: Know the	nrinciples of operation a	l and construction	of transformers		
	3.1 Define transformer	Explain transformers	Textbooks	of transformers.	Guide students to:	Transformer
11-13	3.1 Define transformer	Explain transformers	Journals	Visit power	Visit power substation/	Ammeter,
	2.2 Explain the	Explain the	White board	substation/show video clips	<u> </u>	Voltmeter,
	3.2 Explain the classification of	classification of	Marker	substation/show video clips	show video chips	
	transformers	transformers	Charts	Classification	Classify two afamasans	Clamp meter,
	transformers	transformers		Classify transformers	Classify transformers	Tachometer,
	225 1: 4	D 1 ' 4	Animations			Multimeter
	3.3 Explain the	Explain the	Computer	Monitor temperature of a	Monitor temperature of	Temperature
	applications of	applications of	Projector	transformer.	a transformer.	Sensors,
	transformer	transformer	Electrical			•
			machines	Identify methods of	Identify methods of	
	3.4 Differentiate between			cooling transformers.	cooling transformers.	Video clips
	power and	Explain the	X			
	distribution	differences between		Sketch phasor diagrams	Sketch phasor	
	transformers.	power and		of transformers on load	diagrams of	
		distribution		and on No-load	transformers on load	
		transformers.			and on No-load	
	3.5 Describe the effects			Sketch the equivalent		
	of temperature rise on	Explain the effects of		circuit of a transformer	Sketch the equivalent	
	transformers.	temperature rise on			circuit of a transformer	
		transformers.		Perform experiment on		
	3.6 Describe the different			open circuit	Perform experiment on	
	types of transformer	Explain the different		characteristics of a single	open circuit	

cores and windings.	types of transformer	phase transformer.	characteristics of a
cores and windings.	cores and windings.	phase transformer.	single phase
3.7 Describe methods of	cores and windings.		transformer.
cooling transformers.	Explain methods of	Perform experiment on	transformer.
cooming transformers.	cooling transformers.	open circuit	Perform experiment on
2 0 Danamila a 41a a	cooming transformers.	characteristics of three	
3.8 Describe the	D 1: 4		open circuit
limitation of each	Explain the	phase transformers.	characteristics of three
method.	limitations of each		phase transformers.
	method.	·(U)	
3.9 Explain the working		Carryout experiment on	Carryout experiment on
principle of the	Explain the working	close circuit characteristics	close circuit
transformers.	principle of the	of a single phase	characteristics of a
	transformers.	transformer.	single phase
3.10 Derive the EMF			transformer.
equation of a	Explain the EMF		
transformer.	equation of a	Perform experiment on	Perform experiment on
	transformer.	close circuit	close circuit
3.11 Describe:		characteristics of three	characteristics of three
Resultant flux	Describe:	phase transformer.	phase transformer.
Magnetizing	 Resultant flux 		
inductance	Magnetizing		Perform experiment on
Leakage fluxes	inductance	Perform experiment on	identifying polarity of a
Leakage Leakage	• Leakage	identifying polarity of a	3-phase transformer.
		3-phase transformer.	Final transferring
inductances.	fluxes	o phase transformer.	Conduct transformation
2.10 D 11 .1 .1	Leakage	Conduct transformation	ration test on a
3.12 Describe the phasor	inductances.	ration test on a	transformer'
diagrams for			transformer
transformer on No-	Describe the phasor	transformer'	

diagrams for			Use the Open-circuit	
transformer on No-			and Short-circuit tests	
load and On-load.		Use the Open-circuit and	to determine the	
		Short-circuit tests to	equivalent circuit	
Describe the		determine the equivalent	parameters.	
equivalent circuit of		circuit parameters.		
a transformer.			Sketch possible	
		Sketch possible	arrangement of three	
Explain the		arrangement of three	transformer windings.	
limitations of the		transformer windings.		
equivalent circuit and				
the approximate				
equivalent circuit.				
Explain Open-circuit				
and the Short-circuit				
tests to determine the				
equivalent circuit				
parameters.				
\circ				
Describe different				
methods of testing				
transformers.				
. 💙				
Explain connection of				
three single phase				
transformers for 3-				
phase operation (i.e.				
	transformer on No-load and On-load. Describe the equivalent circuit of a transformer. Explain the limitations of the equivalent circuit and the approximate equivalent circuit. Explain Open-circuit and the Short-circuit tests to determine the equivalent circuit parameters. Describe different methods of testing transformers. Explain connection of three single phase transformers for 3-	transformer on No-load and On-load. Describe the equivalent circuit of a transformer. Explain the limitations of the equivalent circuit and the approximate equivalent circuit. Explain Open-circuit and the Short-circuit tests to determine the equivalent circuit parameters. Describe different methods of testing transformers Explain connection of three single phase transformers for 3-	transformer on No- load and On-load. Describe the equivalent circuit of a transformer. Explain the limitations of the equivalent circuit and the approximate equivalent circuit and the Short-circuit tests to determine the equivalent circuit and the Short-circuit tests to determine the equivalent circuit parameters. Describe different methods of testing transformers Explain connection of three single phase transformers for 3-	transformer on No- load and On-load. Describe the equivalent circuit of a transformer. Explain the limitations of the equivalent circuit and the Short-circuit tests to determine the equivalent circuit and the Short-circuit tests to determine the equivalent circuit parameters. Explain Open-circuit and the Short-circuit tests to determine the equivalent circuit and the Short-circuit tests to determine the equivalent circuit and the Short-circuit tests to determine the equivalent circuit parameters. Describe different methods of testing transformers Explain connection of three single phase iransformers for 3-

1				1	
	Star/Star, Star/Delta).				
3.18 Describe					
diagrammatically the	Explain				
possible arrangement	diagrammatically the				
of three transformer	possible arrangement				
windings.	of three transformer				
	windings.				
3.19 Describe the purpose					
of the tertiary	Explain the purpose of		12.	,	
windings in 3-phase	the tertiary windings				
transformers.	in 3-phase		1/1/4		
	transformers.		CK1.		
3.20 Describe the parallel					
operation of 3-phase	Explain the parallel				
transformers.	operation of 3-phase				
	transformers.				
3.21 State the conditions		()			
for paralleling of	Explain the conditions				
transformers	for paralleling of				
	transformers				
3.22 Derive expression					
for load sharing of	Explain how to derive				
transformers	expression for load				
connected in parallel.	sharing of				
	transformers				
	connected in parallel.				

Assessment: The practical class will be awarded 60% of the total score. The continuous assessments, test and quizzes will take 10% of the total score, while the remaining 30% will be for the end of the semester examination score.

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY							
COURSE TITLE: Electronics II	CODE: EEC 213	CONTACT HOURS: 4					
	CREDIT UNIT: 3	THEORETICAL: 1					
YEAR: II SEMESTER: I	PRE-REQUISITE: EEC 123	PRACTICAL: 3					
GOAL: This course is designed to equip	he student with the knowledge and skills of pa	assive and active electronic components and their					
applications.							
GENERAL OBJECTIVES: At the end of the course the student should be able to:							
1.0. II. 1							

- 2.0 Understand biasing equivalent circuits and gain stages
- 3.0 Understand transformer coupling and power and multistage of amplifiers

Electronics II

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE TITLE: Electronics II	CODE: EEC 213	CONTACT HOURS: 4					
	CREDIT UNIT: 3	THEORETICAL: 1					
YEAR: II SEMESTER: I	PRE-REQUISITE: EEC 123	PRACTICAL: 3					
COVER OF CHECKEY OF THE CALL THE CALL	TO A T A TYPE PRO A CONTO A T	_					

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GOAL: This course is designed to equip the student with the knowledge and skills of semi-conductor components

General Objective 1.0: Understand the Field Effect transistor and its applications

THEORETICAL CONTENT I			PRACTICAL CONTENT			
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers' Activities	Resources
	Outcome			Outcome		
	1.1 Describe the basic	Explain the basic	Textbooks		Guide students to:	Breadboard
1 -5	operations and	operations and	Journals	Carry out experiment on	Carry out experiment on	
	constructional features	constructional features	Whiteboard	FET Static Characteristics	FET Static Characteristics	MOSFET
	of FET's (junction gate	of FETs (junction gate	Marker	in common source	in common source	
	and insulated gate).	and insulated gate).	Charts	configuration	configuration	Multimeter
			Animations			FET
	1.2 Explain JFET Transfer	Explain the transfer	Computer	Demonstrate the	Demonstrate the	
	Characteristics.	Characteristics of	Projector	applications of MOSFET:	applications of MOSFET:	JFET
		JFET		 Switching (DC- 	 Switching (DC- 	
	1.3 Describe Mutual			DC Converter)	DC Converter)	
	Conductance and Drain	Explain Mutual		 Amplification 	 Amplification 	
	to Source Resistance.	Conductance and		 Variable 	 Variable 	
		Drain to Source		resistance (Signal	resistance (Signal	
	1.4 Describe handling	Resistance		processing)	processing)	
	precautions of FET.	4 '				
	\(\)'	Explain handling				

		-				.
	1.5. Define Input	precautions of FET				
	Resistance.					
		Explain Input			. 10"	
	1.6 Describe Depletion	Resistance				
	mode and enhancement					
	mode of MOSFET					
	Characteristics.	Explain Depletion			•	
		mode and				
	1.7 Explain the	enhancement mode of		CHMICAL		
	applications of FET,	MOSFET				
	JFET and MOSFET	Characteristics				
		Explain the		(,\(\)		
		applications of FET,				
		JFET and MOSFET	`			
Genera	al Objective 2.0: Understand	the biasing equivalent circ	cuits and gain	stages		
	2.1 Describe DC Biasing	Explain DC biasing and		Perform experiment on	Guide students to:	Breadboard,
6 - 10	and r – parameters.	r – parameters.	Journals	common source		MOSFET,
	•		Whiteboard	amplifier characteristics.	Perform experiment on	Multimeter,
	2.2 Describe Common	Explain Common	marker	_	common source	DC Power
	source Configuration	source Configuration of	Charts	Carry Out experiment on	amplifier characteristics.	source.
	of MOSFET	MOSFET	Animations	common gate amplifier	_	
	 Voltage gain 		Computer	characteristics	Carry Out experiment on	
	Current Gain	• Voltage gain	Projector		common gate amplifier	
	Power Gain.	• Current Gain	_	Conduct an experiment	characteristics	
		Power Gain.		on common drain		
	2.3 Describe Common	Explain Common drain		amplifier characteristics	Conduct an experiment	
	drain Configuration of	Configuration of			on common drain	
	9	1	l .			

	MOSFET • Voltage gain	MOSFET. • Voltage gain			amplifier characteristics	
	• Current gain	Current gain			110,	
	Power gain	Power gain				
	2.4 Describe Common gate Configuration of MOSFET	Explain Common gate Configuration of MOSFET				
	Voltage gain	Voltage gain				
	Current gainPower gain	• Current gain		1/0,		
	1 Tower gain	Power gain				
	2.5 Differentiate between	Explain the differences				
	the configurations of BJT and MOSFET	between the				
	BJT and WOSI ET	configurations of BJT and MOSFET	R			
Gener	al Objective 3.0: Understand	the Transformer coupling	and power an	d multistage of amplifiers.	1	
	3.1 Describe Power	Explain Power amplifier	Textbooks		Guide students to:	Transformer
11-15	amplifier		Journals Whiteboard	Perform an experiment on Characteristics of	Perform an experiment on Characteristics of	coupled Class
	3.2 Explain transformer	Explain transformer	marker	transformer coupled	transformer coupled	Amplifier
	coupling.	coupling.	Charts	Class A amplifier:	Class A amplifier:	p
		6	Animations			Multimeter
	3.3 Describe principles of	Explain principles of	Computer	Identify the frequency	Identify the frequency	0 111
	coupling	coupling	Projector	response characteristics	response characteristics	Oscilloscope
	3.4 Explain the methods of	Explain the methods of		of amplifier.	of amplifier.	Electronics

		1	ı			
inter stage	coupling in	inter stage coupling in		Identify the relationship	Identify the relationship	trainer
multistage	amplifiers.	multistage amplifiers.		impedance, power and	impedance, power and	
				phase relationship.	phase	Circuit
3.3 Describe A	amplifiers and	Explain Amplifiers and				construction
small signa	al analysis.	small signal analysis.				deck
						Semiconductor
3.4 Describe m	ultistage	Explain multistage				trainer.
amplifiers.		amplifiers.				
3.6 Describe C	omplex	Explain Complex				
amplifier c	ircuit.	amplifier circuit.				

Assessment: The practical class will be awarded 60% of the total score. The continuous assessments, test and quizzes will take 10% of the total of the seme. score, while the remaining 30% will be for the end of the semester examination score.

Electric Circuit Theory I

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY				
COURSE TITLE: Electric Circuit Theory I	COURSE CODE: EEC 214	CONTACT HOURS: 3		
	CREDIT UNIT: 2	THEORETICAL: 1		
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL: 2		

GOAL: This course is designed to equip the students with knowledge and skills of electrical circuit theorems and network analysis of multiphase systems.

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

- 1.0 Understand a.c theory and its applications in simple electrical circuits.
- 2.0 Know mesh and nodal analysis and their applications in solving electrical circuits' problems.
- 3.0 Understand network transformation and duality principles.
- 4.0 Understand network theorems and their applications to d.c and a circuits.

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING TECNOLOGY				
COURSE TITLE: Electric Circuit Theory I	COURSE CODE: EEC 214		CONTACT HOURS: 3	
	CREDIT UNIT: 2		THEORETICAL: 1	
YEAR: II SEMESTER: I	PRE-REQUISITE:		PRACTICAL: 2	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL				

GOAL: This course is designed to equip the students with knowledge and skills of electrical circuit theorems and network analysis of multiphase systems.

General Objective 1.0: Understand a.c theory and its applications in simple electrical circuits.

	THEORETICAL CONTENT			PRACTICAL CONTENT		
Week	Specific Learning	Teachers' Activities	Resources	Špecific Learning	Teachers'	Resources
	Outcome			Outcome	Activities	
	1.1 Define signals	Explain signals	Textbooks		Guide students to:	Sample
1 - 4			Journals			phasor
	1.2 Explain the types of	Explain the types of signals	Markers	Draw to scale phasor	Draw to scale	diagrams
	signals		Whiteboard	diagrams for a.c	phasor diagrams for	
			Charts	circuits.	a.c circuits.	Electrical
	1.3 State the different	Explain the different	Animation			circuits
	mathematical forms of	mathematical forms of	Calculators	Draw phasor	Draw phasor	
	representing a.c	representing a.c signals such	Computer	diagrams that the	diagrams that the	Ohmmeter
	signals. such as:	as:	Multimedia	current in a capacitor	current in a	
	 Exponential 	 Exponential 	Projectors	circuit leads voltage	capacitor circuit	Capacitor
	 Trigonometry 	 Trigonometry 		and the current in the	leads voltage and	
	 Polar 	Polar and		inductive circuit lags	the current in the	Multimeter
	Rectangular (j-	 Rectangular (j- 		the voltage.	inductive circuit	
	notation)	notation)			lags the voltage.	Electronic
						trainer
	1.4 Explain how to			Investigate the	Investigate the	
	convert a c signal in			behaviour of series-	behaviour of series-	

polar form to the	Explain how to convert a.c		parallel connected	parallel connected	
Rectangular form.	signal in polar form to the		resistors.	resistors.	
	Rectangular form.				
1.5 Explain how to use all			Determine the	Determine the	
the four (4)			voltage divider.	voltage divider.	
mathematical operator	Explain how to use all the				
to calculate the values	four (4) mathematical		Test the inductor	Test the inductor	
of ac signals in	operator to calculate the		using ohmmeter.	using ohmmeter.	
different forms of ac	values of ac signals in				
signal.	different forms of ac signal.		Demonstrate how to	Demonstrate how	
			test capacitor by	to test capacitor by	
1.6 Solve simple			observing their	observing their	
problems			charging and	charging and	
using j-notation	Explain how to solve as many		discharging	discharging	
	numerical problems as				
	possible on conversion of an		Convert a.c signal in	Convert a.c signal	
1.7 Explain with the aid of	ac signals from one form to		polar form to the	in polar form to the	
phasor diagrams (draw	another.		Rectangular form.	Rectangular form.	
to scale) the behaviour		•			
of a.c	Explain with the aid of phasor		Demonstrate how to	Demonstrate how	
	diagrams (draw to scale) the		verify Ohm's law.	to verify Ohm's	
1.8 Distinguish between	behaviour of a.c			law.	
inductive reactance and			Simulate resonance		
capacitive reactance.	Explain the difference		conditions in series	Simulate resonance	
	between inductive reactance		and parallel RLC	conditions in series	
1.9 Define a.c Circuits	and capacitive reactance.		circuits.	and parallel RLC	
	No.			circuits.	
•	Explain a.c circuits and its		Show with the aid of		
1.10 Explain the types of	types		phasor diagrams that	Show with the aid	
a.c circuits			the current in a	of phasor diagrams	
	1		capacitor circuit	that the current in a	
			leads voltage and the	capacitor circuit	

1.11 Explain how to draw	Explain the types of a.c circuits		current in the	leads voltage and	
the phasor diagrams for			inductive circuit lags	the current in the	
series and parallel a.c			the voltage.	inductive circuit	
circuits.				lags the voltage.	
	Explain how to draw the		Show wave forms of		
1.12 Explain how to	phasor diagrams for series and		lagging and leading	Show wave forms	
calculate voltage,	parallel a.c circuits.		angles of voltage and	of lagging and	
current, power and			current on a	leading angles of	
power factor in series			Cartesian plane.	voltage and current	
and parallel circuits.	Explain how to calculate			on a Cartesian	
	voltage, current, power and			plane.	
1.13 Explain series and	power factor in series and				
parallel resonance	parallel circuits.				
1.14 Explain how to	Explain the resonance	\wedge			
calculate the Q-factor	frequency and the conditions				
for a coil; loss factor	for series and parallel				
for a capacitor.	resonance.				
1.65					
1.15 Explain, with the aid	Explain how to calculate the				
of a diagram,	Q-factor for a coil; loss factor				
bandwidth	for a capacitor.				
1.165 1:1					
1.16 Explain how to solve	F 1 0 1 6				
problems involving	Explain, with the aid of a				
bandwidth and circuit	diagram, bandwidth				
Q-factor.	Endin have to calve				
1 17 51-:	Explain how to solve				
1.17 Explain resonance in	problems involving bandwidth				
RLC circuit	and circuit Q-factor.				

	T	T= 4	1	T		T
		Explain resonance in RLC				
		circuit			CV	
General		nd nodal analysis and their application		ing electrical circuits pro		
5 - 7	2.1 Explain the terms used	Explain the terms used in	Textbooks		Guide students to:	Sample
	in electric network:	electric network:	Journals	Demonstrate the	Demonstrate the	phasor
	 Ideal and practical 	Ideal and practical	Markers	application of mesh	application of mesh	diagrams
	independent	independent current	Whiteboard	circuit analysis.	circuit analysis.	Electrical
	current and voltage	and voltage sources	Charts			circuits
	sources	Branch	Animation	Demonstrate the	Demonstrate the	Circuits
	 Branch 	• Node	Calculators _	application of Nodal	application of	Ohmmeter
	• Node	• Loop	Computer	circuit analysis.	Nodal circuit	
	• Loop	Network	Multimedia		analysis.	Capacitor
	 Network 		Projectors			Multimeter
						Multimeter
		Explain the basic principle of				Electronic
	2.2 Explain the basic	mesh circuit analysis and				trainer
	principle of mesh circuit	•				
	analysis.					
		Explain how to solve problem				
	2.3 Explain how to solve	on mesh circuit analysis				
	problem on mesh circuit					
	analysis.					
		Explain the basic principle of				
		nodal circuit analysis.				
	principle of nodal					
	circuit analysis.					
		Explain how to solve as many				
	2.5 Explain how to solve	numerical problems as				
L	1	1	J.		l	1

problems on nodal circuit analysis.	possible on mesh and nodal circuit analysis.			CA	
Objective 3.0: Understand no	etwork transformation and dualit	y principles			
3.1 Explain network transformation	Explain network transformation	Textbooks Journals Markers	Reduce a complex network to its series	Guide students to: Reduce a complex network to its	Sample phasor diagrams
3.2 Explain how to reduce a complex network to its series or parallel	Explain the process of reducing a complex network to its series or parallel	Whiteboard Charts Animation.	or parallel equivalent.	series or parallel equivalent.	Electrical circuits
equivalent.	equivalent	Calculators Computer	Derive the formula	Derive the formula for the	Ohmmeter
3.3 Explain star and delta	Explain Star and Delta			transformation of a	Capacitor
networks.	networks	Projectors	transformation of a delta to a star	delta to a star network and vice	Multimeter
3.4 Explain how to derive the formula for the transformation of a	for the transformation of a		network and vice versa.	versa. Measure the total	Electronic trainer
delta to a star network and vice versa.	versa.		Measure the total resistance of combinations of	resistance of combinations of parallel connected	
3.5 Explain duality principle.	Explain duality principle.		parallel connected resistors.	resistors.	
265 1: 1 1:	-			•	
			•		
	capacitance, voltage carrent		connected in series.	in series.	
	Dbjective 3.0: Understand notes 3.1 Explain network transformation 3.2 Explain how to reduce a complex network to its series or parallel equivalent. 3.3 Explain star and delta networks. 3.4 Explain how to derive the formula for the transformation of a delta to a star network and vice versa. 3.5 Explain duality	Dbjective 3.0: Understand network transformation and duality 3.1 Explain network transformation 3.2 Explain how to reduce a complex network to its series or parallel equivalent. 3.3 Explain star and delta networks. 3.4 Explain how to derive the formula for the transformation of a delta to a star network and vice versa. 3.5 Explain duality principle. 3.6 Explain duality between resistance, conductance 2 Explain network transformation Explain the process of reducing a complex network to its series or parallel equivalent Explain Star and Delta networks Explain how to derive formula for the transformation of a Delta to Star network and vice versa. Explain how to derive formula for the transformation of a Delta to Star network and vice versa. Explain how to derive formula for the transformation of a Delta to Star network and vice versa. Explain how to derive formula for the transformation of a Delta to Star network and vice versa. Explain how to derive formula for the transformation of a Delta to Star network and vice versa.	Dbjective 3.0: Understand network transformation and duality principles 3.1 Explain network transformation Explain the process of reducing a complex network to its series or parallel equivalent. Explain the process of reducing a complex network to its series or parallel equivalent Explain Star and Delta networks Explain Star and Delta networks Explain how to derive formula for the transformation of a Delta to Star network and vice versa. Explain how to derive formula for the transformation of a Delta to Star network and vice versa. Explain how to derive formula for the transformation of a Delta to Star network and vice versa. Explain how to establish duality between resistance, conductance conductance, capacitance, voltage- current	3.1 Explain network transformation 3.2 Explain how to reduce a complex network to its series or parallel equivalent. 3.3 Explain star and delta networks. 3.4 Explain star and delta networks. 3.5 Explain how to derive the formula for the transformation of a delta to a star network and vice versa. 3.6 Explain duality principle. 3.7 Explain duality between resistance, conductance 3.8 Explain duality between resistance, conductance 3.9 Explain network transformation and duality principles 3.1 Explain network transformation and duality principles Textbooks Journals Markers network to its series or parallel equivalent. Animation. Calculators Computer Computer Multinedia for the transformation of a delta to a star network and vice versa. Explain how to derive formula for the transformation of a delta to a star network and vice versa. Explain duality principle. Explain how to establish duality between resistance, conductance capacitance, voltage- current Explain network Textbooks Journals Markers network to its series or parallel charter in the vork its series or parallel equivalent. Charts Animation. Calculators Computer Derive the formula for the transformation of a delta to a star network and vice versa. Measure the total resistance of combinations of parallel connected resistors.	Dijective 3.0: Understand network transformation and duality principles 3.1 Explain network transformation Textbooks Journals Markers Markers Markers Markers Miteboard capuivalent. Explain star and delta networks. 1. Explain star and delta networks. 2. Explain how to derive the formula for the transformation of a delta to a star network and vice versa. 3. Explain duality principle. Explain duality between resistance, conductance Sexplain network transformation and duality principles Textbooks Narkers Whiteboard Charts Compute Charts Compute Charts Compute Charts Animation. Calculators Compute Multinedia Projectors Measure the formula for the transformation of a delta to a star network and vice versa. Measure the total resistance of combinations of parallel connected resistors. Determine by experiment the total resistance of resistors connected resistance of resistors connected resistors connected resistance of resistors connected

	1,	T		1		
	voltage- current			Identify star and delta networks	Identify star and delta networks	
General	Objective 4.0: Understand n	etwork theorems and their applic	ations to d.c ar	nd a.c circuits	O	
12 -15	4.1 State Thevenin's Theorem.	Explain Thevenin's Theorem.	Textbooks Journals Markers	Verify Thevenin's theorem	Guide students to: Verify Thevenin's theorem.	Sample phasor diagrams
	4.2 Explain the basic principle of Thevenin's theorem.	Explain the basic principle of Thevenin's theorem. Explain problems on some	Animation.	Demonstrate the application of Nodal ercuit analysis.	Demonstrate the application of Nodal circuit analysis.	Electrical circuits
	4.3 Solve problems on some network using Thevenin's theorem.	network using Thevenin's theorem.	Computer Multimedia	Verify the Millman's theorem	Verify the Millman's theorem	Ohmmeter Capacitor Multimeter
	4.4 State Norton's theorem.	Explain Norton's theorem.		Use Thevenin's	Use Thevenin's	Electronic
	4.5 Explain the basic principle of Norton's theorem.	Explain the basic principle of Norton's theorem.		theorem to analyze energy delivery from a battery to a load.	theorem to analyze energy delivery from a battery to a load.	trainer
	4.6 State the difference between the Norton's theorem and Thevenin's theorem.	Explain the difference between the Norton's theorem and Thevenin's theorem.				
	4.7 Explain how to solve problems using	Explain how to solve problems using Norton's				

Norton's theorem.	theorem.		
4.8 State Millman's			
theorem.	Explain Millman's theorem.)
4.9 Explain the basic	Explain the basic principle of		
principle of Millman's	Millman's theorem.		
theorem.			
1.105			
4.10 Explain how to solve	Explain how to solve network	1	
network problems	problems using Millman's		
using Millman's	theorem.	. () ·	
theorem.			
4.10 Ct + D : :	Explain Reciprocity theorem		
4.12 State Reciprocity			
theorem	Familia de la signaja si		
4.125 1 : 4 1 :	Explain the basic principle of		
4.13 Explain the basic	reciprocity theorem		
principle of			
reciprocity theorem	Explain how to solve network		
4.14Explain how to solve	problems using Reciprocity		
network problems	theorem.		
using Reciprocity	theoreting		
theorem.			
theorem.	Explain the Thevenin's and		
4.15 Explain the	Norton's theorem to solve		
Thevenin's and	electric circuits/networks		

Norton's theorem to	problems	
solve electric		
circuits/networks	Explain how to solve network	, 0,
problems	problems using Millman's	
	theorem and Reciprocity	
4.16 Explain how to	theorem	
solve network		
problems using		
Millman's theorem		
and Reciprocity		
theorem		

EVALUATION: The practical class will be awarded 60% of the total score. The continuous assessments, test and quizzes will take 10% of the total score, while the remaining 30% will be for the end of semester examination score.

Use of Electrical and Electronics Instrument

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY					
COURSE TITLE: Use of Electrical and Electronics	COURSE CODE: EEC 215	CONTACT HOURS: 3			
Instrument	CREDIT UNIT: 2	THEORETICAL: 1			
YEAR: II SEMESTER: I	PRE-REQUISITE: EEC 125	PRACTICAL: 2			

GOAL: This course is designed to acquaint the students with the knowledge and skills of application of electrical/electronic instruments for laboratory and industrial measurements

GENERAL OBJECTIVES:

At the end of the course the student should be able to:

- 1.0 Understand an oscilloscope.
- 2.0 Understand the operation of power meter
- 3.0 Understand the factors for selection of electrical and electronic instruments.
- 4.0 Understand the importance of electrical instruments in industries
- 5.0 Understand controllers and controller design (Proportional Integral Derivative, PID)

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY					
COURSE TITLE: Use of Electrical and Electronics COURSE CODE: EEC 215 CONTACT HOURS: 3					
Instruments	CREDIT UNIT: 2	THEORETICAL: 1			
YEAR: II SEMESTER: I	PRE-REQUISITE: EEC 125	PRACTICAL: 2			
COLINGE OPECIFICATION THEODETICAL AND DRACTICAL					

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GOAL: This course is designed to acquaint the students with the knowledge and skills of application of electrical/electronic instruments for laboratory and industrial measurements

GENERAL OBJECTIVE: 1.0 Understand an Oscilloscope.

	THEORETIC	CAL CONTENT		PRA	PRACTICAL CONTENT		
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers'	Resources	
	Outcome			Outcome	Activities		
1- 4	1.1 Explain the block	Explain the block	Textbooks		Guide Students to:	OSCILLOSCOP	
	diagram of an	diagram of an	Journals	Draw the block	Draw the block	Е	
	Oscilloscope	Oscilloscope	Whiteboard	diagram of an	diagram of an		
			Marker	Oscilloscope	Oscilloscope	Signal generator	
	1.2 Explain the function of	Explain the function of	Charts				
	each block and the knobs	each block and the knobs	Animations		Measure D.C	DC/AC power	
			Computer	Measure D.C voltage	voltage in	supplies and	
	1.3 Explain the operation	Explain the operation	Projector	in experiments using	experiments using	probe	
	principles of an	principles of an		OSCILLOSCOPE	OSCILLOSCOPE		
	OSCILLOSCOPE	OSCILLOSCORE				OSCILLOSCOP	
				Measure A.C voltage	Measure A.C	E and	
				in experiments using	voltage in	OSCILLOSCOP	
				OSCILLOSCOPE	experiments using	E charts.	
					OSCILLOSCOPE		
				Measure range of			
		,		frequencies with	Measure range of		
	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			OSCILLOSCOPE	frequencies with		

				Measure phase angles with OSCILLOSCOPE	OSCILLOSCOPE Measure phase angles with OSCILLOSCOPE	
General	Objective 2.0: Understand the	e operation of power meter.				
5-7	2.1 Define Power meter 2.2 Explain the operation	Explain Power meter Explain the operation of	Textbooks Journals	Sketch Power meter	Guide the students to:	Wattmeter
	of the meter in 2.1	the meter in 2.1	Whiteboard Marker	Measure DC and AC	Sketch Power meter	Power supplies
	2.3 Explain the use of three meters and two meters in measuring power in three-phase Circuit 2.4 Explain how to calculate Power factor.	Explain the use of three meters and two meters in measuring power in three-phase Circuit Explain how to calculate Power factor.	Charts Animations Computer Projector	Measure DC and AC power for single and three phase circuits Measure power factor	Measure DC and AC power Measure DC and AC power for single and three phase circuits Measure power factor	Single and three phase circuits charts.
General	Objective 3.0: Understand the		etrical and elect	ronic instruments		
8-10	3.1 Define electrical and electronic instruments	Explain electrical and electronic instruments	Textbooks Journals Whiteboard			
	3.2 Explain the factors to be considered when	Explain the factors to be considered when	Marker Charts			

	selecting electrical and	selecting electrical and	Animations			
	electronic instruments:	electronic instruments:	Computer		CV	
	• Range	• Range	Projector		, 10"	
	 Accuracy 	 Accuracy 				
	 Response 	 Response 			V	
	 Stability 	 Stability 				
	 Reliability 	 Reliability 				
	 Sensitivity 	 Sensitivity 				
General	3.3 Explain the importance of factors in 3.1 when selecting electrical and electronic instruments: • Range • Accuracy • Response • Stability • Reliability • Sensitivity Objective 4.0: Understand the	Explain the importance of the following factors in selecting electrical and electronic instruments: • Range • Accuracy • Response • Stability • Reliability • Sensitivity	R	Justries		
11-12	4.1 Explain the following	Explain the following in	Textbooks		Guide students to:	Resistors
	in relation to industries:	relation to industries:	Journals	Determine	Determine	·
			Whiteboard	temperature effect on	temperature effect	Semi-conductor
	• Conductor	• Conductor	Marker	resistance	on resistance	diodes
	Semiconductor P: 1	• Semiconductor	Charts			
	Diode	• Diode	Animations		Verify temperature	Digital

	Temperature	Temperature	Computer	Verify temperature	effect on	thermometers
	Tomporature	Temperature	Projector	effect on	semiconductor	
	4.2 Explain the electrical	Explain the electrical	Trojector	semiconductor diode	diode	Power supplies
	instruments used in	instruments used in				cables
	industry	industry		Measure temperature	Measure	
				range using digital	temperature range	
	4.3 Explain the importance	Explain the importance of		thermometer	using digital	
	of measurement	measurement and			thermometer	
	instruments in	instruments in industry				
	industry.					
		Explain the variables in				
	4.4 Explain the variables	4.2 above				
	in 4.2 above)		
		Explain the classification				
	4.5.5. 1 : .1	instruments into the				
	4.5 Explain the classification of	following:	11			
	instruments into the	 Indicating 	3 ,			
	following:	Recording				
		Controlling				
	• Indicating					
	RecordingControlling					
Canaval	U	untualism and controller design	m (Duamantiana)	 Internal Demissative DIE)	
13-15	Objective 5.0 Understand co	Explain controllers	Textbooks	i integrai Derivative, PIL	Guide students to:	Computers (with
13-13	J.1 Define controllers	Explain connoncis	Journals	Design a simple	Design a simple	installed licensed
	5.2 Explain the types of	Explain the types of	Whiteboard	controller circuit	controller circuit	Matlab or Python
	controllers	controllers	Marker	Controller cheuit	commoner circuit	software
	Controllers	oona onois	Charts			
			2114115			

5.3 Explain the	Explain the importance	Animations			PID control
importance controllers	controllers to electronic	Computer			
to electronic circuits	circuits	Projector			
5.4 Explain the properties	Explain the properties of a			20	
of a Proportional,	Proportional, Integral and				
Integral and Derivative	Derivative (PID)				
(PID) controller	controller		CAL		
5.5 Explain the uses of			110.		
PID controller	Explain the uses of PID				
5.6 Explain the circuits of	controller		·		
PID controller in	Explain the circuits of PID				
function generator and	controller in function				
its uses in industries	generator and its uses in				
	industries)			

ASSESSMENT: The practical class will be awarded 60% of the total score. The continuous assessments, test and quizzes will take 10% of the total score, while the remaining 30% will be for the end of the semester examination score

Telecommunication II

PROGRAMMI	E: NATIONAL DIPLOMA IN	I ELECTRICAL AND ELECTRONIC	S ENGINEERING T	TECHNOLOGY
COURSE TITI	LE: Telecommunication II	COURSE CODE: EEC 216		CONTACT HOURS: 3
		CREDIT UNIT: 2		THEORETICAL: 1
YEAR: II	SEMESTER: I	PRE-REQUISITE: EEC 126		PRACTICAL: 2

GOAL. This course is designed to equip the students with the knowledge and skills of the principles of telecommunication techniques

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

- 1.0 Know the basic principles of audio-visual (Television) signal transmission.
- 2.0 Know various frequency bands within the radio frequency spectrum.
- 3.0 Understand the principles of electromagnetic (EM) wave propagation.
- 4.0 Understand the principles of radio frequency (RF) wave propagation
- 5.0 Understand computer networks

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY							
COURS	SE TITLE: Telecommunicati	on II	COURSE	CODE: EEC 2	16	CONTACT HOURS: 3	
				EDIT UNIT: 2 THE ORETICAL: 1			
YEAR: II SEMESTER: I PRE			PRE-REC	QUISITE: EEC	C 126	PRACTICAL: 2	,
COURS	SE SPECIFICATION: THE	ORETICAL AND	PRACTI	CAL			
	This course is designed to eq	•		_		elecommunication techni-	ques
Genera	Objective 1.0: Know the bar			al (Television) s			
	THEORETI	CAL CONTENT			PRA	CTICAL CONTENT	
1-3	1.1 Explain signal	Explain signal		Textbooks	'(10)	Guide students to;	TV sets,
	transmission	transmission		Journals	Demonstrate	Demonstrate	frequency
				Whiteboard	amplitude	amplitude modulation	generator
	1.2 Explain the principle	Explain the princ		Marker	modulation with	with signals in audio	
	of operation of	operation of telev		Charts	signals in audio	frequency band.	AM and FM
	television (TV)	(TV) transmission	on.	Animations	frequency band.		demonstratio
	transmission.			Computer		Demonstrate	n units
		Explain how visi		Projector.		amplitude	
	1.3 Explain how vision	sound signals are) '	Demonstrate	demodulation with	Oscilloscope
	and sound signals are	generated separa			amplitude	AM modulated signal.	
	generated separately	transmitted toget	her		demodulation with		RF and AF
	and transmitted		Y		AM modulated	Determine the	demonstratio
	together	Explain the princ	_		signal.	frequency deviation	n units
		operation of Rad	io			with FM modulated	
	1.4 Explain the principle	frequency (RF)			Determine the	signal.	Receivers.
	of operation of Radio	transmission.			frequency deviation		
	frequency (RF)				with FM modulated	Demonstrate the	
	transmission.	Explain digital			signal.	frequency	
		transmission				demodulation with FM	
						modulated signals.	

1.5 E1-1 11-14-1	E1-1- DTV -411-	D		<u> </u>
1.5 Explain digital	Explain DTV standards	Demonstrate the		
transmission	and tools:	frequency	Determine how radio	
	 Terrestrial 	demodulation with	receivers operate	
	transmission	FM modulated		
1.6 Explain DTV	• Satellite	signals.	Visit a television	
standards and tools:	transmission		station	
Terrestrial	• Cable	Determine how radio		
transmission	transmission	receivers operate		
Satellite				
transmission	Explain the features of	Visit a television		
Cable transmission	digital transmission	station		
	standards			
1.7 Explain the features of	Explain digital signals			
digital transmission	modulation			
standards				
	Explain types of digital			
1.8 Explain digital signals	signal modulation			
modulation	Signar modulation			
	Explain the basics of			
1.9 Explain types of digital	digital radio			
signal modulation	digital radio			
	Explain the principle of			
1.10 Explain the basics	operation of a telephone			
of digital radio	circuit with the aid of			
or digital radio				
1.11 Explain the	diagram.			
principle of operation	Example the sensent of			
principle of operation	Explain the concept of			

	. f . 4.11	111				
	of a telephone circuit	cellular communication				
	with the aid of					
	diagram.				, 10'	
	1.12 Explain the concept					
	of cellular					
	communication					
	Communication					
Canan	Objective 2 O. V. commen		 			
	al Objective 2.0: Know variou			cy spectrum.		
5 – 6	2.1 Define radio frequency	Explain radio frequency	Textbooks	·10.		
			Journals			
	2.2 Explain radio	Explain radio frequency	Whiteboard,			
	frequency spectrum.	spectrum.	Marker			
			Charts			
	2.3 Explain the frequency	Explain the frequency	Animations			
	ranges allocated to	ranges allocated to	Computer			
	different bands:	different bands:	Projector			
	Extremely Low	Extremely Low	3) 0,0000			
	Frequency (ELF)	Frequency (ELF)				
	• Very Low	Very Low				
	Frequency (VLF).	Frequency				
	 Low Frequency 	(VLF).				
	(LF)	Low Frequency				
	Medium Frequency	(LF)				
	(MF)	• Medium				
	High Frequency	Frequency (MF)				
	(HF)	High Frequency				
	((() ()	(HF)				
		(***)				

	 Very High Frequency (VHF) Ultra High Frequency (UHF) Super High Frequency (SHF) Extremely High Frequency (EHF) 2.4 Explain the functions of the bands in 2.3 	 Very High Frequency (VHF) Ultra High Frequency (UHF) Super High Frequency (SHF) Extremely High Frequency (EHF) 				
	above.	the bands in 2.3 above				
Genera	al Objective 3.0: Understand t	the principles of electro-mag	gnetic wave pro	pagation.	l	<u> </u>
7 – 10	3.1 Define a wave propagation3.2 Explain the function of an aerial antenna as a radiator.3.3 Define a dipole	Explain a wave propagation Explain the function of an aerial antenna as a radiator. Explain a dipole	Textbooks Journals Whiteboard Marker Charts Animations Computer Projector	Use appropriate software to simulate the wave propagation of antenna	Guide students to: Use appropriate software to calculate and simulate the wave propagation of antenna	Appropriate software Aerial antenna Wave guides Charts
	3.4 Explain the current and voltage distribution of a dipole.	Explain the current and voltage distribution of a dipole.				Coaxial cables.

3.5 Explain aerial	Explain aerial			
impedance and	impedance and radiation			
radiation resistance.	resistance.		10	
3.6 Define the following	Explain the following			
terms:	terms:			
 Isotropic 	 Isotropic radiator 			
radiator	 Gain of an aerial 			
 Gain of an aerial 	 Beam width of an 	(U)		
 Beam width of an aerial. 	aerial.	MI		
	Explain the polar			
3.7 Explain the polar	diagram or the radiation)		
diagram or the radiation	pattern of an aerial.			
pattern of an aerial.	pattern of an aerian.			
pattern of an aerian	Explain the horizontal			
3.8 Explain the horizontal	and vertical plane			
and vertical plane	patterns of a horizontal			
patterns of a horizontal	and vertical dipoles.			
and vertical dipoles.				
	Explain various types of			
3.9 Explain various types	aerial antennas			
of aerial antennas				
	Explain the effect of			
3.10 Explain the effect of	frequency on aerial			
frequency on aerial	dimensions and			
dimensions and	performance.			
performance.				

	2 11 Escalain tha factous	Escalain the feetans				
	3.11 Explain the factors	Explain the factors				
	guiding the choice of	guiding the choice of			. ()	
	aerial antenna.	aerial antenna.				
Genera	l Objectives 4.0: Understand	the principle of radio frequ	lency (RF) wave	propagation	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
11 -12	4.1 Explain the following	Explain the following	Textbooks	propuguion		
11 12	terms in relation to	terms in relation to wave	Journals			
			Whiteboard			
	wave propagation:	propagation:				
	 Ground waves 	 Ground waves 	Marker			
	 Sky waves 	 Sky waves 	Charts			
	 Space waves 	• Space waves	Animations			
			Computer			
	4.2 Explain troposphere	Explain troposphere and	Projector			
	and ionosphere.	ionosphere.				
	•					
	4.3 Explain the existence	Explain the existence				
	and usefulness of the	and usefulness of the				
	troposphere.	troposphere.	J			
	tropospiicie.	troposphere.				
	A A Francis the offerts of	Escalain the Consection				
	4.4 Explain the effects of	Explain the effects of the				
	the troposphere on	troposphere on				
	propagation below	propagation below				
	30MHZ.	30MHZ.				
		•				
	4.5 Explain the various	Explain the various				
	layers of the	layers of the ionosphere.				
	ionosphere.	•				
L	· ·	1	I .			1

			1	<u></u>		
		Explain critical and				
	4.6 Explain critical and	maximum usable				
	maximum usable	frequency.			. 10"	
	frequency.					
		Explain optimum				
	4.7 Explain optimum	working frequency.				
	working frequency.					
Genera	l Objective 5.0: Understand	computer networks				
13-15	5.1 Explain computer	Explain computer	Textbooks	الله .	Guide students to:	Router
	networks	networks	Journals	Set up a simple cable	Set up a simple cable	
			Whiteboard	network	network	Access points
	5.2 Explain types of	Explain types of	Marker			
	computer networks:	computer networks:	Charts	Configure a router	Configure a router	Switch
	 Wireless fidelity 	 Wireless 	Animations			
	(WI-FI)	fidelity (WI-	Computer	Connect two routers	Connect two routers or	Ethernet
	• Bluetooth	FI)	Projector	or access points	access points	cable
	 Intranet 	Bluetooth)`			
		 Intranet 		Transfer information	Transfer information	
	5.3 Explain network			using:	using:	
	topologies:	Explain network		 Wireless 	 Wireless 	
	• Mesh	topologies:		fidelity	fidelity (WI-	
	• Ring	Mesh		(WI-FI)	FI)	
	• Bus	7.2552		• Bluetooth	• Bluetooth	
		Ring		Intranet	Intranet	
	5.4 Explain network	Bus Evalain natuvark				
	devices:	Explain network devices:				
	• NIC					
		• NIC				

• Switch	• Switch	
• HUB	• HUB	
• Repeater	 Repeater 	
Gateway	 Gateway 	
• Router	• Router	
 Access points 		
5.5 Explain network protocols:UDPTCP/IP	Explain network protocols: • UDP • TCP/IP	CHILCHI
5.6 Explain OSI model	Explain OSI model	

EVALUATION: The practical class will be awarded 60% of the total score. The continuous assessments, tests and quizzes will be 10% the total score, while the remaining 30% will be for the end of Semester examination.

Computer Hardware and Software I

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY						
COURSE TITLE: Computer Hardware and Software I	COURSE CODE: EEC 217	CONTACT HOURS: 3				
	CREDIT UNIT: 2	THEORETICAL: 1				
YEAR: II SEMESTER: I	PRE-REQUISITE: NIL	PRACTICAL: 2				
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GOAL: This course is designed to equip students with basic knowledge and skills on computer hardware and specialized software packages.

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

- 1.0 Understand the basic functions of a computer
- 2.0 Understand the computer hardware components
- 3.0 Understand Human-Computer Interaction
- 4.0 Understand the Language of software packages.
- 5.0 Understand the operation of computer hardware components

PROGE	RAMME: NATIONAL DIPL	OMA IN ELECTRICA	L AND ELECTR	ONICS ENGINEERIN	NG TECHNOLOGY	
COURSE TITLE: Computer Hardware and Software I			OURSE CODE:	EEC 217 CO	ONTACT HOURS: 3	
		CR	EDIT UNIT: 2	Ţ	HEORETICAL: 1	
YEA	AR: II SEMESTER: I	PR	E-REQUISITE:	NIL P	RACTICAL: 2	
COURS	SE SPECIFICATION: THE	ORETICAL AND PRA	CTICAL		*	
GOAL:	This course is designed to eq	uip students with basic l	knowledge and sk	cills on computer hardw	vare and specialized software	re packages.
General	Objective 1.0: Understand the	he basic functions of a c	omputer.	'(10),		
THEO	RETICAL CONTENT			PRACTICAL CONT	TENT	
Week	Specific Learning	Teacher's Activities	Resources	Specific Learning	Teacher's Activities	Resources
	Outcome			Outcome		
1-3	1.1 Define computer.1.2 Explain the evolution of computer.	Explain computer Explain the evolution of computer.	Whiteboard Marker Textbooks Computer Internet	Identify computer components	Guide the students to: Identify computer components	Computer
	1.3 Explain the application of computers.1.4 Explain the impact of technology on Personal Computer (PC).	f Explain the application computers Explain the impact of technology on Personal Computer (PC)		Dismantle a computer system and show the: • RAM card • Hard Disk • Processors.	-	
	1.5 Differentiate between hardware and software.	Explain the differences between hardware and software.		Identify: • Input mechanisms Output Mechanisms	Identify: • Input mechanisms Output Mechanisms	

	1.6 Explain the input-process output algorithm (hardware):	-Explain the input-process- output algorithm (hardware).				
	1.7 Explain microprocessors, inputs and outputs devices	Explain microprocessors, inputs and outputs devices	,(HAIL		
	1.8 Explain the need for data storage	Explain the need for data storage.				
	 1.9 Explain how data is stored in: RAM ROM Fixed discs Removable discs 	Explain how data is stored in: • RAM • ROM • Fixed discs Removable discs				
Genera	l Objective 2.0: Understand t	the computer hardware com	ponents			•
4-6	2.1 Define computer.	Explain computer.	Whiteboard Marker	Assemble computer sub-	Guide the students to: Assemble computer	Computer auxiliary unit
	2.2 Explain types of computers	Explain types of computers	Textbooks Computer	units.	sub-units	Computer

		Internet	Identify the memory,	Identify the memory,	peripheral
2.3 Enumerate components		Projector	ports, CPU and power	ports, CPU and power	1 1
of computer hardware:	of a computer hardware:		supply unit	supply unit	
Input/output	 Input/output 				Central
System Unit	 System Unit 		_	•	processing
 Processing unit 	 Processing unit 		CMOS battery for	CMOS battery for	units (CPU)
 Storage devices 	 Storage devices 		memory retention.	memory retention.	
					I/O devices,
2.4 List major subunits of a	Explain major subunits of		Identify the various types		tools and
computer:	a computer:		of port:	types of ports:	measuring
• Mother board (ATX,	 Mother board 		• Parallel	Parallel	instruments.
Micro-ATX, and	(ATX, Micro-	. (• Serial	• Serial	Scraps of
Mini-ITX Form	ATX, and Mini-		• USB	• USB	computer
Factors),	ITX Form				system.
 Drives (Hard disk, 	Factors),	\circ	Identify the components	Identify the	
Floppy, CD-ROM,	• Drives (Hard		of a computer hardware:	components of a	
Zip),	disk, Floppy, CD-) ·	• Input/output	computer hardware:	
• Ports.	ROM, Zip),		System Unit	• Input/output	
	• Ports.		 Processing unit 	System Unit	
2.5 Explain SSD and HDD	Compare SSD and HDD		 Storage 	 Processing 	
technologies	technologies		devices	unit	
				 Storage 	
2.6 Explain the technical	Explain the technical			devices	
aspects of cables	aspects of cables				
connecting the units.	connecting the units.				
	Explain how data is				
transferred down the					

	11 11 0		1	1		T
	cables and the type of	transferred down the				
	hand- shake methods	cables and the type of			, C Y	
	used.	hand- shake methods				
		used.				
Genera	l Objective 3.0: Understand H	Human-Computer Interaction	n.			
						_
7-8	3.1 Explain the concept of	Explain the concept of	Whiteboard	Access computers	Guide students to:	Computers
	operating system	operating system	Marker	correctly through	Access computers	
	• PC-DOS/MS-DOS	 PC-DOS/MS-DOS 	Textbooks	Windows operating	correctly through	Operating
	• Windows	 Windows 	Computer	system such as:	Windows operating	system
	Linux Unix	 Linux Unix 	Internet	• Open/Close a	system such as:	
			Projector 🧨	window	Open/Close a	Application
	3.2 Explain the advantage of	Explain the advantage of		Program Manager	window	packages
	1	the Windows operating		Button bars/scroll		
	System.	System.	_ ' \ '	bars/ menu bars	Manager	
			Q_	Moving from one	Button	
	3.3 Explain the windows	Explain the windows		Window to	bars/scroll	
	menu and tools	menu and tools		another	bars/ menu	
	menu and tools	menu and tools		anomei	bars	
	3.4 Explore modern	Explore modern operating				
	*				Moving from	
	operating systems like:	systems like:			one Window	
	• Windows 11	• Windows 11			to another	
	Linux distributions	Linux				
	MacOS.	distributions				
		MacOS.				
	3.5 Explain the advantage of:	Explain the advantage of:				
	Windows Operating	• Windows				

1		T	1			ı
	System	Operating System				
	 Windows menu and 	 Windows menu 			CY	
	tools	and tools				
	3.6 Explain mobile	Explain mobile				
	operating systems	operating systems				
	(Android, iOS) and	(Android, iOS) and				
	their user interface	their user interface				
General	Objective 4.0: Understand Appl	ication software packages.	l	.40		
9-10	4.1 Explain file management	Explain file management	Whiteboard	Create a file and folder	Guide students to:	Computers
			Marker (Create a file and folder	
	4.2 Explain how to manage	Explain how to manage	Textbooks	Manipulate files (moving,	Manipulate files	Printers
	files.	files.	Computer	copying, saving, deleting).	(moving, copying,	
			Internet		saving, deleting).	Papers
	4.3 Explain the concepts of	Explain the concepts of	Projector	Manipulate Print Manager.		
	software packages such	software packages such			Manipulate Print	Computers
	as:	as:		_	Manager	
	 MSOffice 	 MSOffice 		Demonstrate the		Application
	Lotus SmartSuite	Lotus SmartSuite		competent use of a word-	Demonstrate the	packages
	MS Encarta	MS Encarta		processing package such	competent use of a	
				as:	word-processing	
	4.4 Explain the steps	Explain the steps involved		MSWord (or	package such as:	
	involved in installation of			equivalent	MSWord (or agrivelent	
	MS-Words.	Words.		standard).	equivalent	
	10			• Entering text	standard).	
	4.5 Explain the steps	Explain the steps involved		• Formatting text	• Entering text	
	involved to competently	to competently operate		(emboldening, font	• Formatting text	
	mvorved to competentry	to competently operate		size, italicizing).	(emboldening,	

MS word or equivalents standard. Explain the different features of the software Explain cloud-based applications and collaborative tools: e.g.: • Google Workspace		Creating and Saving text files Editing and moving text Importing objects Spelling and Grammar Checking Create tables, text	Saving text files Editing and moving text Importing objects Spelling and
Explain the different features of the software Explain cloud-based applications and collaborative tools: e.g.: • Google Workspace		Editing and moving text Importing objects Spelling and Grammar Checking	 Creating and Saving text files Editing and moving text Importing objects Spelling and
Explain cloud-based applications and collaborative tools: e.g.: • Google Workspace		text Importing objects Spelling and Grammar Checking	Saving text files Editing and moving text Importing objects Spelling and
Explain cloud-based applications and collaborative tools: e.g.: • Google Workspace		Importing objects Spelling and Grammar Checking	Editing and moving textImporting objectsSpelling and
Explain cloud-based applications and collaborative tools: e.g.: • Google Workspace		Spelling and Grammar Checking	moving text Importing objects Spelling and
applications and collaborative tools: e.g.: • Google Workspace		Grammar Checking	Importing objectsSpelling and
applications and collaborative tools: e.g.: • Google Workspace		Checking	Spelling and
applications and collaborative tools: e.g.: • Google Workspace			1 0
collaborative tools: e.g.:GoogleWorkspace		• Create tables, text	
• Google Workspace			Grammar
Workspace	_	boxes, equations.	Checking.
•		Type a short	• Create tables, text
 Microsoft 365 		document and	boxes, equations.
• Wheresoft 303		save it.	• Type a short
Explain axhan agazmity		Edit a document	document and
• •		and carryout a	save it.
•		•	Edit a document
sonware packages.		Demonstrate the	and carryout a
		use of tables.	spelling check.
		Use the Internet to	Demonstrate the
		retrieve	use of tables.
		information.	Use the Internet
		World Wide	to retrieve
		Web(WWW)	information.
00		` ′	World Wide
			Web(WWW)
			Download
•			information
			Paste retrieved
		an appropriate	- Tasto Toniovod
1	Microsoft 365 Explain cyber security implications of using oftware packages.	Explain cyber security mplications of using	save it. Explain cyber security implications of using oftware packages. Save it. Edit a document and carryout a spelling check. Demonstrate the use of tables. Use the Internet to retrieve information.

				application	information into	
				 Use-mail to send 	an appropriate	
				and receive	application	
				messages.	Use-mail to send	
				National and	and receive	
				international e	messages.	
				mail	National and	
				E-mail attachments	international e-	
				(sending& receiving)	mail	
					E-mail attachments	
				11/2	(sending& receiving)	
Genera	l Objective 5.0: Understand the	he operation of computer ha	ardware comp	onents		
11-14	5.1 Explain the operations	Explain the operations	Whiteboard	Demonstrate how to start	Guide students to:	PC with
	of computer	of computer	Marker	and shut down a		Presentation
	1		Textbooks	computer system.	Demonstrate how to	package
	5.2 Explain:	Explain:	Computer		start and shut down a	installed and
	Memory	Memory	Internet	Identify different types	computer system.	connected to
	• Ports	Ports	Projector	of cables and connectors.		multimedia
	• CPU	OPI J	3		Identify different	projector
	Power supply	Power supply			types of cables and	Computer
		Power supply		Demonstrate how to	connectors.	auxiliary units
	Battery supply for many retentions	Battery supply for memory		connect Computer Ports		
	memory retention.			to peripherals.	Demonstrate how to	Computer
	5.2 Emploin the many	retention		1 L P	connect Computer	peripherals,
	5.3 Explain the protocols of			Demonstrate how you	Ports to peripherals.	tools and
				permensioned now you	r one to peripherais.	vooib uiiu

various port: Parallel,	Explain the protocols of	can setup and connect a		measuring
Serial; USP.	various port: Parallel,	printer to a computer.	Demonstrate how you	instruments
Serial, OSI.	Serial; USP.	printer to a computer.	can setup and connect	mstruments
5.4 Explain the functions of	Schai, OSi .		a printer to a	Central
the Ports listed 2.3	Explain the functions of	Setup some printing	computer.	processing
above.	the Ports listed 2.3 above.	exercise	computer.	units
above.	the Ports fisted 2.3 above.	exercise	G - L 	umus
5 5 E1-: 41		I I A'Co	Setup some printing	I/O 1
5.5 Explain the		Identify a modern and	exercise	I/O devices.
characteristics of	Explain the characteristics	draw a block diagram of	T1 .:0 1 1	
monitors:	of monitors:	a modem	1	Computer
 Scanning Speed 	Scanning Speed		draw a block diagram	toolboxes
• Colour resolution,	• Colour resolution,	Draw a block diagram	of a modem	
etc.	etc.	showing the		Electrostatic
		interconnection of the	Draw a block	discharge
5.6 Explain the functions and	Explain the functions and	Sub-units of the	diagram showing the	hand.
operation of monitors	operation of monitors	motherboard.	interconnection of	
			the Sub-units of the	Scraps of
5.7 Explain how to select	Explain how to select		motherboard.	computer
monitors for different	monitors for different			system.
mother board's speed and	mother board's speed and			
resolution.	resolution			
5.8 Explain the operation of	Explain the operation of a			
aprinter.	printer.			
5.9 List different types of	Explain different types			
	of printers e.g.:			
printers e.g.:	or printers e.g			

• Dot	• Dot				
• Laser	• Laser			CY	
• Deskjet, etc.	• Deskjet, etc.				
6.10 Explain the difference	Explain the difference				
between various types of	f between various types of				
Printer heads.	Printer heads.				
6.11 Explain the operation o	f Explain the operation of a		·40'		
a modem and its	modem and its		1/10.		
classification such as:	classification such as:				
• V Series	• V Series	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			
• X Series	• X Series				
6.12 Explain the concepts of	Explain the concepts of	\			
networking.	networking.				

ASSESSMENT: The continuous assessment, tests and quizzes will be awarded 60% of the total score. The end of the Semester Examination will make-up for the remaining 40% of the total score.

Research Methods in Electrical and Electronics Engineering Technology

PROGRAMME: NATIONAL DIPLOMA ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY								
COURSE TITLE: Research Methods in Electrical and Electronics	COURSE CODE: EEC 218	CONTACT HOURS: 2						
Engineering Technology	CREDIT UNIT: 2	THEORETICAL: 2						
YEAR: II SEMESTER: I	PRE-REQUISITE:	PRACTICAL:0						

GOAL: This course is designed to equip the student with the knowledge and skills of Research Methods in Electrical and Electronics Engineering Technology

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

- 1.0 Understand the Concept of Research in Electrical and Electronics Engineering Technology
- 2.0 Understand Terminologies in Electrical and Electronics Engineering Research
- 3.0 Understand the Methods of Research in Electrical and Electronics Engineering
- 4.0 Understand Sampling Techniques in Electrical and Electronics Engineering Research
- 5.0 Understand Data Collection Techniques in Electrical and Electronics Engineering Research
- 6.0 Understand Research Report Writing and Presentation in Electrical and Electronics Engineering

PROGR	AMME: NATIONAL DIPLOM	A ELECTRICAL AN	D ELECTRONI	CS ENGINEERING TI	ECHNOLOGY	<u> </u>
	E TITLE: Research Methods in	COURSE CODE	: EEC 218	CON	TACT HOURS: 2	
	l and Electronics Engineering	CREDIT UNIT:	2	TH	EORETICAL: 2	
Technolo	63					
YEAR:		PRE-REQUISITE		PR	CTICAL: 0	
	E SPECIFICATION: THEORI			11 CD	1 ' 1 4 ' 1 11	71 / '
	This course is designed to equipring Technology	the student with the Kn	lowledge and ski	ills of Research Method	is in Electrical and I	Electronics
	Objective 1.0: Understand the O	Concept of Research in	Electrical and E	Electronics Engineering	Technology	
THEOR	RETICAL CONTENT	•		PRACTICAL CONT	ENT	
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
1-3	1.1 Define research	Explain research	Textbooks Journals			
	1.2 Explain the importance in EEET:	Explain the importance in EEET:	Computer Internet			
	• Advancements in	Advancements in				
	IoT	IoT	Marker			
	• Power systems.	• Power systems.	Marker Board			
		Explain types of research:				
	• Quantitative,	• Quantitative,				
	• Qualitative,	• Qualitative,				
	 Mixed Methods. 	• Mixed Methods.				
		~				
	1 1	Explain the purpose of	,			
		research and its				
	application in EEET:	application in EEET:				

	 Efficiency improvement, fault detection, etc. 	 Efficiency improvement, fault detection, etc. Explain sources of			SCA	
	knowledge in engineering			CAL		
	Standards,Experimentation.	Standards,Experimentation.		MIC.		
	scientific research	Explain the elements of scientific research methods.	160			ı
General	Objective 2.0: Understand Terr	ninologies in Electrical	and Electronics E	ngineering Research		
4-6	2.1 Define evidence, fact, and data as they apply to EEET.	_	Textbooks Journals Computer Internet			
	 2.2 Explain the following: Concepts Constructs Propositions Variables Assumptions. 	Explain the following:				
	2.3 Explain types of variables	Explain types of variables				

	 Dependent, Independent Controlled). 2.4 Explain conceptualization and operationalization in EEET research.	 Dependent, Independent Controlled). Explain conceptualization and operationalization in EEET research.				
Genera	l Objective 3.0: Understand the l	I .	Electrical and E	Electronics Engineering	I	
7-8	3.1 Define research methods	Explain research method	Textbooks Journals Computer			
	3.2 Explain the importance of research methods in EEET.	Explain the importance of research methods in EEET.	Internet Projector Marker Marker Board Research			
	 3.3 Explain types of research methods: Experimental, Simulation-based Analytical. 	Explain types of research methods. • Experimental, • Simulation-based • Analytical.	reports Internet			
	 3.3 Explain methodologies under each type in 3,3 Circuit testing Simulation of power 	Explain methodologies under each type in 3.3 • Circuit testing				

	systems	Simulation of power systems			CA	
	Objective 4.0: Understand Sam					_
9-11	4.1 Define sampling	Explain sample	Textbooks Journals	Identify sampling techniques	Guide students: Identify sampling	Sample project/sam
	4.2 Explain census in the context of EEET.	Explain Census in the context of EEET.	Computer Internet	Use the selected	techniques	ple report Street
			Projector Marker	technique to a draw sample	Use the selected technique to a draw	Directories
	4.3 Explain methods of sampling:	Explain methods of sampling:	Marker Board		sample	
	 Probability 	 Probability 				
	Non-probability.	Non- probability				
	1 1	Explain sampling techniques under each method in 4.3	6			
	4.5 Explain factors influencing	Explain factors	D'			
	the choice of sampling	influencing the choice				
	technique	of sampling technique				
General	Objective 5.0: Understand Data	a Collection Techniques	s in Electrical ar	nd Electronics Engineering	g Research	
12-13	5.1 Define data	Explain Data	Textbooks Journals	Identify types of data	Guide students: Identify types of	Sample data
	5.2 Explain types of data:	Explain types of Data	Computer		data	
	• Quantitative,	• Quantitative,	Internet			
	Qualitative	Qualitative	Projector Marker	Identify sources of data	Identify sources of data	
	5.3 Explain sources of data:	Explain sources of	Marker Board			
	Experimental	data:		Use data collection	Use data collection	

results,	 Experimental 		techniques to conduct	techniques to	
Manufacturer	results,		research	conduct research	
datasheets.	 Manufacturer 				
	datasheets.		Use statistical tools to	Use statistical tools	
			present data	to present data	
5.4 Explain data collection	Explain data				
techniques:	collection techniques			•	
• Use of multimeters,	• Use of				
Oscilloscope	multimeters,				
readings	 Oscilloscope 				
	readings				
5.5 Define data analysis	Explain data analysis				
5.6 Explain methods of data	Explain methods of				
analysis:	data analysis				
 Fourier analysis, 	 Fourier analysis 				
Statistical	 Statistical 				
evaluations	evaluations				
5.7 Explain tools for data	Explain tools for data	\mathbf{Y}			
presentation:	presentation:				
• Tables	Tables				
• Charts	Charts				
Graphs.	 Graphs 				
General Objective 6.0: Understand Rese	earch Report Writing a	and Presentation	in Electrical and Electron	ics Engineering	
14-15 6.1 Define report writing and	Explain research	Textbooks	Write research report	Guide students to	Sample
presentation	report writing and	Journals		write research	reports
	presentation	Computer		report.	
		Internet			
6.2 Explain the stages of	Explain stages of	Projector			

writing a research report:	research reports	Marker	1	
 Introduction 	writing:	Marker-Board	CV	
 Methodology 	 Introduction 			
• Results.	 Methodology 			
	• Results.			
6.3 Explain the process of	Explain how to			
research idea generation	generate research			
_	ideas			
6.4 Explain proposal writing:	Explain how to write			
• Objectives	research reports			
• Problem statements				
6.5 Explain the use of	Explain the use of			
technologies in research:	new technologies in			
MATLAB	EEET research.			
Simulation tools				
	Explain ethical issues			
6.6 Explain ethical issues in	in EEET research			
EEET research:				
 Intellectual property). 				

EVALUATION: CA 40% EXAMINATION: 60%

EAR TWO, SEMESTER TWO

Trigonometry and Analytical Geometry

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY								
COURSE Trigonometry and Analytical Geometry	COURSE CODE: MTH 221	CONTACT HOURS: 2						
	CREDIT UNIT: 2	THEORETICAL: 2						
YEAR: II SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 0						

GOAL: This course is designed to acquaint students with the basic knowledge of Trigonometry and Analytical Geometry

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

- 1.0 Understand the manipulation of trigonometric equations.
- 2.0 Understand the concept of mensuration and its application to engineering problems
- 3.0 Understand the concept of analytical geometry and their applications
- 4.0 Understand the concept of Parabola, ellipse and hyperbola.

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY									
COURSE Trigonometry and Analytical Geometry			COURSE CO	ODE: MTH 221	CONTACT HOURS: 2				
			CREDIT UN	IT: 2	THEORETICAL: 2				
YEAR:	II SEMESTER: II		PRE-REQUI	ISITE:	PRACTICAL: 0				
COUR	SE SPECIFICATION: THEORE	ETICAL AND PRACTICA	L						
GOAL	: This course is designed to acqua	int students with the basic	knowledge of T	Trigonometry and A	nalytical Geometry				
Genera	l Objective 1.0: Understand the m	anipulation of trigonometri	c equations.						
THEO	RETICAL CONTENT			PRACTICAL C	ONTENT				
Week	Specific Learning Outcome	Teachers Activities	Resources	Specific Learnin	g Teachers Activities	Resources			
WCCK				Outcome					
1-3	1.1 Convert sums and	Convert sums and	Textbooks						
1-3	differences of trigonometric	differences of	Lecture						
	ratios to products.	trigonometric ratios to	notes						
		products.	Whiteboard						
			Marker						
	1.2 Prove the sine and cosine	Prove the sine and							
	formulae of triangles	cosine formulae of							
		triangles							
	1.3 Solve problems triangles								
	using the sine and cosine	Solve problems triangles							
	formulae e.g.:-The sides	using the sine and cosine							
		formulae e.g.:-The sides							
	5cm, and 6cm respectively.	a,b,c, of a triangle are							
	Find the angles.	4cm, 5cm, and 6cm							
		respectively. Find the							
		angles.		<u> </u>					

 1.4 Calculate angles of					
elevation and depression	Calculate angles of			· C Y	
using trigonometric ratios	elevation and depression		•		
e.g.:- From the top of a tree	using trigonometric				
120m high an observer sees	ratios e.g.:- From the top				
a boat 560m away.	of a tree 120m high an				
Calculate the angle of	observer sees a boat				
depression.	560m away. Calculate				
	the angle of depression.				
1.5 Compute bearings, heights	Compute bearings,				
and distances of	heights and distances of	CX			
inaccessible objects and	inaccessible objects and				
projections,	projections,e.g A man				
e.g A man walks 3km due	walks 3km due North,				
North, and the 3km	and the 3km N.52° W				
N.52° W. How far is the	How far is the man from				
man from his starting point?	his starting point? What				
What is his bearing from his	is his bearing from his				
original position.	original position.				
	Derive half angle				
	formulae from sin, cos				
from sin, cos and tan.	and tan.				
1.7 Define inverse circular	Define inverse circular				
function.	function.				
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	1	L	ı			
	1.8 Explain inverse circular	Explain inverse circular				
	functions graphically.	functions graphically.				
	1.9 Solve problems involving	Solve problems involving				
	1.8 and e.g.:- Draw the	1.8 and e.g.:- Draw the				
	graph of 1/(cos 2θ) Taking	graph of $1/(\cos 2\theta)$				
	values from0° to	Taking values from0° to				
	90° inclusive.	90° inclusive.				
		Apply the concepts in 1.8				
	1.10 Apply the concepts in 1.8	above to three				
	above to three dimensional	dimensional problems.				
	problems.		CX			
Genera	al Objective 2.0: Understand the c	oncept of mensuration and i	ts application to	o engineering problen	ns	
4 - 5	2.1 Explain circular measure.	Explain circular	Lecture			State the
		measure.	notes			relation
	2.2 State the relation between		Textbooks			between
	radians and degrees	Explain the relation	Charts			radians
		between radians and	Whiteboard			and
		degrees	Marker			degrees
	2.3 Prove the formulae for arc					
	length and area of a sector.	Prove the formulae for				
	-	arc length and area of a				
		sector.				
	2.4 Identify segment and chord	V				
	of a circle.	Explain segment and				
		chord of a circle.				
	2.5 Determine the area of a					
	segment and the chord of	Determine the area of a				

length of a given circle.	segment and the	
	chord of length of a	
	given circle.	
2.6 Calculate the surface areas		
and volumes of simples	Calculate the surface	
shapes such as cylinder,	areas and volumes of	
sphere and cone. E.g. A	simples shapes such as	
solid sphere has radius 8cm.	cylinder, sphere and	
Calculate its volume.	cone. E.g. A solid sphere	
	has radius 8cm.	
2.7 Determine the areas and	Calculate its volume.	
volumes of irregular shapes		
applying Simpsons rule.	Determine the areas and	
	volumes of irregular	
	shapes applying	
2.8 Apply mid-ordinate rule to	Simpsons rule.	
determine the areas and		
volumes applying mid-	Apply mid-ordinate rule	
ordinate rule.	to determine the areas	
	and volumes applying	
	mid-ordinate rule.	
eneral Objective 3.0: Understand the	concept of analytical geometry and their applications	•

	2.1.5. 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.		T 4		D 1 4
	3.1 Explain two dimensional	Explain two dimensional	Lecture		Relate
	coordinate systems:	coordinate systems:	notes	(Y)	Cartesian
	Cartesian and Polar	Cartesian and Polar	Textbooks		coordinate
	coordinate systems.	coordinate systems.	Charts		to polar
			Whiteboard		coordinate
		Explain plotting and	Marker		S
	3.2 Explain plotting and	sketching of graphs w.r.t.			
	sketching of graphs w.r.t. the	the two coordinate			
	two coordinate systems.	systems.			
	3.3 Relate Cartesian coordinate	Relate Cartesian			
	to polar coordinates.	coordinate to polar	CX		
		coordinates.			
6.0	3.4 Explain the slope of a line in				
6-9	relation to the above	Explain the slope of a			
	concepts in 3.3. above.	line in relation to the			
	1	above concepts in 3.3.			
	3.5 Explain the intercept of a	above.			
	line.				
	inter-	Explain the intercept of a			
		line.			
	3.6 Derive the formula for the	inic.			
	gradient of line	Derive the formula for			
		the gradient of line			
	passing unough two points.	passing through two			
	2.7 Dariya the aquation of	passing unough two points.			
	3.7 Derive the equation of a	points.			
	straight line given the	Davissa 41. a a secutiva s			
	gradient and the co-	Derive the equation of			

ordinates of a point.	straight line given the			
	gradient and the co-			
3.8 Reduce a given linear	ordinates of a point			
equation to the intercept				
form. $x/a + y/b = 1$	Reduce a given linear			
	equation to the intercept			
3.9 Determine the coordinates of	form. $x/a + y/b = 1$			
the point of intersection of				
two straight lines.	Determine the			
	coordinates of the point			
3.10 Define locus	of intersection of two			
	straight lines.	CX		
3.11 Derive the slope-intercept				
form of the equation of a	Define locus			
straight line: $y = mx + c$				
	Derive the slope-			
3.12 Derive the point - slope	intercept form of the			
form of the equation of a	equation of a straight			
straight line: $y - y_1 = m(x - y_1)$	line: $y = mx + c$			
x_1).	\circ			
	Derive the point – slope			
3.13 Derive the double – point	form of the equation of a			
form of the equations of	straight line: $y - y_1 =$			
the	$\mathbf{m}(\mathbf{x}-\mathbf{x}_1).$			
straight line: $y - y_1 = \underline{y_2}$				
<u>yı</u>	Derive the double –			
$(x - x1) x_2 - x_1$	point form of the			
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	equations of the straight			

3.14 Derive the perpendicular	line: $y - y_1 = \underline{y_2} - \underline{y_1} (x -$			
form of the equation of a	$(x_1) x_2 - x_1$			
straight line				
	Derive the perpendicular			
3.15 Solve examples of 3.11	form of the equation of a			
to 3.14 above.	straight line			
3.16 Find the angle (Q)	Solve examples of 3.11			
between two lines whose slopes, (m ₁ , and m ₂) are	to 3.14 above.	•		
Known: $Q = \tan (m_2 - m_1)/1$	Find the angle (Q)			
$+ m_1 m_2$	between two lines whose			
	slopes, (m ₁ , and m ₂) are			
	Known: $Q = \tan (m_2 -$			
3.17 Determine the conditions	$m_1)/1 + m_1 m_2$			
for two lines to be parallel				
and to be perpendicular.	Determine the			
	conditions for two lines			
3.18 Derive the expression for	to be parallel and to be			
the perpendicular distance	perpendicular.			
from a point to a line.				
	Derive the expression			
3.19 Draw a circle.	for the perpendicular			
	distance from a point to			
3.20 Derive the equation of a	a line.			
circle with center at the				
origin and radius r.	Draw a circle.			
\ \(\alpha\)\\				
 	•			

	T	T	ı	1	
	3.21 Derive the equation of a	Derive the equation of a			
	circle with center	circle with center at the			
	outside the origin.	origin and radius r.			
	3.22 State general equation of a	Derive the equation of a			
	circle.	circle with center			
		outside the origin.			
	3.23 Determine the coordinates				
	of the center of a circle	State general equation of		()	
	from a given equation of a	a circle.			
	circle.				
		Determine the		•	
		coordinates of the center			
	3.24 Draw orthogonal circles	of a circle from a given			
	3.2 i Braw ermegenar eneres	equation of a circle.			
	3.25 Find the equations of the	equation of a energy			
	tangent and the normal at	Draw orthogonal circles			
	a point circle	Draw orthogonal efficies			
	a point energ	Find the equations of the			
	3.26 List illustrative examples	tangent and the normal			
	of each of 3.20 to 3.25				
		at a point circle			
	above				
		List illustrative examples			
		of each of 3.20 to 3.25			
		above	11 1 1		
Gener	al Objective 4.0: Understand the c		and hyperbola.		
10-12	4.1 Define the Parabola	Define the Parabola			Derive the
10-12	NO.				standard
		•		•	

equation of
a Danalas 1-
a Parabola
$y^2 = 4ax$

4.9 State the properties of the	
Ellipse.	State the properties of the
	Ellipse.
1.10 Determine the equation of	
the tangent and the normal	Determine the equation of
to an ellipse from a given	the tangent and the normal
point.	to an ellipse from a given
	point.
4.11 Define focal chord and axis	
of ellipse.	Define focal chord and
_	axis of ellipse.
4.12 Solve problems on ellipses	
e.g. Find the length of the	Solve problems on ellipses
axis and the eccentricity	e.g. Find the length of the
for the ellipse: $4x^2 + 9y^2 =$	axis and the eccentricity
36	for the ellipse: $4x^2 + 9y^2 =$
	36
4.13 Define the Hyperbola.	
	Define the Hyperbola.
4.14 Derive the equation of the	
Hyperbola.	Derive the equation of the
	Hyperbola.
4.15 Identify the properties of	
the Hyperbola.	Identify the properties of
	the Hyperbola.
4.16 Define asymptoes, chord,	
tangent and normal to a	Define asymptoes,
hyperbola	chord, tangent and normal

	to a hyperbola.		
4.17 Solve problems on		, (<u> </u>	
hyperbola e.g. Find the foci	_		
and directrixes for	hyperbola e.g. Find the		
hyperbola: $x^2/16 - y^2/9 = 1$	foci and directrixes for	U	
	hyperbola: $x^2/16 - y^2/9 = 1$		
4.18 Explain rectangular			
hyperbola.	Explain rectangular		
	hyperbola.		
4.19 Determine tangent and			
normal to the rectangular	Determine tangent and		
Hyperbola.	normal to the rectangular		
	Hyperbola.		
LUATION; EXAMINATION: 60	% C.A: 40%		
EUATION, EXAMINATION. 00	% C.A: 40%		

Electrical Power III

PROGRAMME	: NATIONAL DIPLOMA IN ELI	ECTRICAL AND ELECTRONICS ENGIN	EERING TECHNOLOGY
COURSE TITL	E: Electrical Power III	COURSE CODE: EEC 221	CONTACT HOURS: 3
		CREDIT UNIT: 2	THEORY: 1
YEAR: II	SEMESTER: II	PRE-REQUISITE: EEC 211	PRACTICAL: 2

GOAL: This course is designed to acquaint the students with the knowledge and skills of the principles of power systems

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

- 1.0 Understand the performance of load flow in an interconnected power system.
- 2.0 Understand the fault analysis in interconnected power systems.
- 3.0 Understand the principles of protection systems.

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY								
COURSE TITLE: Electrical Power III			COURSE CODE: EEC 221		CONTACT HOURS: 3			
			CREDIT U	JNIT: 2		THEORET	TCAL: 1	
YEAR	: II SEMESTER:	II	PRE-REQ	UISITE: EE	C 211	PRACTICA	AL : 2	
COUR	COURSE SPECIFICATION: THEORETICAL AND PRACTICAL							
GOAL	: This course is designed to acqu	aint the students with	the knowled	dge and skills	of the pr	nciples of po	ower systems	
Genera	al Objective 1.0: Understand the	performance of load	flow in an in	nterconnected	power sy	stem.		
	THEORETICAL CO	ONTENT:			PRAC'	TICAL CON	TENT:	
Week	Specific Learning Outcome	Teachers' Activitie	S	Resources	Specifi	c Learning	Teachers'	Resources
				.(\)	Outcor	ne	Activities	
	1.1 Explain interconnected	Explain interconnec	ted power	Textbook			Guide students to:	Transmission
1-5	power systems.	systems.		Journals	Determ		Determine the	line trainer
				Whiteboard	sending		sending and	
	1.2 State the advantages and	Explain the advanta	ges and	Marker	receivin	•	receiving end	Ammeter
	disadvantages of	disadvantages of		Charts	voltage		voltage of the	
	interconnected power	interconnected power	er	Animations	transmi	ssion line.	transmission line.	Voltmeter
	Systems.	Systems.	•	Computer				
		.07		Projector			Determine the	Wattmeter
	1.3 Explain the power circle	Explain the power c	ircle		Determin	ne the	voltage regulation	
	diagram.	diagram.			_	egulation	and transmission	Computers
	•					smission	efficiency.	with
	1.4 Describe the techniques for	·			efficienc	y.		appropriate
	reducing interconnected	reducing interconne	-				Conduct a load flow	software.
	power systems to simple	systems to simple ed	quivalent				study of two bus	
	equivalent diagrams.	diagrams.			Conduct	a load flow	power network	
	AU'				study of	two bus	using appropriate	

1.5 Explain the need for a	Explain the need for a power	power network using software	
power flow study.	flow study.	appropriate software	
		Run a programme	
1.6 State the benefits of power	Explain the benefits of power	Run a programme for a load flow	
flow study.	flow study.	for a load flow analysis of a two-	
		analysis of a two-bus bus power	
1.7 Explain the nodal	Explain the nodal admittance	power network. network.	
admittance matrices for a	matrices for a two-bus		
two-bus network.	network.	Construct the	
		Construct the power power circle	
1.8 State the variables	Explain the variables affecting	círcle diagram. diagram.	
affecting the load flow in	the load flow in power system		
power system network.	network.	Formulate the nodal	
		admittance matrices nodal admittance	
1.9 State which variables are	Explain which variables are	for a two-bus	
control dependent and	control dependent and	bus network.	
independent.	independent.	network.	
		Calculate the load	
1.10 State the general form of	Explain the general form of	Calculate the load flow in an	
the load flow equation in:	the load flow equation in:	flow in an interconnected	
Rectangular form	Rectangular form	interconnected system	
Polar form	Polar form	system	
1.11 Explain the Gauss-Seidel	Explain the Gauss-Seidel	Classify the	
method of load flow	method of load flow solution.	variables in 1.9	
solution		Classify the into control	
		variables in 1.9 into dependent and	
AO.		control dependent	

	1.12 Solve problems on load	Explain how to solve		and independent	independent	
	flow analysis for	problems on load flow		1		
	interconnected systems.	analysis for interconnected				
		systems.				
	1.13 Explain the application of	Explain the application of				
	computers to conduct load	computers to conduct load				
	flow study.	flow study.				
			.4			
	1.14 Explain a computer	Explain a computer				
	programme for a load	programme for a load flow				
	flow analysis of a two-bus	analysis of a two-bus power				
	power network.	network				
	1.15 Explain Circuit	Explain Circuit parameters: P,				
	parameters: P, Q, S, V	Q, S, V and \wp variables				
	and & variables affecting	affecting the load flow in the				
	the load flow in the power	power system network.				
	system network.	\(\)				
Gener	al Objective 2.0: Understand the	fault analysis in interconnected p	ower systems.			
	2.1 State types of faults that can	Explain types of faults that can	Textbook		Guide students to:	Wattmeter
6-9	occur on generators,	occur on generators,	Journal	Identify the faults	Identify the faults	
	transformers and	transformers and transmission	Whiteboard	on generators,	on generators,	Voltmeter
	transmission lines.	lines.	Marker	transformers and T-	transformers and	
			Charts	line.	T-line.	Ammeter
	2.2 Explain short-circuit, open	Explain short-circuit, open	Animations			
	circuit and earth faults on	circuit and earth faults on	Computer		Insert an open	Phase
	transmission lines.	transmission lines.	Projector	Insert an open	circuit and earth	sequence

			circuit and earth	faults on	meter
2.3 State the transient and sub-	Explain the transient and sub-		faults on	transmission lines	
transient reactances.	transient reactances.		transmission lines	using appropriate	Oscilloscope
			using appropriate	software	
2.4 Explain the sub-transient	Explain the sub-transient and		software		Computers
and transient reactances	transient reactances using the			Determine the	with
using the appropriate	appropriate waveform of a			fault levels on	appropriate
waveform of a faulted	faulted generator.			typical power	software
generator.			Determine the fault	systems.	
			levels on typical		
2.5Explain typical waveforms	Explain typical waveforms of		power systems.		
of short circuit currents in	short circuit currents in power	.('\')		Determine the	
power systems.	systems.			MVA fault level	
			Determine the	on typical power	
2.6 State a symmetrical fault.	Explain a symmetrical fault.		MVA fault level on	systems.	
			typical power		
2.7 Solve symmetrical fault	Explain how to solve		systems.	Draw typical	
problems using the one-line	symmetrical fault problems			waveforms of	
diagram and the per-unit	using the one-line diagram and			short circuit	
system method.	the per-unit system method.		Draw typical	currents in power	
			waveforms of short	systems.	
2.8 Derive expressions for the	Derive expressions for the		circuit currents in		
symmetrical components	symmetrical components for		power systems.		
for positive, negative and	positive, negative and zero				
zero sequences in terms of	sequences in terms of the				
the transmission line	transmission line parameters.				
parameters.					
L AU'					

power in the symmetrical	Explain the expression for power in the symmetrical component.			CAI	
 2.10 Define unsymmetrical (asymmetrical) faults for a. Single-line to ground Double-line to ground 	Explain unsymmetrical (asymmetrical) faults for • Single-line to ground • Double-line to ground • Line-to-Line.		CULEDI		
 Line-to-Line 2.11 Solve unsymmetrical fault problems using the symmetrical component of networks. 	Explain how to solve unsymmetrical fault problems using the symmetrical component of networks.	FCHI			
impedance of a power	Explain the sequence impedance of a power system using symmetrical components.				
2.13 Explain the sequence network for a given power system.	Explain the sequence network for a given power system.				
2.14 Calculate the MVA fault level on typical power systems.	Calculate the MVA fault level on typical power systems.				

			1	1		1
	2.15 Describe methods of selecting circuit breakers, switch gears bus bars, fuses for typical fault levels.	Explain methods of selecting circuit breakers, switch gears bus bars, fuses for typical fault levels				
Genera	al Objective 3.0: Understand the	principles of protection systems		-11/		
10-15	3.1 Explain the corona effect	Explain the corona effect	Textbook		Guide students to:	Transmission
			Journal	Plot graphs for	Plot graphs for	line
	3.2 Explain the factors	Explain the factors affecting	Whiteboard	voltage and current	voltage and	demonstrator
	affecting corona effect	corona effect	Marker	surges when R is	current surges	
			Charts	less than Z_o (R< Z_o)	when R is less	Ammeter
	3.3 Explain the causes of	Explain the causes of	Animations		than Z_o (R < Z_o)	
	overvoltage in power	overvoltage in power systems.	Computer			Voltmeter
	systems.	_0_	Projector	Test Insulators to	Test Insulators to	
	3.4 Explain surge waveform.	Explain surge waveform.		determine their	determine their	Wattmeter
				voltage distribution	voltage	Insulators
	3.5 State the possible effects of	Explain the possible effects of a		and string	distribution and	
	a travelling wave on the	travelling wave on the		efficiency.	string efficiency.	Insulation
	transmission line.	transmission line.				tester
	3.6 Solve problems involving	Explain how to solve problems			Draw a typical	Relay
	surge voltage in the	involving surge voltage in the		Draw a typical	surge waveform.	_
	following:	following:		surge waveform.	X1 .:0 1: 1 . :	Data
	 Single phase line 	 Single phase line 		X1	Identify lightning	D1
	 Three phase line 	• Three phase line		Identify lightning	arrester	Plotting
	Single-phase	 Single-phase 		arrester		materials.

		T			ı
concentric cable.	concentric cable.			Classify relays	
			Classify relays		
3.7 Explain an expression for	Explain an expression for			\mathcal{O}'	
reflected surge voltage and	reflected surge voltage and				
current.	current.				
3.8 Define:	Explain:				
 Reflecting factor 	 Reflecting factor 				
coefficient (p)	coefficient (p)				
 Transmission factor 	 Transmission factor 				
coefficient (t)	coefficient (t)				
		CKI			
3.9 Explain the protection	Explain the protection scheme				
scheme of transmission lines	of transmission lines against				
against possible lightning	possible lightning surges				
surges.					
	/()				
3.10 Explain the effect of a	Explain the effect of a surge				
surge on an overhead line	on an overhead line				
terminating to a	terminating to a transformer.				
transformer.					
3.11 Explain methods of	Explain methods of testing				
testing insulators.	insulators.				
•					
3.12Describe insulation co	Explain insulation co-				
ordination in overhead	ordination in overhead lines.				
lines.					

3.13 Explain the principles of	Explain the principles of	
operation of an impulse	operation of an impulse	
generator	generator	
3.14 Explain relays	Explain relays	
3.15 Explain the operation principles of relays	Explain the operation principles of relays	
3.16 Explain the classification	Explain the classification of	
of relay	relay	

ASSESSMENT: The practical class will be awarded 60% of the total score. The continuous assessments, tests and quizzes will take 10% of the total score, while the remaining 30% will be for the end-of-the-semester examination score.

Computer Hardware and Software II

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY					
COURSE TITLE	: Computer Hardware and Software II	COURSE CODE: EEC 222	CONTACT HOURS: 3		
		CREDIT UNIT: 2	THEORETICAL: 1		
YEAR: II	SEMESTER: II	PRE-REQUISITE:	PRACTICAL: 2		
GOAL: This course is designed to equip students with knowledge and skills on how to diagnose and rectify simple faults on a computer and					

GOAL: This course is designed to equip students with knowledge and skills on how to diagnose and rectify simple faults on a computer and application software for electrical and electronics engineering design

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

- 1.0 Understand how to diagnose simple faults on a computer
- 2.0 Understand how to carry out repairs on Computer
- 3.0 Understand the concept and principle of application software for electrical and electronic engineering design
- 4.0 Understand basic structure and function of python software
- 5.0 Understand MATLAB software

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY								
COURSE TITLE: Computer Hardware and Software II		COURSE (CODE: EEC 222	CONTACT HOURS: 3				
				CREDIT UNIT: 2 THEORETICAL: 1				
YEAR:			PRE-REQ	UISITE: P	RACTICAL: 2			
	SE SPECIFICATION: TH							
				ls on how to diagnose and rect	rify simple faults on a com	puter and		
	ion software for electrical ar							
General	Objective 1.0: Understand	Computer Hardware Re	epairs					
THEOR	RETICAL CONTENT			PRACTICAL CONTENT	•			
Week	Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources		
	1.1 Explain the concept of	Explain the	Markerboard	Demonstrate how to carry	Guide students to:	Desktop		
	system repairs	procedures involved	Marker	out computer maintenance	Demonstrate how to	computer		
	1.2 Describe the procedures involved for Computer	for electronics/ computer repairs	Textbooks Computer	Repair common power supply issues.	carry out computer maintenance	Laptops		
	Repairs		Pro je ctor	supply issues.	Repair common power	Toolbox		
	1.3 Explain how to repair			Upgrade laptop	supply issues.			
	common power supply	\circ		components (RAM, SSDs,				
	issues.	ONE		Wi-Fi cards).	Upgrade laptop components (RAM,			
	1.4 Explain how to upgrade laptop	BORRIV		Disassemble and repair a faulty motherboard.	SSDs, Wi-Fi cards).			
	components (RAM,				Disassemble and repair			
	SSDs, Wi-Fi cards).			Upgrade components in a	a faulty motherboard.			
	1.5 Explain how to			laptop or desktop to improve performance.	Upgrade components in a laptop or desktop to			
	disassemble and repair				a raptop of desirtop to			

1	1	1	1	1		, ,
	a faulty motherboard. 1.6 Explain how to upgrade components in a laptop or desktop to improve performance.				improve performance.	
Genera	al Objectives 2.0: Understand	Computer Fault Diagnosis	8			
1-4	2.1 Explain computer software components2.2 Explain computer hardware components.	Explain the basic concept of PC Troubleshooting Explain Hardware Problems	Markerboard Marker Textbooks Computer Projector	Identify computer hardware components Identify AT and ATX f power packs	Guide students to: Identify computer hardware components Identify AT and ATX f power packs	Computer auxiliary units Computer peripheral units
	2.3 Explain the basic concept of PC Troubleshooting	Explain Operating System & Software Issues	R	Identify different computer interface cables Assemble a Computer System.	Identify different computer interface cables Assemble a Computer	Central processing units (CPU) I/O devices,
	2.4 Explain Hardware Problems	Explain Networking & Internet Connectivity Troubleshooting		Disassemble a Computer System.	System. Disassemble a Computer System.	tools and measuring instruments.
	2.5 Explain Operating System & Software Issues	Explain Virus & Malware Removal Preventative		Identify faults in the following: • Power supplies • System clocks • Memory Cards	Identify faults in the following: • Power supplies • System clocks	Scraps of computer system.
	2.6 Explain Networking & Internet Connectivity Troubleshooting	Maintenance & Optimization Explain Hands-on Troubleshooting		 Low battery I/O ports, Disk drives Voltages Keyboard 	 Memory Cards Low battery I/O ports, Disk drives Voltages 	Memory cards Mother board

2.7 Explain Virus & Malware Removal2.8 Explain computer preventative	Techniques Explain faults that relates the following: • Power supplies • System clocks • Memory Cards	 Monitors Scratches on discs Rectify the following faults: Overheating Slow performance 	• Keyboard • Monitors • Scratches on discs Rectify the following faults:
Maintenance & Optimization 2.9 Explain Hands-on Troubleshooting Techniques	 Low battery I/O ports, Disk drives Voltages Keyboard Monitors 	 Blue screen of Death Internet connectivity issues Malware Frozen screen Power issues Software crashes Peripheral device 	 Overheating Slow performance Blue screen of Death Internet connectivity issues Malware
 2.10 Explain faults that relates the following: Power supplies System clocks Memory Cards Low battery I/O ports, Disk drives Voltages Keyboard Monitors Scratches on discs. 2.11 Explain the troubleshooting procedures for the	 Scratches on discs. Explain the troubleshooting procedures for the following computer faults: Overheating Slow performance Blue screen of Death Internet connectivity issues Malware Frozen screen Power issues Software crashes Peripheral 	issues Ram (memory) issues Unable to boot Applications won't install CPU problems Data loss issues Dropped internet connections	 Frozen screen Power issues Software crashes Peripheral device issues Ram (memory) issues Unable to boot Applications won't install CPU problems Data loss issues Dropped internet connections

following computer faults: Overheating Slow performance Blue screen of Death Internet connectivity issues Frozen screen Power issues Software crashes Peripheral device issues Nam (memory) issues Unable to boot Applications Ram (memory) issues Unable to boot Applications won't install CPU problems Data loss issues Drate loss issues Dropped internet connections 2.12 Explain the steps to rectify the faults in 1.8 and 1.9. 2.13 Explain harmful software and security threats detection and the steps to rectify the faults in 1.8 and 1.9. 2.13 Explain harmful software and security threats detection and the steps to rectify the faults in 1.8 and 1.9.

	elimination					
Genera	l Objective 3.0: Understand	basic structure and func	tion of python s	software		
3-11	3.1 Define software.	Explain python and	Markerboard	Demonstrate indentation	Guide students to:	Computers
		its functions	Marker	and comments in python	Demonstrate indentation	with installed
	3.2 List of application		Textbooks		and comments in python	python
	software in electrical	Explain python	Computer	Demonstrate different		software
	engineering.	syntax compared to	Projector	types of python data	Demonstrate different	
		other programming		()	types of python data	
	3.3 Explain the uses of	languages		Demonstrate functions		
	application software			associated with numpy	Demonstrate functions	
		Explain the basic			associated with numpy	
	3.4 Define python and its	syntax, indentation		Demonstrate the use of		
	functions	and comments in		numpy library	Demonstrate the use of	
		python			numpy library	
	3.5 Explain python			Create table and classes		
	syntax compared to	Explain the different			Create table and classes	
	other programming	types of python data:		Manipulate the usual		
	languages	• Integer (int)		functions associated with	Manipulate functions	
		• Float		numpy in python	associated with numpy	
	3.6 Explain the basic	• String			in python	
	syntax, indentation	• Boolen		Demonstrate the pandas		
	and comments in	\(\)'		library	Demonstrate the	
	python	Explain python data			pandas	
		structure and		Demonstrate how to build	library	
	3.7 Explain different	characteristics		and manipulate a data		
	types of python data:			frame	Demonstrate how to	
	• Integer (int)	Explain python			build and manipulate a	

Genera	l Objective 4.0: Understand	MATLAB software				
12-15	4.1 Define MATLAB and its function 4.2 Explain how to start MATLAB	Explain MATLAB and its function Explain the startup of MATLAB	Markerboard Marker Textbooks Computer Projector	Demonstrate the launch of MATLAB Demonstrate MATLAB window as a calculator	Guide students to: Demonstrate the launch of MATLAB Demonstrate MATLAB window as a	Computers with MATLAB software
	4.3 Describe how to use MATLAB as a calculator4.4 Define the following:	Explain how to use MATLAB as a calculator Explain the following:		Demonstrate the following in MATLAB windows library	Demonstrate the following in MATLAB windows library	
	 Matrices Arrays Columns of data 4.5 Explain the basic syntax, indentation and comments in MATLAB 	 Matrices Arrays Columns of data Explain the basic syntax, indentation and comments in MATLAB 	OR	Demonstrate the following data in MATLAB window Integer (int) Float String Boolean	Demonstrate the following data in MATLAB window Integer (int) Float String Boolean	
	 4.6 Explain different types of MATLAB data: Integer (int) Float String Boolean 	Explain different types of MATLAB data: Integer (int) Float String		Simulate an RLC circuit using MATLAB	Simulate an RLC circuit using MATLAB	

Boolean	1		

ASSESSMENT: The practical class will be awarded 60% of the total score. The continuous assessments, test and quizzes will cover 10% of the total score, while the remaining 30% will be for the end of the semester examination.

PROGRAMME: NATIONAL DIPLOMA IN ELEC	CTRICAL AND ELECTRONICS ENGI	INEERING TECHNOLOGY
COURSE TITLE: Electronics III	COURSE CODE: EEC 223	CONTACT HOURS: 4
	CREDIT UNIT: 3	THEORETICAL: 1
YEAR: II SEMESTER: II	PRE-REQUISITE: EEC 213	PRACTICAL: 2
GOAL: This course is designed to equip the student	with the knowledge and skills of passiv	e and active electronic components and their
applications.	. (
GENERAL OBJECTIVES: At the end of the cours	se the student should be able to:	<i>y</i>
1.0 Understand the nature of feedback in relation to	amplifier	
2.0 Understand controllers and controller design		
3.0 Understand Oscillators and Multivibrators in ele	ectronic circuits	
4.0 Know power converters and their applications		
WATE	264	

Electronics III

PROGRAMME: NATIONAL DIPLOMA IN E	ERING	
COURSE TITLE: Electronics III	COURSE CODE: EEC 223	CONTACT HOURS: 4
	CREDIT UNIT: 3	THEORETICAL: 1
YEAR: II SEMESTER: II	PRE-REQUISITE: EEC 213	PRACTICAL: 2

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GOAL: This course is designed to equip the student with the knowledge and skills of passive and active electronic components and their applications.

General Objective 1.0: Understand the nature of feedback in relation to amplifier

Genera	General Objective 1.0: Understand the nature of feedback in relation to amplifier									
	THEORETICAL CONTENT				PRACTICAL CONTENT					
Week	Specific Learning	Teachers' Activities	Resources	Specific Learning	Teachers' Activities	Resources				
	Outcome			Outcome						
1-3	1.1 Describe Input and	Explain Input and Output	Textbooks		Guide students to	Oscilloscope				
	Output of a system in an	of a system in an	Journals	Investigate the effect	Investigate the effect					
	amplifier in relation to:	amplifier in relation to:	Whiteboard	of applying negative	of applying negative	Oscillators				
	 Voltage 	• Voltage	Marker	feedback on a	feedback on a distorted					
	Current	• Current	Charts	distorted signal, input,	signal, input, output	Operational				
	 Gain 	• Gain	Animations	output and	and impedances of	amplifiers				
			Computer	impedances of	negative feedback of					
	1.2 Explain the general	Explain the general nature	Projector	negative feedback on	an amplifier	Multi-				
	nature of positive and	of positive and negative		an amplifier.		vibrator				
	negative feedback in a	feedback in a system.								
	system.	1 0				Voltmeter				
		•								
	1.3 Prove that the GAIN of	Explain how to prove that				Ammeter				
	a system is mainly	the GAIN of a system is								
	determined by the	mainly determined by the				Cables				

feedback function and feedback function and	
independent of forward independent of forward	Power source
gain. gain.	,
	Electronic
1.4 Describe the general Explain the general	trainer.
expression for stage gain expression for stage gain	
of a basic feedback in an of a basic feedback in an	
amplifier amplifier	
1.5 Describe effect of Explain the effect of	
applying negative applying negative	
feedback to an amplifier feedback to an amplifier	
in relation to:	
• Gain • Gain	
Gain stability Gain stability	
Bandwidth Bandwidth	
Distortion Distortion	
Noise Noise	
Input and output Input and output	
resistance in a resistance in a	
qualitative method qualitative method	
1.6 State the advantages and Explain the advantages	
disadvantages of and disadvantages of	
negative feedback to an negative feedback to an	
amplifier circuit amplifier circuit	
General Objective 2.0: Understand Controllers and Controller design	

	1		1	T		1
	2.1 Define Controller	Explain Controller	Textbooks		Guide students to:	Breadboard
4-8			Journals	Design a controller	Design a controller	Computers
	2.2 Explain the types of	Explain the types of	Whiteboard	with simple control	with simple control	with
	Controllers	Controllers	Marker	system configuration	system configuration	appropriate
			Charts			software
	2.3 Explain the importance	Explain the importance of	Animations			PID
	of Controllers to electronic	Controllers to electronic	Computer			controller.
	circuits	circuits	Projector			
				()		
	2.4 Explain the properties	Explain the properties of				
	of a Proportional	a Proportional Integral				
	Integral and Derivative	and Derivative (PID)				
	(PID) Controller	Controller				
	2.5 Explain the	Explain the applications				
	applications of PID	of PID Controller.	0_			
	Controller:	Temperature PID				
	Temperature PID	Controller				
	Controller	Tension PID				
	Tension PID	Controller.				
	Controller.	Contoner				
	Controller.					
	. 1					

Genera 9-10	al Objective 3.0: Understand	Oscillators and Multivibrator				
	al Objective 3.0: Understand	Oscillators and Multivibrator				1
9-10			rs in electronic	circuits		
	3.1 Define Oscillators	Explain Oscillators	Textbooks		Guide students to:	Oscilloscope
			Journals	Measure the	Measure the frequency	
ļ.	3.2 Explain the working	Explain the working	Whiteboard	frequency and	and amplitude of a	Oscillators
	principles of oscillators	principles of oscillators	Marker	amplitude of a	sinusoidal signal of an	
			Charts	sinusoidal signal of	LC Colpitts oscillator.	Op-amp
	3.3 Explain the functions of	Explain the functions of	Animations	an LC-Colpitts		
	Oscillators	Oscillators	Computer	oscillator.	Measure the frequency	Ammeter
			Projector		and amplitude of an	
-	3.4 Explain how oscillators	Explain how oscillators		Measure the	output generated	Cable
	can be produced by an	can be produced by an		frequency and	signal.	
	amplifier with positive	amplifier with positive		amplitude of an		Voltmeter
	feedback.	feedback.		output generated	Carryout experiment	3.6.1.2.21
	2.5.5. 1 : .1		~	signal.	to investigate the	Multivibrate
	3.5 Explain the operation	Evaloia the enematic et		Comment or manino ant	factors which affect	
	of:	Explain the operation of:		Carryout experiment to investigate the	the operation of LC	
	• C oscillator	• C oscillator		factors which affect	Hartley oscillator and	
	• L-C oscillator	• L-C oscillator		the operation of LC	measure the frequency	
	(Hartley & Colpitts Oscillators)	(Hartley & Colpitts		Hartley oscillator	and amplitude of a	
	Oscillators)	Oscillators)		and measure the	generated signal	
	3.6 Describe methods of	Ostiliators)		frequency and		
	achieving frequency	Explain methods of		amplitude of a	Carryout an	
	stability of oscillators as			generated signal	experiment to	
	in piezo-electric crystal	stability of oscillators as			determine the factors	
	in pieze electric exvadit	in piezo-electric crystal		Carryout an	which influence the operation of	

	3.7 Define with the aid of			experiment to	transistorized	
	suitable sketches the	Explain with the aid of		determine the factors	monostable, bistable	
	operation of	suitable sketches the		which influence the	and astable	
	multivibrators	operation of		operation of	multivibrator	
		multivibrators		transistorized		
	3.8 Explain the types of			monostable, bistable		
	Multivibrators	Explain the applications		and astable	Perform experiment to	
		of multivibrators circuits		multivibrators.	observe and measure	
	3.9 Explain with the aid of				both the input and	
	suitable sketches the	Explain with the aid of		Carryout an	output waveforms of a	
	operation of	suitable sketches the		experiment to	bridge rectifier and the	
	multivibrators	operation of		determine both the	effects of different	
		multivibrators		input and output	filter circuits	
	3.10 State the applications			waveforms of a bridge	2	
	of multivibrators			rectifier and the	Build a circuit	
	circuits.	Explain the applications		effects of different	consisting of 555	
		of multivibrators circuits		filter circuits	multivibrator to	
	3.11 Explain how to solve				determine 50% duty	
	simple problems on	Explain how to solve		Build a circuit	cycle square wave	
	multivibrators.	simple problems on		consisting of 555	output signal	
		multivibrators.		multivibrator to		
				determine 50% duty		
				cycle square wave		
		V		output signal		
Genera	al Objective 4.0: Know power	converters and their applica	tions			
11-15	4.1 Define power	Explain power converters	Textbooks		Guide students to:	Sample
	converters		Journals	Sketch a block	Sketch a block diagram	converter
		Explain the types of	Whiteboard	diagram	representation of a	Oscilloscope

4.2 Explain the types of	power converters and	Marker	representation of a	converter with its	
power converters and	inverters	Charts	converter with its	components	Multimeter
inverters		Animations	components	. 10"	
		Computer		Measure the input and	Power source.
4.3 Explain the working	Explain the working	Projector	Measure the input	output current and	
principles of power	principles of power		and output current	voltage levels of a	
converters	converters		and voltage levels of	converter and determine	
			a converter and	the frequency	
4.4 Explain frequency	Explain frequency		determine the	waveforms	
converter as a special	converter as a special type		frequency		
type of power converter	of power converter		waveforms		
4.5 Explain the applications	Explain the applications) *		
of power converters	of power converters				

ASSESSMENT: Assessment: The practical class will be awarded 60% of the total score. The continuous assessments, tests and quizzes will be 10% the total score, while the remaining 30% will be for the end of semester examination

Electric Circuit Theory II

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY							
COURSE TIT	LE: Electric Circuit Theory II	COURSE CODE: EEC 224	CONTACT HOURS: 3				
		CREDIT UNIT: 2	THEORETICAL: 1				
YEAR: II	SEMESTER: II	PRE-REQUISITE: EEC 214	PRACTICAL: 2				

GOAL. This course is designed to equip the students with the knowledge and skills of Electrical circuit theorems and network analysis of multiphase systems

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

- 1.0 Understand the principle of power calculation in a.c circuits.
- 2.0 Understand the basic principles of three-phase systems.
- 3.0 Know time domain analysis of RC and RL circuits.
- 4.0 Understand the concept of magnetic coupling.

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY							
COURSE TITLE: Electric Circuit Theory II		COURSE CODE: EEC 224	COURSE CODE: EEC 224			CONTACT HOURS: 3	
		CREDIT UNIT: 2				THEORETICAL: 1	
YEAR: II	SEMESTER: II	PRE-REQUISITE: EEC 214				PRACTICAL: 2	
COLIDGE CDE	CIPICATION THEODETICAL AN	ID DD 4 CEICAI					

COURSE SPECIFICATION: THEORETICAL AND PRACTICAL

GOAL: This course is designed to equip the students with thew knowledge and skills of Electrical circuit theorems and network analysis of multiphase systems

General Objective 1.0: Understand the principle of power calculation in a.c circuits

	THEORETIC	CAL CONTENT		PRACTICAL CONTENT			
Week	Specific Learning Outcome	Teachers' Activities	Resources	Specific Learning	Teachers' Activities	Resources	
				Outcome			
1-3	1.1 Explain how to calculate	Solve problems	Textbooks		Guide students to:	Transformer	
	power in a.c. circuits	involving power in A.C.	Journals	Demonstrate the effect of	Demonstrate the		
	containing:	circuits containing active	Markers	the step-down	effect of the step-	Insulation -	
	Resistance	and reactive elements	Whiteboard	transformer.	down transformer.	resistance	
	Inductance	and the combination of	Charts			tester	
	Capacitance	both.	Animations		Carryout Continuity		
	Combinations of (a.)-		Calculators	Carryout Continuity Test	Test on a Single	Multimeter	
	(c)		Projectors,	on a Single Phase	Phase Transformer.		
	•			Transformer.		Power source	
	1.2 Explain the following	Explain the following			Carryout experiment		
	terms:	terms:		Carryout experiment on	on the turns ratio of		
	Apparent power	 Apparent power 		the turns ratio of a	a transformer		
	Reactive power	• Reactive power		transformer			

						,
	 Power factor and factors affecting its values Apparent power, active and reactive power Methods of power factor correction Explain methods of power factor correction. Explain how to solve problems on power factor, active power, apparent power, reactive power and power factor correction. 	 Active power. Power factor and factors affecting its values Apparent power, active Methods of power factor correction Explain methods of power factor correction Explain how to solve as many numerical problems as possible on power factor, active, power, apparent power, reactive power and power factor correction. 				
General	Objective 2.0: Understand the b		_	T		
4-7	2.1 Define polyphase system2.2 Explain the basic principles of polyphase	Explain polyphase Explain the basic principles of polyphase	Textbooks Journals Markers Whiteboard	Measurement of voltage and current.	Guide students to: Measurement of voltage and current.	Transformer Multimeter Insulation –
	power systems. 2.2 Explain difference	power systems. Discuss the three-phase	Charts Animations Calculators	Carryout continuity test in three phase transformer.	Carryout continuity test in three phase transformer.	resistance tester Power source
	between single phase, two	system versus single-	Projectors			

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phase and three-phase	phase system.	Demonstrate terminals of	Demonstrate	
systems		three phase transformer.	terminals of three	
	Explain the phase		phase transformer.	
2.3 Define the phase sequence	sequence of a three			
of a three phase system.	phase system.	Demonstrate Three phase	Demonstrate Three	
		star connected circuits.	phase star connected	
	Explain the advantages		circuits	
2.4 Explain the advantages of	of 3-phase circuits.			
3-phase circuits.	Explain how 3-phase			
2.5 Explain how 3-phase	emf's are produced			
emf's are produced	1			
1	Explain the differences			
2.6 Differentiate between star	between star and delta			
and delta 3phase system	3phase system with their			
with their corresponding	corresponding merits and			
merits and demerit.	demerit.			
	Explain the relationship			
2.7. Derive the relationship	between line and phase			
between line and phase	values of voltages and			
values of voltages and	current in a star and delta			
current in a star & delta	connected windings.			
connected windings.	connected windings.			
	Analyse an expression for			
	power in a 3phase circuit			
2.8 Derive an expression for	(balanced and			
power in a 3phase circuit	`			
(balanced and	unbalanced).			

<u> </u>	1	T	ı	T		, , , , , , , , , , , , , , , , , , ,
	unbalanced).	Discuss the 2-wattmeter				
		and single wattmeter				
	2.9 Explain the 2-wattmeter	methods of measuring 3-			O '	
	and single wattmeter	phase power.				
	methods of measuring 3-					
	phase power.	Explain how to solve as				
		many problems as				
	2.10 Explain how to solve as	possible on 2.5 to 2.9				
	many problems as possible on	above.				
	2.5 to 2.9 above.					
		Explain smart grid				
	2.11 Explain smart grid	concepts related to three-	CX			
	concepts related to three-	phase power systems.				
	phase power systems.					
	2.12 Explain the Impact of	Explain the Impact of				
	unbalanced loads in a	unbalanced loads in a				
	three-phase system	three-phase system				
Genera	l Objective 3.0: Know time don	nain analysis of RC and RL	circuits			
	3.1 Explain transients	Explain transients	Textbooks		Guide the students	Electronic
8-11			Journals	Demonstrate three phase	to:	trainer
	3.2 Explain the growth and	Explain the growth and	Markers	delta connected circuits.	Demonstrate three	Energy meter
	decay curves in RC	decay curves in RC	Whiteboard		phase delta	
	circuits.	circuits.	Charts		connected circuits	Multimeter
	. 6		Animations	Sketch the growth and		Motor
	3.3 Explain how to derive	Explain how to derive	Calculators,	decay curves in RC	Sketch the growth	starters
	formulae for current &	formulae for current &	Projectors,	circuits.	and decay curves in	Electric
		t	1	l	l .	

voltage growth and decay in	voltage growth and			RC circuits.	motor
			C1-4-1,	rections.	IIIOtoi
RC circuits.	decay in RC circuits.		Sketch curves for growth	G1 V 1 C	
			and decay of current and		
3.4 Define time constant	Explain time constant		voltage in RL circuits.	growth and decay of	
				current and voltage	
3.5 Explain time constant in	Explain time constant in			in RL circuits.	
RC circuits.	RC circuits.		Demonstrate three phase		
			power measurement	Demonstrate three	
3.6 Explain how to derive	Explain how to derive		using two wattmeter	phase power	
expressions for the growth	expressions for the		method.	measurement using	
and decay of voltage and	growth and decay of			two wattmeter	
current in RL circuits.	voltage and current in	CX		method.	
	RL circuits.				
			Demonstrate starting	Demonstrate starting	
3.7 Explain curves for growth	Explain curves for		method of three-phase	method of three-	
and decay of current and	growth and decay of	2	induction motors, Direct	phase induction	
voltage in RL circuits.	current and voltage in		on-line starting method.	motors, Direct on-	
	RL circuits.		C	line starting method.	
3.8 Explain the need for			Measure the electrical	Measure the	
connecting a resistor in	Explain the need for		quantities of 3-phase	electrical quantities	
parallel with an inductor.	connecting a resistor in		induction motor.	of 3-phase induction	
r nomes were see each water	parallel with an inductor.			motor	
3.9 Explain how to solve					
problems involving transient	Explain how to solve				
in RC and RL.	problems involving				
in ite und ite.	transient in RC and RL.				
	dansient in ice and ice.				

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	3.10 Explain damping and	Explain damping and				
	oscillatory responses of RLC	oscillatory responses of				
	circuits for real-world signal	RLC circuits for real-			O '	
	processing applications.	world signal processing				
		applications.				
General	Objective 4.0: Understand the	concept of magnetic coupling	ng phenomena.			
	4.1 Define magnetic coupling	Explain magnetic	Textbooks		Guide the students	Induction
12–15		coupling.	Journals	Determine three -phase	to:	motor
	4.2 Define mutual		Markers	Induction motor under	Determine three -	Multimeter
	Inductance	Explain mutual	Whiteboard	load.	phase Induction	Multimeter
		Inductance.	Charts		motor under load.	Electronic
	4.3 Explain the polarity of		Animations	Determine Torque –		trainer
	coupled coils.	Explain the polarity of	Calculators	Current Characteristic	Determine Torque –	
	1	coupled coils	Projectors		Current	
	4.4 Explain coefficient of			Connect the 3-phase dual	Characteristic	
	coupling	Explain coefficient of	_	speed squirrel cage		
		coupling.		induction motor'.	Connect the 3-phase	
	4.5 Explain equivalent circuit				dual speed squirrel	
	for magnetically coupled	Explain an equivalent			cage induction	
	coils.	circuit for magnetically		Carryout experiment on	motor'.	
		coupled coils.		Induction motor		
	4.6 Define an ideal			Determine the polarity of	Carryout experiment	
	transformer	Explain the concept of		coupled coils.	on Induction motor	
		an ideal transformer.		•	Determine the	
				Find equivalent circuits	polarity of coupled	
	4.7 Use 4.5 to derive an	Use equivalent circuit		for magnetically coupled	coils.	
	equivalent circuit of an	for magnetically coupled		coils.		
	ideal transformer.	coils to derive an				

	equivalent circuit of an	Find equivalent
	ideal transformer	circuit for
		magnetically
4.8 Explain with the aid of	Explain with the aid of	coupled coils.
sketches, an equivalent	sketches, an equivalent	
circuit of a practical	circuit of a practical	
transformer.	transformer.	
4.9 Explain magnetic	Explain magnetic	
coupling in resonant	coupling in resonant	
circuits for wireless	circuits for wireless	
communication.	communication.	
	Explain transformer	
4.10 Explain transformer	equivalent circuit	
equivalent circuit analysis	analysis in high-	
in high-efficiency power	efficiency power	
systems.	systems.	

EVALUATION: The continuous assessment; tests and quizzes will be awarded 60% of the total score. The end of the Semester Examination will make up for the remaining 40% of the total score.

Introduction to Industrial Automation

PROGRAMME: NATIONAL DIPLOMA IN ELECTRICA	L AND ELECTRONICS ENGINEERING TECHNOLOGY
COURSE TITLE: Introduction to Industrial Automation	COURSE CODE: EEC 225 CONTACT HOURS: 4
	CREDIT UNIT: 3 THEORETICAL: 2
YEAR: II SEMESTER: II	PRE-REQUISITE: PRACTICAL: 2

GOAL: This course is designed to acquaint students with the knowledge and skills of industrial automation systems.

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

- 1.0: Understand Automation Systems
- 2.0 Understand Programmable Logic Controller
- 3.0 Know PLC Software and Programming Tools
- 4.0: Understand PLC fault diagnosis and troubleshooting principles including software tools
- 5.0 Understand Robotics System
- 6.0 Understand Mechatronics System
- 7.0: Know how to use Human-Machine Interfaces (HMI)

PROGRAMME: NATIONAL DIPI	LOMA IN ELECTRICA	L AND ELECT	RONICS ENGINEERING T	ECHNOLOGY	
COURSE TITLE: Introduction to In	ndustrial Automation	COURSE CO	DE: EEC 225	ONTACT HOURS: 4	1
		CREDIT UNI	T: 3	HEORETICAL: 2	2
YEAR: II SEMESTER: II		PRE-REQUIS	SITE: P	RACTICAL: 2	2
COURSE SPECIFICATION: TH	EORETICAL AND PRA	ACTICAL			
GOAL: This course is designed to a	equaint students with th	e knowledge and	l skills of industrial automatic	on systems.	
General Objective 1.0: Understand	Automation System		, (U) ,		
THEORETICAL CONTENT			PRACTICAL CONTEN	T	
Week Specific Learning Outcome	Teacher's Activities	Resources	Specific Learning Outcome	Teacher's Activities	Resources
concept of Automation. 1.2 Enumerate types of Automation. 1.3 Define the following: • Home automation • Industrial automation • Cognitive automation 1.4 Explain the elements of the following: • Home Automation	Explain types of Automation. Explain types of Automation. Explain the following: • Home automation • Industrial automation • Cognitive	Textbooks Journals Projector	Identify: • Home Automation • Industrial Automation Identify the elements of the following: • Home Automation Industrial Automation	Guide Student to: Identify: Home Automation Industrial Automation Identify the elements of the following: Home Automation Industrial Automation	Videos and Pictures.

	 Cognitive automation 1.5 Explain structure and Hierarchy of the following: Home Automation Industrial Automation Cognitive automation 1.6 Explain Safety in automation in 2.5. 1.7 List Manufacturing and Process Industry Automation Equipment 1.8 State the Advantage and Disadvantages of Industrial Automation. 	 Cognitive automation Explain structure and Hierarchy of the following: Home Automation Industrial Automation 				
Genera	l Objective 2.0: Understand	Programmable Logic C	Controller		_	
3-4	1.1 Explain the history of	Explain the history of	Whiteboard	Identify the parts of a	Guide students to:	PLC Simulator
	programmable logic	programmable logic	Markers	programmable logic		
-						

controllers (PLC) and its	controllers (PLC) and	PLC internal	controller	Identify the parts of	PCs
major manufacturers	its major manufacturers		Controller	a programmable	
major manuracturers	its major manufacturers	drawings	Identify the types of		PLC device with
1.2 Explain parts of a	Explain parts of a	Textbooks	Input/output devices		training board
programmable logic	programmable logic	Journals		Identify the types of	
controller	controller	Projector	Identify expansion	Input/output devices	Manual switche
			modules and boards		for inputs.
1.3 State the PLC hardward	Explain the PLC			Identify expansion	Variety of PLCs
devices.	hardware devices.		Connect and program	modules and boards	and expansion
			different types of sensors		modules and
1.4 Explain PLC logic	Explain the PLC Logic		and actuators.	Connect and	boards.
functions	functions			program different	
1.55			1	3 1	PLC simulator
1.5 Explain signal Modules			signals.	actuators.	
and Other Peripherals	and Other Peripherals			Connect different	
1.6 Explain basic concept				analog signals.	
of signal conditioning.	Explain basic	\mathcal{O}	the PLC:		
er ergum communermig.	concept of signal		On/Off sensors	Connect the	
1.7 List different types of	conditioning.	·	 Analog sensors 	following to the	
analog signals used in PLC	Explain different		• Switches	PLC:	
system:	_		• Actuators	• On/Off	
Voltage signal (05V,	types of analog signals used in PLC		• Valves	sensors	
010V, -55V)	system:		• Drives	• Analog	
Current signal				sensors	
(020mA, 420mA)	Voltage signal (05V, 010V, -		Turn on a motor or lamp	• Switches	
	(03V, 010V, - 55V)		using two buttons	• Actuators	
1.8 Explain the function of	´		applying latching logic	• Valves	
	 Current signal 			 Drives 	

digital input and output	(020mA, 420mA)			
modules.		Turn off a motor or lamp	Turn on a motor or	
	Explain the function of	using two buttons	lamp using two	
1.9 Explain the	digital input and output	applying latching logic	buttons applying	
integration of different	modules.		latching logic	
types of sensors and				
actuators with PLCs.	Explain the integration		Turn off a motor or	
	of different types of		lamp using two	
1.10 Explain the role of	sensors and actuators		buttons applying	
analog I/O modules in	with PLCs.		latching logic	
PLCs				
	Explain the role of			
1.11 Explain SCADA and	analog I/O modules in)		
Data Acquisition systems	PLCs			
	Explain SCADA and			
1.12 Explain the differences	Data Acquisition			
between SCADA, DCS	systems			
(Distributed Control				
1 1 1 1 1	Explain differences			
1 12 D 1 1 1	between SCADA, DCS			
DTII.	(Distributed Control			
(Dometa Torminal	Systems), and PLC-based			
Units), PLCs, sensors,	control systems.			
and actuators.	Describe the hardware			
	components: RTUs			
1.14Explain the following	(Remote Terminal Units),			
PLC communication	PLCs, sensors, and			

	protocols • Modbus,	actuators. Explain the following			CA	
	11011045	PLC communication				
	• Proffinet	protocols				
	• Ethernet/IP	• Modbus,				
		• Profibus				
		• ProfiNet				
	•	•Ethernet/IP		A()		
General	l Objective 3.0: Know PLC	Software and Programm	ing Tools	di		
5-6	3.1 Define a PLC program	Explain the following:	Whiteboard and	Make a program in	Guide students to:	PLC Simulators
		 Programming 	markers, PLC	ladder diagram		PCs
	3.2 Explain the following.	Instructions	Textbooks		Make a program in	rcs
	 Programming 	 Programming 	Journals	Translate a ladder	ladder diagram	
	Instructions	software	Projector.	diagram program into		
	 Programming 			electrical and logic	Translate a ladder	
	software	Explain the major		circuits equivalent.	diagram program	
		features of IEC 61131-			into electrical and	
	3.3 Explain the major	3 standard	Ť	Carry out basic Timer	logic circuits	
	features of IEC 61131-	programming		operations	equivalent.	
	3 standard	languages:				
	programming	• Ladder logic		Carry out basic counter	Carry out basic	
	languages:	Structured text		operations	Timer operations	
	• Ladder logic 💉	Function block				
	 Structured text 	diagrams		Download and Upload	Carry out basic	
	 Function block 			programs to/from a CPU	counter operations	
	diagrams			using PLC software		
	NU				Download and	

_				
	Explain how a PLC			Upload programs
3.4 Explain how a PLC	scans a program and			to/from a CPU using
scans a program and	how the scan relates to		•	PLC software
how the scan relates to	input and output data			
input and output data	table registers.			
table registers.	Explain the PLC			
	program terminals			
3.5 Explain the PLC				
program terminals	Explain the uses of the		()	
	'Main' and 'Init'			
3.6 Explain the uses of	program files			
'Main' and 'Init'				
program files	Explain PLC Ladder			
	diagrams			
3.7 Explain PLC Ladder				
diagrams	Explain the Function	_0_		
	Block Diagram			
3.8 Explain the Function				
Block Diagram	Explain how to make a			
	program in ladder			
3.9 Explain how to make a	diagram			
program in ladder				
diagram	Explain how to			
	translate a ladder			
3.10 Explain how to	diagram program into			
translate a ladder	electrical and logic			
diagram program into	circuits equivalent.			
electrical and logic				
	•			

	1		T	<u> </u>		1
	circuits equivalent.	Explain Timers and				
		Counter applications			CV	
	3.11 Explain Timers					
	and Counter					
	applications	Explain how to				
		download and Upload				
	3.12 Explain how to	programs to/from a				
	download and Upload	CPU using PLC				
	programs to/from a	software.				
	CPU using PLC					
	software					
	Software					
Conora	l Objective 4.0: Understand	DI C fault diagnosis and	troubleshoeting pri	nciples including software	tools	
Genera	i Objective 4.0. Onderstand	1 LC fault diagnosis and	troubleshooting pri	nciples including software	10018	
0.44		—	h	<u> </u>	la	Dr. C. C. 1
9-11	_	_	Whiteboard	Interpret what each status	Guide students to:	PLC Simulator
				light on a PLC or CPU		
	indicators	indicators	PLC Textbooks		1	PCs
		Y	Journals		status light on a PLC	
	4.2 Describe the	Explain the advantages	Projector	Interpret PLC error	or CPU module	
	advantages of using	of using PLC error		codes.	indicates.	
	PLC error codes and	codes and how they are				
	how they are displayed	displayed on a PLC		Practice resolving	Interpret PLC error	
	on a PLC	00		common hardware and	codes.	
		Explain techniques for		software issues.		
	4.3 Describe techniques for				Practice resolving	
		PLC systems.			common hardware	
	PLC systems.				and software issues.	
		Explain diagnostic				

	3.13 4.4 Explain	tools and software for						
	diagnostic tools and	troubleshooting.			CV			
	software for							
	troubleshooting.				O			
General Objective 5.0: Understand Robotics System								
12-13	5.1 Define a robot	Explain the term robot	Whiteboard and	Identify components of	Guide the student to	Pictures and		
			markers, PLC	robot based on	Identify components	videos		
	<u> </u>	Explain the basic	Textbooks	configuration and	of robot based on			
			Journals	application.	configuration and			
			Projector.		application.			
	5.3 Explain the Laws of Robotics	Explain the Laws of Robotics						
	Robotics	Robotics						
	5.4 List the Different	Explain different types						
		of Robots.						
	5.5 List Robot Part and	List Robot Part and	_0_					
	Explain their functions.	Explain their functions.						
	_	Explain Robot						
	Technical Specification.	Technical Specification						
	5.7 Describe the following:	Specification						
		Describe the following:						
	Kinematics	Robot Anatomy						
	Mechanisms	Kinematics						
	Drive Systems	 Mechanisms 						
	Robot Sensors	Drive Systems						
	Vision Systems	Robot Sensors						
	Voice Recognition	• Vision Systems						
	NO.	• Voice						

			T			
	5.7 Explain the basic concept of robot Control.				CA	
		Explain the basic				
		concept of robot				
	Robotics.	Control.		CALL		
	5.9 Explain the	Explain Safety in				
	Application of	Robotics.				
	Robotics.					
	Robotics.	Explain the		10 N		
		Application of				
		Robotics.				
Genera	al Objective 6.0: Understand	Mechatronics System			1	-
14	6.1 Define Mechatronics.	Explain different	Whiteboard	Identify household	Guide students to:	Instrumental
İ		mechatronics	Markers	items that can be	Identify	diagrams
	6.2 List different		PLC Textbooks	characterized as	household items	Training board
	mechatronics			mechatronic System.	that can be	Plug-in- cables
	system.	Explain	Journals	-	characterized as	
		Mechatronics	Projector	Identify components	mechatronic	Dc power source
	6.3 Explain	system primary		the task above that	System.	Washing machine
	Mechatronics	elements.		help identify them as		Bread toaster and
	system primary			mechatronic	Identify	Hand drilling
	elements.	Explain the		Systems.	components the	Machine.
		applications of			task above that	iviaciiiic.
	6.4 Explain the	mechatronics system.		Identify the	help identify	
	applications of			characteristics of the	them as	Transducer
	mechatronics	Explain different		following:	mechatronic	Trainer
	system.	types of systems		LVDT	Systems.	
		TALL OF ST ST STORY		Variable	Systems.	LVDT.
	6.5 Define a System	Explain the function of		• Variable Capacitor.	Identify the	Variable
		each type in 1.6.		1	characteristics	Capacitor.
	6.6 Explain different			 Light Dependent 	Characteristics	Capacitor.

			1	1		1
	types of systems			Resistor	of the following:	Light Dependent
		Explain the		 Resistance 	• LVDT	Resistor.
	6.7 State the function of	following:		Temperature	 Variáble 	Resistance
	each type in 1.6.	• Transducer		Detector	Capacitor.	Temperature
		 Sensors 		• Thermistor.	Light	Detector.
	6.8 Explain the			• Thermocouple.	Dependent	Thermistor.
	following:	Explain the different			Resistor	
	• Transducer	types of transducers		Identify different	 Resistance 	Thermocouple.
	• Sensors	and sensors		drives	Temperature	
	 Actuators 	D:		'(10)	Detector	AC and DC
	COF 1: 41 1:00 4	Discuss the			• Thermistor.	motors
	6.9 Explain the different	applications of sensors and			 Thermocoup 	
	types of transducers, sensors and actuators	transducer.			le.	
	sensors and actuators	transducer.				
	6.10 Explain the	Explain the			Identify	
	applications	applications			different drives	
	of sensors, transducer	of sensors,	_0_			
	and actuators.	transducer and				
		actuators.				
ener	al Objective 7.0: Know how					
15	7.1 Describe HMIs and	Explain HMIs and their	Whiteboard	Program a basic HMI for	Guide students to:	PLC device with
	their interaction with	interaction with PLCs.	Markers	a PLC system.	Design and program	training board
	PLCs.	V	PLC Textbooks		a basic HMI for a	equipped with
		Explain how to design	Journals		PLC system.	manual switches
	7.2 Explain how to design		Projector			for digital inputs
		HMI for a PLC system.				lor digital input
	III (I C DI C					HMI panal DI C
	HMI for a PLC system.					HMI panel. PLC
			289			
			289			
	HMI for a PLC system.					
	•					

6.11			& HMI programming software (depends on PLC platform: TIA Portal, MELSEC, TwidoSuite, Studio 5000 Logix Designer)
EVALUATION: 60% EXAMINATION: 40%	ORIVE		
	290		

PRACTICAL MANUAL

	PRACTICAL MANUAL
Algebra And Elementary Trigonometry	1. Establish the laws of Indices.
MTH 112	2. Solve problems using the laws of
	indices
	3. Solve simple logarithms problem.
	4. Apply knowledge from 3.1in
	termination as laws from experimental
	data.
	5. Ask the students to draw graphs
	6. Solve quadratic equation by
	factorisation.
	7. Solve set theory problems using Venn
	diagrams.
	8. Obtain the formula for nth term and the
	first n terms of an A. P.
	9. Ask the students to apply progression
	to solve problems.
	10. Apply the techniques of vectors to
	solve various problems
	11. Apply the parallelogram law in solving
	problems including addition and
	subtraction of vectors.
	12. Compute the resultant of coplanar
	forces acting at a point using
	algebraic and graphical method
	13. Apply the techniques of resolution and
	resultant to the solution of
	problems involving coplanar forces.

	14. Apply vectorial techniques in solving problems involving relative velocity. 15. Compute the scalar product of given vectors. 16. Compute the scalar product of given vectors.
	17. Calculate the direction ratios of given vectors.18. Calculate the angle between two vectors using the scalar product
	19. Solve carious equations as indicated in section 10. 20. Apply algebraic and graphical methods
	in solving two simultaneous equations a linear equation and a quadratic equation
	21. Apply the algebraic and graphical methods in solving two simultaneous and quadratic equations. 22. Apply determinants of order 2 and 3 in
Technical Drawing MEC 111	solving simultaneous linear equations. 1) Identify the different types of drawing instruments, equipment and materials.
412	2) Observe the precautions necessary to preserve the items identified above. 3) Use each of the items mentioned
10/4	above. 4) Maintain the various instruments and

- equipment.
- 5) Illustrate the various conventions 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.
- 6) Prepare drawing sheets with the following:
 - Margins
 - Title block etc.
- 7) State the various standards of drawing sheets.
- 8) Print letters and figures of various forms and characters.
- 9) Illustrate conventional signs, symbols and appropriate lettering characters.
- lo) Construct parallel and perpendicular lines.
- Construct and bisect lines, angles and areas.
- 12) Divide a straight line into given number of equal parts.
- 13) Identify polygons (regular or irregular).
- 14) Construct regular polygons with N sides in a given circle, given:
 - Distance across flats

- Distance across corners.
- 15) Carryout simple geometrical constructions on circles e.g.:
 - Diameter of a circle of a circle of a given circumference.
 - The circumference to a circle of a given diameter
 - A circle to pass through 3 points
 - A circle to pass through 2° points and touch a given line
 - A circle to touch a given smaller circle and a given line
 - Tangents to circles at various points
 - An arc of radius tangent
 - To two lines at an angle to less than and more than 90
 - An arc externally tangent to two circles: inscribing and circumscribing circles
- 16) Construct ellipse by using:
 - Trammel method
 - Concentric circle method.
- 17) Construct plane scales and diagonal scales, using appropriate instruments.
- 18) Draw a square in isometric and oblique

forms.

- 19) Draw a circle in Isometric and oblique forms.
- 20) Draw an ellipse in Isometric and oblique forms.
- 21) Draw a polygon with a minimum of eight sides in Isometric and oblique forms.
- 22) Dimension holes, circles, arcs and angles correctly on isometric and oblique projections.
- 23) Use appropriate convention symbols and abbreviations.
- 24) Project views of three-dimensional objects on to the basic planes of projection in both first and third angle to obtain:
 - The front view or elevation
 - The top view or plan.
 - The side view
- 25) Draw the lines of intersections of the following regular solids and planes in both first and third angles:
 - Two square-prisms meeting at right angles.
 - Two dissimilar square prisms meeting at an angle.
 - Two dissimilar square prisms

	meeting to an angle • A hexagonal prism meeting a square prism at right angles. • Two dissimilar cylinders meeting at an angle. • Two dissimilar cylinders
Basic Workshop Practice and Technology MEC 113	meeting at right angle, their centres not being in the same vertical plane 1) Demonstrate all safety rules and regulations in the workshop
	 2) Use safety equipment and Personal Protection Equipment 3) Follow safety procedures and precautionary measures 4) Inspect the following equipment in the workshops: Air receivers
MALB	 Ropes and Chains Pulley blocks Forklift carriage Mobile and overhead cranes Derricks and gantries 5) Differentiate between:
WATO	• Hand tools and machine 296

tools

- Bench tools and machine cutting tools
- 6) Identify marking out tools used on the bench typical workshop practical exercises.
- 7) Use marking-out tools on the bench correctly
- 8) Identify this bench cutting tools
- 9) Produce simple objects using bench/hand tools such as:
 - Files
 - Chisels
 - Scrapers
 - \Saws etc.
- 10) Maintain files, dividers, saws, gauges try squares, bevel edge square etc.
- 11) Write process sheet or operation layout for the component to be produced.
- 12) Identify the differences and similarities between measuring and testing equipment in mechanical workshop with regards to:
 - Principle of operation
 - Construction
 - Use
- 13) Perform simple measuring exercises

using steel rules, vernier calipers and micrometers.

- Use dial indicators to:
- Set up jobs on the lathe
- Roundness testing etc.
- 14) Carry out exercises involving flatness, squareness, straightness and surface finish test.
- 15) Perform taper measurement on jobs using vernier protractor and sine bars.
- 16) Inspect jobs using simple comparators
 Operate different types of drilling
 machine
- 17) Carry out drilling operations such as:
 - Counter-boring
 - Counter-sinking
- 18) Grind drill bits accurately
- 19) Select correct drilling speeds
- 20) Indicate the nomenclature of a twist drill:
 - Clearance angle
 - Rake angle
 - Point angle etc.
- 21) Calculate the speeds of various sizes of drills using appropriate formulae.
- 22) Identify various metal joining operations

- 23) Fabricate metal container by Knock-up joining
- 24) Join metals by the grooving technique
- 25) Fabricate metal container by knock-up joining
- 26) Carry out soft soldering
- 27) Identify the tools used for wood work
- 28) Mark out and prepare wood for various operations as described in 7.2
- 29) Carry out various woodwork operations using the tools in 7.1 -7.3
- 30) Maintain all tools and machines used
- 31) Identify the steps and tools involved in making a simple machine part using wood as material
- 32) Carry out reaming operations:
 - On the bench
 - On drilling/lathe
- 33) Select correct speeds for reaming small and large holes
- 34) Select correct tapping drill size
- 35) Select correct taps
- 36) Carry out tapping operation:
 - On the work bench
 - On drilling machine
 - On lathe
- 37) Calculate tapping drill sizes
- 38) Identify various types of plastic groups

39) Identify the characteristics of each type of plastic. 40) Use conventional metal cutting tools to perform operations on plastics. 41) Carryout joining operations using plastics Electrical Drawings EEC 111 EEC 111 1. Identify electrical and electronic symbols 3. Read and interpret Electrical Bunding and Electronic diagrams. 4. Draw Symbolic Electrical circuits 5. Draw Building wring diagrams showing all components, wiring, conduits, switch boxes, wall plugs. 6. Draw a simple electrical circuit with voltage and current source and other circuit elements. 7. Identify standard symbols 8. Perform Power experiments' from the symbolic diagrams to wiring diagrams		
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7. Identify standard symbols 8. Perform Power experiments" from the		
8. Perform Power experiments" from the		
symbolic diagrams to wiring diagrams		_
showing terminals and earth points and		
how " 2 channel Oscilloscopes" should		
be connected without shorting the		
circuit. 9. Draw a typical electrical installation	Va.	
9. Draw a typical electrical installation project using standard symbols.		
10. Draw electronic circuits using standard		

	symbols 11. Identify machine diagrams 12. Identify redline drawings 13. Carryout redline drawings marking 14. Use computer software to draw electrical installation diagrams 15. Draw machine diagrams using computer software 16. Draw electronic circuit diagrams using
Introduction to Digital Electronics EEC 112	computer software 1. Demonstrate conversion from decimal and hexadecimal 2. Investigate the logical behavior of AND, OR, NOT, NAND, NOR, and EX-OR gates. 3. Show the NAND gate as a Universal Gate 4. Interpret truth tables for logic gates 5. Verify Boolean Laws using the various logic gates 6. Construct the truth table of various logic gates and combination circuits using logic gates. 7. Evaluate various combinational circuits such as adders, subtractors, 8. Design and implement adders and subtractors using logic gates 9. Implement adders and subtractors using logic gates
WALL	301

- 10. Design and implement of 4-bit binary adder/subtractor and BCD adder using digital ICs
- 11. Implement of 4-bit binary adder/subtractor and BCD adder using digital ICs
- 12. Interpret truth tables for multiplexers and de-multiplexers
- 13. Implement multiplexer and demultiplexer using logic gate
- 14. Design multiplexer and demultiplexer using logic gates and study of IC 74150 and IC 74154
- 15. Evaluate flip-flops, counters, and shift registers.
- 16. Implement SISO, SIPO, PISO, and PIPO shift registers using flip-flops.
- 17. Verify of 4-bit ripple counter and Mod-10, Mod-12, and Mod-N ripple counters
- 18. Simulate various combinational circuits, sequential circuits flip-flops, and counters. using relevant software
- 19. Interpret Truth Tables for latches, flip flops, and counters
- 20. Identify the Microcontrollers.
- 21. Identify Microcontroller Input/Output ports, power pins, reset and clock pins.
- 22. Perform Basic Programming.

	 23. Load the program from PC to microcontroller via programmer. 24. Setup the hardware (vero board, breadboard, microcontroller, led, sensors.
Technical Documentation and Report Writing EEC 113	25. Interface microcontrollers with sensors 1. Identify types of technical documentation 2. Operate text editors: • Microsoft Word, • LaTeX. 3. Prepare simple drawings, diagrams using AutoCAD. 4. Conduct simple calculations and prepare graphs using Microsoft Excel. 5. Use collaborative platform: • Google Docs. 6. Prepare project proposal including its specific sections: • Client requirements • Specification • Proposed drawings • Bill of materials • Material and labour cost estimation • Execution period 7. Write a project report based on list of project sections.

	8. Identify mistakes in technical report and correct them.
	9. Identify guidelines for document calculations.
	10. Identify guidelines for graphs and numerical data preparation and
	representation.
	11. Fill a Logbook based on work carried
	out.
	12. Write a laboratory experiment report.13. Write a non-technical report for:
	Progress report
	New Development
	Recommendation
	14. Prepare complete RAMS document.
	15. Prepare of a comprehensive technical
	project related to hypothetical or real- world scenarios in Electrical and
	Electronics Engineering - individual or
	group projects.
	16. Present the projects to the class for
	17. Peer and teacher evaluation based on
	clarity, accuracy, and professionalism.
Electrical Engineering Science I	1. Determine the effect of variable EMF
EEC 114	on single loop DC circuit.
	2. Measure current and voltage of power
	source in a simple circuit using a
x()\	multimeter

	Mon
	3. Verify Ohm's law. 4. Demonstrate series and parallel circuits. 5. Verify the effect of varying resistance on current flow in a conductor. 6. Verify the Kirchhoff's Laws with DC circuits. 7. Verify superposition principle. 8. Determine the temperature coefficient of a resistance 9. Verify the heating effect. 10. Perform experiment to determine the DC power. 11. Verify Coulombs' Law using experiment 12. Perform experiment on charging and
Industrial Health and Safety EEC 115	discharging of a capacitor. 1. Identify different types of safety signs. 2. Identify workplace hazards in a real or simulated environment. 3. Document workplace hazards in a real or simulated environment. 4. Perform risk assessments and recommend control strategies. 5. Select, use, and maintain correct PPE for specific tasks. 6. Select appropriate signage according to location-specific hazards. 7. Install appropriate signage according to location-specific hazards.

- 8. Apply relevant legislative requirements to assess workplace compliance.
- 9. Interpret key legislative safety signage and documents.
- 10. Practice legal reporting procedures for unsafe conditions under OHS law.
- 11. Identify and record hazards in a work environment.
- 12. Record hazards in a work environment.
- 13. Conduct a basic risk assessment and suggest control measures.
- 14. Apply appropriate hazard control methods using the hierarchy of controls.
- 15. Report on hazards to supervisors or safety reps
- 16. Identify control measures in place and assess their adequacy and effectiveness.
- 17. Apply the hierarchy of control to select appropriate measures for specific hazards.
- 18. Identify safety and health requirements.
- 19. Identify Safety signs and symbols.
- 20. Demonstrate the use of PPE
- Safety boots

- Helmets
- Goggle
- Face Shield
- Coverall
- Earmuff
- Harness
- Nose Mask
- Hand glove
- 21. Organize a simulated fire drill.
- 22. Debrief students post-exercise.
- 23. Demonstrate safe manual handling or machinery use.
- 24. Conduct role-play of an incident and reporting.
- 25. Perform first aid
- 26. Carry out CPR
- 27. Identify and use first aid materials and tools.
- 28. Apply appropriate procedures for treating minor bleeding and wounds.
- 29. Immobilize limbs in cases of suspected

	fractures or sprains.
	30. Perform abdominal thrusts for choking victims (adults and children).
Electrical Power I EEC 121	 Organize Industrial visits to observe the layout of Generation, Transmission and Distribution of power systems. Draw the layout of Steam plant, Diesel plant, Gas plant, Solar and wind plant. Draw the layout of generation transmission and distribution of electrical power systems. Draw the diagram of generating station, transmission and distribution networks with voltage levels. Identify the basic components of distribution systems Determine balancing situations of connected grid to distribution network to ensure power and load demand are equal via calculation Identify the parts a fuse. Demonstrate the function of a fuse. Identify the moulded case circuit breaker. Demonstrate the function of an isolator. Identify the difference between a circuit breaker and an isolator

	12. Identify types of insulators.
	13. Demonstrate the applications of
	insulators in distribution network
	insulators in distribution network
Electrical Machine I	Determine direction of magnetic field.
EEC 122	2. Disassemble and assemble a DC
	Generator.
	3. Determine a DC Generator terminal.
	4. Determine the characteristics of
	separately excited DC Generator.
	5. Perform an experiment to show the
	relationship between armature voltage
	and load current
	6. Interpret a Motor name plate
	7. Conduct an experiment on DC Shunt
	motor Characteristics.
	8. Carry out experiment on DC Series
	motor Characteristics.
	9. Perform an experiment on DC
	Compound motor Characteristics.
	10. Carry out an experiment on starting DC
	motor using a relay
	11. Perform experiment on the
•	Characteristic of Split phase induction
	motor.
	12. Carry out experiment on Characteristic
	of Capacitor Start motor and Capacitor
	run motor

	13. Inspect and maintain a Motor
	14. Perform troubleshooting and repair of
	AC motors
Electronics I	Construct a simple electronic circuit
EEC 123	consisting of two resistors in series as
	a voltage divider
	2. Identify Semiconductor components
	with their circuit symbol.
	3. Carry out an experiment on breadboard
	to implement circuit from the
	schematic diagram.
	4. Perform experiment on how to solder
	and unsolder components on a printed
	wiring circuit board
	5. Demonstrate soldering Techniques
	6. Conduct an experiment on
	measurement of direct current in a
	circuit.
	7 Carry out experiment to measure the
	effect of resistance and observe the
	effect of voltage in controlling current
	in a circuit.
	8. Perform an experiment to observe and
	measure input and output waveforms of
	a full – wave rectifier
	9. Carry out experiment to determine the
	time constant of a Capacitor
	10. Perform an experiment to show Zener

4. Verify Lenz's law of electromagnetic induction.5. Determine the inductance of a coil.	Electrical Engineering Science II EEC 124	diode as a Voltage regulator. 11. Carry out experiment to show Static Characteristic of a PNP Transistor in the Common base configuration 12. Test Bipolar Junction Transistor. 13. Test PN Junction diode with Multimeter 14. Perform experiment to determine the Characteristic of thyristors 15. Carry out experiment to show Static Characteristic Thyristors 16. Carry out experiment to investigate thyristor switching 1. Determine the B-H curve for magnetic material (Hysteresis curve) 2. Determine the magnetic energy loss in magnetic materials 3. Verify Faraday's law of electromagnetic induction	
6. Determine energy loss in an inductor. 7. Determine the energy loss in an inductor. 8. Determine the equivalent inductance of serial and parallel inductive circuits. 9. Determine the magnetic coupling in a		 Verify Faraday's law of electromagnetic induction Verify Lenz's law of electromagnetic induction. Determine the inductance of a coil. Determine energy loss in an inductor. Determine the energy loss in an inductor. Determine the equivalent inductance of serial and parallel inductive circuits. Determine the magnetic coupling in a 	

	transformer 10. Determine the frequency, period and amplitude of a sinusoidal signal. 11. Determine the series and parallel resonance of an AC circuit.
	12. Determine the Quality-factor (Q-factor) of series and parallel RLC circuits.
Electrical and Electronics measurement and Instrumentation EEC125	1. Identify the instruments listed below: Digital multimeter Analogue multimeter Voltage tester Clamp meter Oscilloscope Insulation resistance tester (Megger) Tachometer Wattmeter Thermometer Frequency Counters Battery tester Demonstrate ohm's law using variable resistance and variable E.M.F Demonstrate practical examples of error Determine the resistivity of materials Verify Kirchhoff's current and voltage

law

- 6. Demonstrate superposition Theorem
- 7. Demonstrate the use of the following using different circuits:
 - Digital multimeter
 - Analogue multimeter
 - Voltage tester
 - Clamp meter
 - Oscilloscope
- 8. Measure voltage and current by connecting Multiplier and Shunt respectively.
- 9. Charge and discharge a capacitor, inductor
- 10. Calibrate and measure with multimeter.
- 11. Measure direct current (d.c) voltage in experiments using multimeter
- 12. Measure alternating current (a.c)

 voltage in experiments using digital multimeter
- 3. Calculate the Values of the multiplier and shunt.
- 14. Calibrate a moving coil instrument
- 15. Use meters to measure:
 - Voltage
 - Current
 - Variable frequencies

Telecommunication I EEC 126	 Earth resistance Insulation resistance Current (Clamp meter) Sketch a diagram of the following meters: Digital Voltmeter Frequency Counter Ohmmeter Ammeter Merger LCR meter Identify earth point Visit a communication service provider company Identify the basic segments in the block diagram of the communication system. Visit AM and FM radio stations Demonstrate modulation and demodulation in AM and FM Modes Yisit AM and FM Radio stations Demonstrate the operation of receivers
Electrical Installation of Buildings EEC 127	1) Identify the standard symbols 2) Sketch the standard symbols 3) Interpret a schematic diagram 4) Interpret a wiring diagram

- 5) Conduct earth resistance test to ascertain the earth resistance value
- 6) Identify electrical symbols
- 7) Insert electrical symbols for the installation layout in building drawings
- 8) Produce a single line diagram based on the layout
- 9) Interpret building drawings.
- 10) Identify cables and their sizes.
- 11) Select appropriate cables for different uses
- 12) Draft electrical services for a residential building e.g. 3 bedroom flat
- 13) Demonstrate installation of various types of joints using PVC flexible cables
- 14) Design an electrical service for a 3-bedroom flat.
- 15) Identify cable colour coding commonly used in Nigeria.
- (6) Carryout laying of cables using different trunking methods.
- 17) Apply I.E.E. wiring Regulations related to cables and their uses.
- 18) Identify types of joints Extract items for bill of quantities from drawings.
- 19) Conduct market survey (hypothetical)
- 20) Assess the cost of materials.

	21) Prepare typical bill of quantity
	22) Identify the components of Solar power system.
	23) Install Closed-Circuit Television (CCTV).
	24) Install a satellite Television with its
	accessories.
	25) Install Electrical service mains for a
	premises
Tania and Lineau Aleshus	26) Install a prepaid meter in a premises
Logic and Linear Algebra MTH 202	1) Translate sentences into symbolic form using quantifiers. e.g.: "some freshmen
W1111 202	are intelligent can be stated as "for
	some x,x is a freshman and x is
	intelligent" can be translated
	in symbols as (ix) (f x & ix)
	2) Give illustrative examples of the
	fundamental principles of
	permutations.
	3) Establish the formula $nPr = \underline{n!} (n-r)!$
	4) Solve problems of permutations with
	restrictions on some of. the objects
	5) Solve problems of permutations in
	which the objects may be repeated.
	6) Solve problems of permutations of N
	identical objects.
	7) State and prove the theorem nCr-1+
<u> </u>	${}^{n}Cr = {}^{n+1}Cr$

	8) Illustrative with examples the method of mathematical induction. 9) Identify the binomial theorem for a rational number. 10) Identify the properties of binomial coefficients 11) Apply binomial expansion in approximations (simple examples only). 12) Determine a determine the minors and cofactors 2 by 2 and 3 by 3 matrixes 13) State and prove the theorem "if two
Electrical Power II	rows or two columns of a matrix are interchanged, the sign of the Value of its determinant is changed 14) Identify the minors and cofactors of a determinant 15) Identify the method of evaluating determinants.
Electrical Power II EEC 211	 Visit a power plant Demonstrate the layout diagrams of power plants Assemble the components of the PV Power generation system for domestic application. Draw a typical load curve Visit a transmission substations Assemble poles, pole supports, and
WATE	317

	insulators in a dead substation. 7) Connect voltage and current transformers for measurements in the transmission line model. 8) Demonstrate the stages of construction for conductors and laying underground cables: • Two-core cable • Three core cable
Electrical Machine II EEC 212	1) Carryout experiments on circuit characteristics of a 3-phase induction motor. 2) Carryout experiment on circuit characteristics of an alternator/A.C generator 3) Perform experiment to determine relationship between excitation current and output terminal voltage 4) Perform experiment to determine relationship between speed and output terminal voltage. 5) Demonstrate the construction of electrical machines. 6) Interpret name plate of synchronous and induction motors and generators 7) Demonstrate the conversion of energy
WILL	in singly excited systems. 318

- 8) Determine the terminal of a 3 phase induction motor
- 9) Determine the terminal of a 3 phase synchronous generator.
- 10) Measure the electrical quantities of 3 phase induction motor.
- 11) Identify the basic difference between motors and generators.
- 12) Demonstrate the techniques for motor starting and control:
 - Direct online starter
 - Star-Delta starter
 - Soft starter
 - Variable frequency drive
- 13) Visit power substation/show video clips
- 14) Classify transformers
- 15) Monitor temperature of a transformer.
- 16) Identify methods of cooling transformers.
- 17) Sketch phasor diagrams of transformer on load and on No-load
- 18) Sketch the equivalent circuit of a transformer
- 19) Perform experiment on open circuit characteristics of a single phase transformer.
- 20) Perform experiment on open circuit

	characteristics of three phase
	transformers.
	21) Carryout experiment on close circuit
	characteristics of a single phase
	transformer.
	22) Perform experiment on close circuit
	characteristics of three phase
	transformer.
	23) Perform experiment on
	identifying polarity of a 3-phase
	transformer.
	24) Conduct transformation ration test on a
	transformer'
	25) Use the Open-circuit and Short-circuit
	tests to determine the equivalent circuit
	parameters.
	26) Sketch possible arrangement of three transformer windings.
Electronics II	1) Carry out experiment on FET Static
EEC 213	Characteristics in common source
210	configuration
	2) Demonstrate the applications of
	MOSFET:
	Switching (DC-DC Converter)
	Amplification
	Variable resistance (Signal
MAL	processing)
~~~	3) Perform experiment on common source

	amplifier characteristics. 4) Carry Out experiment on common gate amplifier characteristics
	5) Conduct an experiment on common drain amplifier characteristics
	6) Perform an experiment on Characteristics of transformer coupled Class A amplifier:
	7) Identify the frequency response characteristics of amplifier.
	8) Identify the relationship impedance, power and phase relationship.
Electric Circuit Theory I EEC 214	 Draw to scale phasor diagrams for a.c circuits. Draw phasor diagrams that the current
	in a capacitor circuit leads voltage and the current in the inductive circuit lags the voltage.
	3) Investigate the behaviour of series- parallel connected resistors.
80	4) Determine the voltage divider.5) Test the inductor using ohmmeter.6) Demonstrate how to test capacitor by
	observing their charging and discharging
, ON'	7) Convert a.c signal in polar form to the Rectangular form.
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- 8) Demonstrate how to verify Ohm's law.
- 9) Simulate resonance conditions in series and parallel RLC circuits.
- 10) Show with the aid of phasor diagrams that the current in a capacitor circuit leads voltage and the current in the inductive circuit lags the voltage.
- 11) Show wave forms of lagging and leading angles of voltage and current on a Cartesian plane.
- 12) Demonstrate the application of mesh circuit analysis.
- 13) Demonstrate the application of Nodal circuit analysis.
- 14) Reduce a complex network to its series or parallel equivalent.
- 15) Derive the formula for the transformation of a delta to a star network and vice versa.
- 16) Measure the total resistance of combinations of parallel connected resistors.
- 17) Determine by experiment the total resistance of resistors connected in series.
- 18) Identify star and delta networks
- 19) Verify Thevenin's theorem.
- 20) Demonstrate the application of Nodal

	circuit analysis. 21) Verify the Millman's theorem 22) Use Thevenin's theorem to analyze energy delivery from a battery to a load.
Use of Electrical and Electronics Instruments EEC 215	9) 1) Draw the block diagram of an Oscilloscope 2) Measure D.C voltage in experiments using OSCILLOSCOPE 3) Measure A.C voltage in experiments using OSCILLOSCOPE 4) Measure range of frequencies with OSCILLOSCOPE 5) Measure phase angles with OSCILLOSCOPE 6) Sketch Power meter 7) Measure DC and AC power 8) Measure DC and AC power for single and three phase circuits 9) Measure power factor 10) Determine temperature effect on resistance 11) Verify temperature effect on semiconductor diode 12) Measure temperature range using digital thermometer
WATE	13) Design a simple controller circuit 323

Telecommunication II EEC 216	1) Demonstrate amplitude modulation
EEC 210	with signals in audio frequency band. 2) Demonstrate amplitude demodulation
	with AM modulated signal.
	3) Determine the frequency deviation
	with FM modulated signal.
	4) Demonstrate the frequency
	demodulation with FM modulated
	signals.
	5) Determine how radio receivers operate
	6) Visit a television station
	7) Use appropriate software to simulate
	the wave propagation of antenna 8) Set up a simple cable network
	9) Configure a router
	10) Connect two routers or access points
	11) Transfer information using:
	• Wireless fidelity (WI-FI)
	Bluetooth
	• Intranet
Computer Hardware and Software I	Identify computer components
EEC 217	2) Dismantle a computer system and show
ELC 217	the:
	RAM card
	Hard Disk
VO,	<u>'</u>
	324

- Processors.
- 3) Identify:
- Input mechanisms
- 4) Output Mechanisms Assemble computer sub-units.
- 5) Identify the memory, ports, CPU and power supply unit
- 6) Identify the computer CMOS battery for memory retention.
- 7) Identify the various types of port
 - Parallel
 - Serial
 - USB
- 8) Identify the components of a computer hardware:
 - Input/output System Unit
 - Processing unit
 - Storage devices
- 9) Demonstrate how to start and shut down a computer system.
- 10) Identify different types of cables and connectors.
- 11) Demonstrate how to connect Computer Ports to peripherals.
- 12) Demonstrate how you can setup and connect a printer to a computer.

- 13) Setup some printing exercise
- 14) Identify a modem and draw a block diagram of a modem
- 15) Draw a block diagram showing the interconnection of the Sub-units of the motherboard.
- 16) Identify computer components
- 17) Dismantle a computer system and show the:
 - RAM card
 - Hard Disk
 - Processors.

18) Identify:

- Input mechanisms
- Output Mechanisms
- 19) Access computers correctly through Windows operating system such as:
 - Open/Close a window
 - Program Manager
 Button bars/scroll bars/ menu bars
 - Moving from one Window to another
- 20) Create a file and folder
- 21) Manipulate files (moving, copying, saving, deleting).
- 22) Manipulate Print Manager.
- 23) Demonstrate the competent use of a

word-processing package such as: MSWord (or equivalent standard). Entering text Formatting text (emboldening, font size, italicizing). Creating and Saving text files Editing and moving text Importing objects Spelling and Grammar Che Create tables, text boxe equations. Type a short document and save it. Edit a document and carryout a spelling check. Demonstrate the use of tables. Use the Internet to retrieve information. World Wide Web(WWW) Download information Paste retrieved information into an appropriate application Use-mail to send and receive messages. National and international e-mail E-mail attachments (sending& receiving) 23)

Research Methods in Electrical and	1) Identify sampling techniques
Electronics Engineering Technology	2) Use the selected technique to a draw
EEC 218	sample
	3) Identify types of data
	4) Identify sources of data
	5) Use data collection techniques to
	conduct research
	6) Use statistical tools to present data
Electrical Power III	7) Write research report 1. Determine the sending and receiving end
EEC 221	voltage of the transmission line
LLC 221	2. Determine the voltage regulation and
	transmission efficiency.
	3. Conduct a load flow study of two bus
	power network using appropriate
	software
	4. Run programme for a load flow
	analysis of a two-bus power network.
	5. Construct the power circle diagram.
	6 Formulate the nodal admittance matrices
	for a two-bus network.
	7. Calculate the load flow in an
Q	interconnected system
	8. Classify the variables in 1.9 into control
	dependent and independent
	9. Identify the faults on generators, transformers and T-line.
	10. Insert an open circuit and earth faults
	10. Insert an open circuit and carm faults
~ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	328

on transmission lines using appropriate software 11. Determine the fault levels on typical power systems. 12. Determine the MVA fault level on typical power systems. 13. Draw typical waveforms of short circuit currents in power systems. 14. Plot graphs for voltage and current surges when R is less than Z, (R X Y) 15. Test Insulators to determine their voltage distribution and string efficiency. 16. Draw a typical surge waveform. 17. Identify lightning arrester 18. Classify relays Computer Hardware and Software II EEC 221 1. Deproduct how to carry out computer maintenance 2. Repair common power supply issues. 3. Upgrade laptop components (RAM, SSDs, Wi-Fi cards). 4. Disassemble and repair a faulty motherboard. 5. Upgrade components in a laptop or deskton to improve performance.			
power systems. 12. Determine the MVA fault level on typical power systems. 13. Draw typical waveforms of short circuit currents in power systems. 14. Plot graphs for voltage and current surges when R is less than Z, (R Z) 15. Test Insulators to determine their voltage distribution and string efficiency. 16. Draw a typical surge waveform. 17. Identify lightning arrester 18. Classify relays. Computer Hardware and Software II EEC 221 2. Repair common power supply issues. 3. Upgrade laptop components (RAM, SSDs, Wi-Fi cards). 4. Disassemble and repair a faulty motherboard. 5. Upgrade components in a laptop or		software	CATI
13. Draw typical waveforms of short circuit currents in power systems. 14. Plot graphs for voltage and current surges when R is less than Z, (R ≥ X) 15. Test Insulators to determine their voltage distribution and string efficiency. 16. Draw a typical surge waveform. 17. Identify lightning arrester 18. Classify relays. Computer Hardware and Software II EEC 221 1. Demonstrate how to carry out computer maintenance 2. Repair common power supply issues. 3. Upgrade laptop components (RAM, SSDs, Wi-Fi cards). 4. Disassemble and repair a faulty motherboard. 5. Upgrade components in a laptop or		power systems. 12. Determine the MVA fault level on	50
surges when R is less than Z ₁ (R < Z ₂) 15. Test Insulators to determine their voltage distribution and strong efficiency. 16. Draw a typical surge waveform. 17. Identify lightning arrester 18. Classify relays Computer Hardware and Software II EEC 221 1. Depronstrate how to carry out computer maintenance 2. Repair common power supply issues. 3. Upgrade laptop components (RAM, SSDs, Wi-Fi cards). 4. Disassemble and repair a faulty motherboard. 5. Upgrade components in a laptop or		13. Draw typical waveforms of short circuit currents in power systems.	
16. Draw a typical surge waveform. 17. Identify lightning arrester 18. Classify relays 1. Demonstrate how to carry out computer maintenance 2. Repair common power supply issues. 3. Upgrade laptop components (RAM, SSDs, Wi-Fi cards). 4. Disassemble and repair a faulty motherboard. 5. Upgrade components in a laptop or		surges when R is less than Z_0 (R< Z_0) 15. Test Insulators to determine their voltage distribution and string	
computer maintenance 2. Repair common power supply issues. 3. Upgrade laptop components (RAM, SSDs, Wi-Fi cards). 4. Disassemble and repair a faulty motherboard. 5. Upgrade components in a laptop or		16. Draw a typical surge waveform.17. Identify lightning arrester	
SSDs, Wi-Fi cards). 4. Disassemble and repair a faulty motherboard. 5. Upgrade components in a laptop or	_	computer maintenance	
motherboard. 5. Upgrade components in a laptop or			
desktop to improve performance.		5. Upgrade components in a laptop or desktop to improve performance.	
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- 6. Identify computer hardware components
- 7. Identify AT and ATX f power packs
- 8. Identify different computer interface cables
- 9. Assemble a Computer Systeme
- 10. Disassemble a Computer System
- 11. Identify faults in the following:
 - Power supplies
 - System clocks
 - Memory Cards
 - Low battery
 - I/O ports,
 - Disk drives
 - Voltages
 - Keyboard
 - Monitors
 - Scratches on discs
- 12. Rectify the following faults:
 - Overheating
 - Slow performance
 - Blue screen of Death
 - Internet connectivity issues
 - Malware

Frozen screen Power issues Software crashes Peripheral device issues Ram (memory) issues Unable to boot Applications won't install CPU problems Data loss issues Dropped internet connection 13. Demonstrate indentation and comments in python 14. Demonstrate different types of python data 15. Demonstrate functions associated with numpy 16. Demonstrate the use of numpy library 17. Create table and classes 18. Manipulate the usual functions

19. Demonstrate the pandas library

associated with numpy in python

	20. Demonstrate how to build and manipulate a data frame
	21. Identify the main algorithm of python 22. Demonstrate the launch of MATLAB
	23. Demonstrate MATLAB window as a calculator
	24. Demonstrate the following in MATLAB windows library
	25. Demonstrate the following data in MATLAB window
	Integer (int)Float
	StringBoolean
Electronics III EEC 223	Simulate an RLC circuit using MATLAB Investigate the effect of applying negative feedback on a distorted signal, input,
	autust and immediance of acception
	feedback on an amplifier. 2. Design a controller with simple control system configuration 3. Measure the frequency and amplitude of a
	sinusoidal signal of an LC-Colpitts

	oscillator. 4. Measure the frequency and amplitude of
	an output generated signal. 5. Carryout experiment to investigate the factors which affect the operation of LC Hartley oscillator and measure the frequency and amplitude of a generated
	signal 6. Carryout an experiment to determine the factors which influence the operation of transistorized monostable, bistable and astable multivibrators.
	7. Carryout an experiment to determine both the input and output waveforms of a bridge rectifier and the effects of different filter circuits
	 8. Build a circuit consisting of 555 multivibrator to determine 50% duty cycle square wave output signal 9. Sketch a block diagram representation of a converter with its components
Electric Circuit Theory H	10. Measure the input and output current and voltage levels of a converter and determine the frequency waveforms
Electric Circuit Theory II EEC 224	 Demonstrate the effect of the step-down transformer. Carryout Continuity Test on a Single Phase Transformer.

- 3. Carryout experiment on the turns ratio of a transformer
- 4. Measurement of voltage and current.
- 5. Carryout continuity test in three phase transformer.
- 6. Demonstrate terminals of three phase transformer.
- 7. Demonstrate Three phase star connected circuits.
- 8. Demonstrate three phase delta connected circuits.
- 9. Sketch the growth and decay curves in RC circuits.
- 10. Sketch curves for growth and decay of current and voltage in RL circuits.
- 11. Demonstrate three phase power measurement using two wattmeter method.
- 12. Demonstrate starting method of threephase induction motors, Direct on-line starting method.
- 13. Measure the electrical quantities of 3-phase induction motor.
- 14. Determine three -phase Induction motor under load.
- 15. Determine Torque Current Characteristic
- 16. Connect the 3-phase dual speed squirrel

	cage induction motor'. 17. Carryout experiment on Induction motor 18. Determine the polarity of coupled coils. 19. Find equivalent circuits for magnetically coupled coils.
Introduction to Industrial Automation EEC 225	 Identify: Home Automation Industrial Automation Identify the elements of the following: Home Automation Industrial Automation Identify the parts of a programmable logic controller Identify the types of Input/output devices Identify expansion modules and boards Connect and program different types of sensors and actuators. Connect different analog signals.
WAII	335

- 8. Connect the following to the PLC:
 - On/Off sensors
 - Analog sensors
 - Switches
 - Actuators
 - Valves
 - Drives
- 9. Turn on a motor or lamp using two buttons applying latching logic
- 10. Turn off a motor or lamp using two buttons applying latching logic
- 11. Make a program in ladder diagram
- 12. Translate a ladder diagram program into electrical and logic circuits equivalent.
- 13. Carry out basic Timer operations
- 14. Carry out basic counter operations
- Download programs to/from a CPU using PLC software
- 6. Upload programs to/from a CPU using PLC software
- 17. Interpret what each status light on a PLC or CPU module indicates.
- 18. Interpret PLC error codes.
- 19. Resolve common hardware and software issues.

- 20. Identify components of robot based on configuration and application.
- 21. Identify household items that can be characterized as mechatronic System.
- 22. Identify components of the task above that help identify them as mechatronic Systems.
- 23. Identify the characteristics of the following:
 - LVDT
 - Variable Capacitor.
 - Light Dependent Resistor
 - Resistance Temperature Detector
 - Thermistor.
 - Thermocouple.
- 24. Identify different drives
- 25. Program a basic HMI for a PLC system.

List of Minimum Resources

LISTS OF EQUIPMENT, INSTRUMENTS AND TOOLS IN THE LABORATORIES, WORKSHOPS AND STUDIOS FOR ND ELECTRICAL & ELECTRONICS ENGINEERING TECHNOLOGY

A. BASIC ELECTRICITY, MEASUREMENT AND INSTRUMENTATION LABORATORY

	DESCRIPTION OF ITEM	
S/N	DESCRIPTION OF ITEM	QUANTITY
1.	Basic Electricity Kit/Trainer	5
2.	Electronics Trainer	3
3.	Experimental Trainer for AC and DC	3
4.	Analogue Multimeter	5
5.	Digital Multimeter	5
6.	Wheatstone Bridge	5
7.	Potentiometer	5
8.	Rheostats (Various ranges)	10
9.	Wattmeter	5
10.	Variac	5
11.	Ammeters (Various ranges)	
	0- 25A DC	5
	0- 2 A AC	5
12.	Milliammeter	
	0 1000mA DC	5
	0- 1000mA AC	5
13.	Micrometer	
	0- 1000mA DC	5
	10- 1000mA AC	5
14.	Voltmeter	
	0-500V DC	5
	0-500V AC	5
15.	Millivoltmeter	
	0- 1000mV DC	5

1.6		
16.	Ohmmeter	
	0- 5 ohms	5
	0- 25 ohms	5
	0- 50 ohms (Multirange)	5
17.	Galvanometer (triple range)	
	50-0-50mA	5
	500-0-500mA	5
	5-0-5 mA	5
18.	Fire extinguisher	
19.	First aid box	V i
20.	Safety bucket	1
21.	Safety posters	6

B. ELECTRONICS/TECOMMUNICATIONS LABORATORY

S/N	DESCRIPTION OF ITEM	QUANTITY
1.	Semiconductor Kit/Trainer	5
2.	Digital Trainer/Logic Tutor	5
3.	Operational Amplifier (Op Amp)	5
4.	Arduino Uno kits	5
5.	Function Generator	5
6.	Frequency Counter	5
7.	Electronics Trainer	5
8.	Communication Trainer Kit	5
9.	AM/FM Transmitter and Receiver	5
10.	Transistor Amplifier Trainer/Demonstrator	5
11.	Circuit Construction Deck/Trainer	10
12.	Microcontroller	5
13.	Microcontroller Trainer	5
	339	

	Function Congretor	5
	Function Generator	
	Frequency Counter	5
1		
	i. 50MHz	5
	ii. 100MHz	5
	. Signal generators (AF, RF)	5
1		5
	. Transistor Tester	5
2		5
2		5
2	*	5
2		5
2		5
2		10
2	. RLC bridge	5
2	. Optocoupler	5
2		5
2	. Wave guides	5
3	Fire extinguisher	1
3		1
3		1
3		6
	Mr Bo.	
WALL	340	

C. POWER & MACHINES LABORATORY

C. TOWER & MACHINES LABORATORY				
ELECTRICAL POWER SECTION				
S/N	DESCRIPTION OF ITEM	NUMBER REQUIRED		
1.	Power Demonstration Units	3		
2.	Stabilizer power units	3		
3.	Power factor meter			
4.	Wattmeter:			
	- Single	5		
	- 3 Phase	5		
5.	Energy meter:			
	- Single	5		
	- 3 Phase	5		
6.	Digital Multimeter	5		
7.	Analogue Multimer	5		
8.	Clip-on ammeter	5		
9.	Transmission and Distribution Lines Model	3		
10.	Insulation Resistance Meter (Megger testers)	3		
11.	Tachometer (mechanical)	5		
12.	Stroboscope	5		
13.	Digital phase meter	5		
14.	Phase sequence meter/indicator	5		
MACHINES SECTION				
S/N	DESCRIPTION OF ITEM	NUMBER REQUIRED		
15.	Motor-Generator Sets for Laboratory Use (DC supply	1		
•	source			
16.	Machine Control Panel Trainer	1		
17.	Tachogenerator	5		
18.	Synchronous Motor	5		

19.	DC motors:	
	- Series	3
	- Shunt	3
	- Compound	3
20.	DC Generators:	
	- Self excited	3
	- Separately excited	3
	- Shunt	
	- Compound	3
	- Starters	3)
21.	A. C. Motors:	
	- Single phase induction motors (assorted)	3
	- 3 phase induction motor	3
	- Dynamometer set	3
	- Direct online starters	3
	- Star-delta starters	3
22.	Transformers:	
	- Power Transformer (single phase)	5
	- Power Transformer (3-phase)	5
	-Transformer Trainer (Single Phase)	2
	-Transformer Trainer (Three Phase)	2
23.	Variable resistance load	3
24.	Variable inductive load	3
25.	Variable capacitive load	3
26.	Single Phase Capacitor Start Capacitor Run Motor"	5
27.	Compound motor relay	5
28.	Flux Meter	5
29.	PID Controller	5

20	DI . H	
30.	Plotter	2
31.	Temperature Sensors	3
32.	Thermometer	5
33.	PLC device with training board equipped with manual switches for digital inputs and adjuster voltage/current source for analog inputs, sensors, audio switches and actuator for training	3
24		
34.	PLC programming software	5)
35.	SCADA software	2
36.	Samples of motor name plate	10
37.	Fire extinguisher	1
38.	First aid box	1
39.	Safety bucket	1
40.	Safety posters	6
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LISTS OF EQUIPMENT, INSTRUMENTS AND TOOLS IN THE WORKSHOPS

D. ELECTRICAL INSTALLATION AND MAINTENANCE WORKSHOP

S/N	DESCRIPTION OF ITEM	QUANTITY
1.	Wiring boards (0.7m x 0.7m)	40
2.	Pedestal drill	1
		1
3.	Hand drill	3
4.	Electrician tool kits	10
5.	Conduit bending machine, and accessories (for Metal)	3
6.	Conduit Bending (Spring Type – for PVC)	20
7.	Bench vices	5
8.	Earth leakage circuit breakers (ELCB)	6
9.	Cable jointing kits for:	
	- Soldering pot & ladle	2
	- Soldering iron	40
	- Modern Raychem joints	3
	- Blowlamp	3
10.	Earth rods and accessories	5
11.	Simulated wall for vertical conduit and metal cable installations	3
12.	Various sizes of PVC cables	5
13.	MICC cables and accessories	5
14.	Underground cables and accessories	5
15.	Various consumables (lamp holders, sockets, etc)	Lot
16.	Insulation Resistance Meter (Megger Tester)	5
17.	Overhead line materials:	
	- Safety belts	10
	- Conductor joint kits	5
	- Earthing kits	3

18. 19. 20. 21. 22. 23. 24.	Inverter Charge Controller Electric cookers, fans, iron etc. (used ones) Motors (assorted) used ones Generators (assorted) used	2 2 3 each
21. 22. 23.	Charge Controller Electric cookers, fans, iron etc. (used ones) Motors (assorted) used ones Generators (assorted) used	
21. 22. 23.	Electric cookers, fans, iron etc. (used ones) Motors (assorted) used ones Generators (assorted) used	
23.	Motors (assorted) used ones Generators (assorted) used	3
	Generators (assorted) used	
24.	, ,	3
	Starter:	V
	- Direct online	3
	- Star delta	3
	-Auto Transformer	2
25.	Coil winding equipment (Manual)	1
26.		1
27.	Refrigerator (used)	2
28.		2
29.	Satellite Decoder	2
30.	Battery charging facilities	
	- Charger (trickle, constant current and constant voltage charging	1
	system)	
	- Battery	1
	- Electrolytes	3
	- Hydrometer	3
31.	Thermo-setting and thermo-plastic	3
32.	Multimeter	5
		3
33.	Lata Bop toster	
33. 34.		1
	Fire extinguisher	
34. 35.	Fire extinguisher First aid box Safety bucket	

E. ELECTRONIC WORKSHOP

S/N	DESCRIPTION OF ITEM	QUANTITY
1.	Electronic technician tool kits	10
2.	Electronic Discrete Components:	Assorted
	(Resistor, Capacitors, Inductors, diode, Zener diodes, Transistor	
	(BJT, FET, JFET, MOSFET), Thyristor, SCR, Multivibrator,	
	etc.)	
3.	Soldering Station	5
4.	Soldering iron (assorted)	20
5.	Multimeter	10
6.	I.C. Tester	5
7.	Transistor tester	5
8.	Galvanometer	5
9.	Radio Set (used one)	5
10.	TV Sets (Plasma, LED) – used one	5
11.	Amplifiers	5
12.	Oscilloscope	1
13.	DC Power Supply	3
14.	Phone (Keyboard) (used)	5
15.	Android phone (used)	5
16.	Phones Repair Kits	5
17.	Microphones	3
18.	Transceivers (walkie talkie)	5
19.	DC/DVD Player	5
20.	Bread Board	30
21.	Vero Board	30
22,	Fire exanguisher	1
23.	First aid box	1
24.	Safety bucket	1
25.	Safety posters	6

F. MECHANICAL WORKSHOP

	V INECESSION (V GILLBIRG)	
S/N	DESCRIPTION OF ITEM	QUANTITY
1.	Pillar drilling machine	3
2.	Bench drill machine	3
3.	Hand drill machine	6
4.	Drilling Machine Accessories	1
	(i) drill sets in boxes	4
	(ii) drills 1/16"x 1/2"	4
	(iii) drills 1mm	4
	(iv) Drill chuck and keys	4
5.	Shaping Machine	1
6.	Grinding Machine	2
7.	Gabro type guillotine/Notches 2M	1
8.	Lathe Machine	1
9.	Riveting machine	1
10.	Power hacksaw (metal cutting machine) with accessories	1 unit
11.	Saw	Assorted
12.	Welding/Fabrication Equipment	
	i. Electric Unit with accessories	2
	ii. Gas Unit with accessories	2
	a. Welding beds	2
	b. Brazing equipment	2
	c. Brazing rods	2
	d. Soldering rods	2
13.	V 7. E CC	10
14.	Apron (leather)	10
15.	Anvil	2

	Welding Booth	3
17.	Welding Marking out tools	Assorted
18.	Welding head shield	4
19.	Welding joint teaching aids (diagram)	Assorted
20.	Pliers	Assorted
21.	Punches	Assorted
22.	Screw Driver	Assorted
23.	Spanners	Assorted
24.	Files	Assorted
25.	Boring tools	Assorted
26.	Micrometers Manual	4
27.	Micrometers Digital	4
28.	Rules	Assorted
29.	Vernier Calipers	Assorted
30.	Gauges	Assorted
31.	Hammers	Assorted
32.	Mallets	Assorted
33.	Stock and dies	1 set
34.	Hand Machine Reamers	1
35.	Clamps	Assorted
36.	Tap and Wrenches	2
37.	Chisels	Assorted
38.	Scrapers	Assorted
39.	Fire extinguisher	1
40.		1
41.	Şafety bucket	1
42.	Safety posters	6
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LISTS OF EQUIPMENT, INSTRUMENTS AND TOOLS IN THE STUDIOS

G. DRAWING STUDIO

	DRIVING STODIO	
S/N	DESCRIPTION OF ITEM	QUANTITY
1.	Drawing tables	40
2.	Drawing/drafting stools	40
3.	Adjustable set squares	4
4.	Desk sharpeners	4
5.	Scale rule (triangular and flat)	30
6.	White board rulers	**
7.	White board Tee-squares	4
8.	White board set-squares (45 & 60)	4
9.	White board compasses	4
10.	White board protractor	4
11.	French curve	4
12.	Letter and number stencils	10
13.	Storage cabinet for drawing papers	1

H. COMPUTER STUDIO/SOFTWARE LABORATORY

S/N	DESCRIPTION OF ITEMS	QUANTITY
1.	Computer systems	30
2.	Solar Power Installation	1
3.	Internet Connectivity	1
4.	Printer (All in one)	1
5.	Multimedia Projector	1
6.	Projector screen	1
7.	Software packages	1 each
	- Operating system (Windows, Linux, Macintosh etc)	

	- Network operating systems	
	- Simulation software (Multisim, Proteus Design,	
	MATLAB, Python, Electronic workbench, Packet	
	Tracer, Scilab, Octave etc)	
	- PLC and SCADA Software	
	- Application suites (MS Office suite etc)	
	- Integrated Development Environment (MS Visual	
	studio, NetBeans etc)	
	- Word processing	
	- Spreadsheet	()
	- Statistical packages	
	- Graphics packages	
	- Educational packages	
8.	Troubleshoot software packages	Varieties
9.	Fire extinguisher	1
10	First aid box	1
11	Safety bucket	1
12	Safety posters	6
WAIL	350	

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