AFRICAN COLLEGE OF COMMERCE

P.O. BOX 301 KABALE – UGANDA

THE CURRICULUM FOR THE CERTIFICATE IN PLUMBING (CP)

THE STRUCTURE, REGULATIONS AND SYLLABUS

YEAR 2014

VISION

To be a leading Institution in Business, Technical and Vocational Training in Africa

MISSION

To establish a competence - based training that equips the learners with skills relevant to employment and economic growth

CORE VALUES

1. **Competence based training for competent and skilled graduates;**

2. **Integrity based on honesty and ethics;**

3. **Hard work, dedication, and achievement of results.**

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THE HISTORY OF

AFRICAN COLLEGE OF COMMERCE (ACC)

African College of Commerce is an Educational Institution majoring in Business Technical and Vocational training programmes. Below is the historical background of the institution.

1986: 14th April, Commissioned as a Business Education Institution.

1986: June, Registered and recognised by the Ministry of Education.

1990: Held the first Graduation Ceremony;

1992: Introduced Computer Science Courses;

1994: Granted Examinations Centre U62 by the Uganda National Examinations Board,

1998: Purchased land on which to construct the Main Campus

2003: Affiliated to Makerere University Business School (MUBS)

2004: Shifted from rented building in Kabale town centre to Kekubo cell a kilometre away in our own buildings in an area conducive for learning

2005: Received donation from the Federal Republic of Germany in form of buildings, computers, text books and Human Resource Development.

2006: Established ICT Centers in Kabale and Kanungu Districts with the assistance of the Uganda Communications Commission.

2007: Worn a BRONZE Medal from the Federation of Uganda Employers for being the third best employer in Uganda for the year 2006.

2008: Accredited by the National Council for Higher Education as a recognized Institution of Higher learning in Uganda:

2010: Re branding African College of Commerce. Introduced more Technical and Vocational programmes and short courses.

2011: April 16th 2011, Cerebrate Silver Jubilee **1986 to 2011**. Penetrated the Rwanda, Congo, Tanzania Burundi and Kenya

2012: Transformed into a fully fledged **Polytechnic.** Engaged all the training programmes into innovation and production units for products and services. Concretised the hands on training and competence based approach.

2014: Affiliating to Kyambogo University for diploma programmes and in particular the Diploma in Instructor and Technical Teacher Education DITTE, under Skilling Uganda Strategy.

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PART B: DETAILED COURSE CONTENT

PART A GENERAL REGULATIONS

1.0 LIST OF ACRONYMS

CP	Certificate in Plumbing
CGPA	Cumulative Grade Point Average
CH	Contact Hours
CU	Credit Units
GP	Grade Point
GPA	Grade Point Average
LH	Lecture Hours
NP	Normal Progress
PH	Practical Hours
PP	Probational Progress
ATP	Assessment Training Packages
ACC	African College of Commerce
ACCEB	African College of Commerce Examinations Board

2.0 TITLE

The title of the Programme is **Certificate in Plumbing**

3.0 INTRODUCTION

The Certificate in Plumbing is a two year academic programme aimed at providing students with skills of installation of the system of pipes, tanks, fittings, and other apparatus required for the water supply, heating, and sanitation in a building.

3.1 Rationale

The building and Construction industry is growing rapidly in Uganda and East Africa at large. The constructed buildings need installation of water and sanitation. There is also increasing need for clean water for all. This require the skills of competently trained personnel in the fields of Plumbing. This programmes therefore intends to produce competent Plumbers to meet the growing demand in building and construction industry, and water and sanitation

3.2 Target Group

The target group is the Senior Four leavers and certificate holders in related fields from a re-organised institution

4.0 OBJECTIVE OF THE PROGRAMME

The programme is intended to train and equip learners with knowledge and skills in Plumbing industry

5.0 PROGRAMME OUTCOMES

The graduate of Plumbing should competently apply skills and knowledge of installation of the system of pipes, tanks, fittings, and other apparatus required for the water supply, heating, and sanitation in a building.

6.0. JOB TITLES FOR CERTIFICATE IN PLUMBING PRACTICE GRADUATES

- Plumber
- Assistant supervisor of works
- Masonry work
- Site foreman
- Trades foreman
- Assistant contract manager

7.0 ORGANIZATIONS THAT EMPLOY BCP GRADUATES

- Self Employment
- Plumbing companies
- National Water and Sewerage Cooperation
- District local governments
- Central governments and its parastatals
- International organizations
- Non Government Organizations
- Self Initiated companies

8.0 NATURE OF COURSES.

All the courses in this programme are compulsory.

9.0 ADMISSIONS AND ENTRY REQUIREMENTS

The applicant will be eligible for admission to the Certificate in Plumbing on meeting any of the following minimum qualifications:

9.1 Ordinary Level Entry Scheme (UCE)

The minimum entry requirement to the Certificate in Plumbing is:

a) Uganda Certificate of Education (UCE) with at least 3 passes in Science subjects;
b) Qualifications equivalent to Uganda Certificate of Education (UCE) as shall be determined by the National Council in consultation with the Uganda National Examinations Board;

10.0 DURATION OF THE PROGRAMME.

The minimum period to complete the Certificate in Plumbing is two years and the maximum period is four years. If the student fails to complete the programme in four years he/she shall be required to repeat the whole programme.

11.0 MODE OF DELIVERY AND INSTRUCTIONAL STRATEGIES

The mode of delivery and instructional strategies shall be by the following:

11.1 Lectures for theory
11.2 Practical work in form of Projects
11.3 Field work through industrial training and Study tours

12.0 STUDY MATERIALS AND INFRASTRUCTURE

12.1 Institutional Infrastructure

The institution will use the existing facilities on ACC Campus. The institution has sufficient infrastructure to facilitate the teaching and learning process e.g., furniture, lecture rooms, workshops, library, computer laboratories and a tools resource room.

12.2 Study Facilities

The Faculty of Engineering will use the existing study facilities on ACC Campus. The institution has sufficient study facilities to facilitate the teaching and learning process e.g. relevant materials, tools and equipment to the programme, computers, handouts, textbooks and other materials from individual lecturers, journals and related publications, internet connectivity in the computer laboratories, library with wireless connection, audio visual materials, relevant software programme, source documents, archival records, government policy papers, Government Acts and Statutes, research and innovations by lecturers and students.

13.0 HUMAN RESOURCE

The Faculty of Engineering has well qualified and experienced teaching and technical staff managing the Certificate and Diploma Programmes. The academic and technical staff to support the Certificate in Plumbing will be drawn from the programmes under the Faculty as listed on page 81 of this curriculum

14.0 PROGRAMME STRUCTURE

14.1 YEAR ONE SEMESTER ONE

Code	Name	LH	PH	CH	CU
CP 1101	Workshop Practice I	15	120	75	5
CP 1102	Water Supply I	45	60	75	5
CP 1103	Drainage & Sanitation I	35	80	75	5
CP 1104	Mathematics I	40	40	60	4
CP 1105	Technical Drawing I	10	70	45	3
CP 1106	Basic Communication Skills	30	30	45	3
CP 1107	Computer Applications I	20	50	45	3
CP 1108	Plumbing Project I	10	130	75	5
	Total	**205**	**580**	**495**	**33**

14.2 YEAR ONE SEMESTER TWO

Code	Name	LH	PH	CH	CU
CP 1201	Workshop Practice II	15	120	75	5
CP 1202	Water Supply II	45	60	75	5
CP 1203	Drainage & Sanitation II	35	80	75	5
CP 1204	Tools & Materials	30	30	45	3
CP 1205	Technical Drawing II	10	70	45	3
CP 1206	Computer Applications II	20	50	45	3
CP 1207	Plumbing Project II	10	130	75	5
CP 1208	Fieldwork	10	130	75	5
	Total	**175**	**670**	**510**	**34**

14.3 YEAR TWO SEMESTER ONE

Code	Name	LH	PH	CH	CU
CP 2101	Workshop Practice III	15	120	75	5
CP 2102	Craft Science & Calculations I	50	20	60	4
CP 2103	Foremanship	40	10	45	3
CP 2104	Engineering Software	20	50	45	3
CP 2105	Plumbing Project III	10	130	75	5
	Total	**135**	**330**	**300**	**20**

14.4 YEAR TWO SEMESTER TWO

Code	Name	LH	PH	CH	CU
CP 2201	Workshop Practice IV	15	120	75	5
CP 2202	Mathematics II	40	40	60	4
CP 2203	Craft Science & Calculations II	50	20	60	4
CP 2204	Hydraulics	45	60	75	5
CP 2205	Entrepreneurship Skills	50	20	60	4
CP 2206	Plumbing Project IV	10	130	75	5
	Total	**210**	**390**	**405**	**27**

15.0 PROGRAMME LOAD

To qualify for the award of the CERTIFICATE IN PLUMBING, a candidate must obtain 114 credit units distributed as follows:

YEAR ONE	SEMESTER I	33
	SEMESTER II	34
YEAR TWO	SEMESTER I	20
	SEMESTER II	27
TOTAL		**114**

16.0 CURRICULUM

The curriculum for the CERTIFICATE IN PLUMBING programme will be prepared by African College of Commerce and accredited by National Council for Higher Education (NCHE).

17.0 EXAMINATION REGULATIONS

The examination rules and regulations for the CERTIFICATE IN PLUMBING will be set by African College of Commerce Examinations Board.

18.0 ADMISSIONS AND WITHDRAWALS FROM THE PROGRAMME

Admission into the programme will close at the end of the third full week of each semester;

19.0 PROGRESSION

Progression of a student will be classified as normal, probational or discontinued as follows

19.1 Normal progress

Normal progression occurs when a student passes each course taken with a minimum grade point of 2.0.

19.2 Probational progress

This is a warning stage and it occurs when a student;

(i) Fails a core/compulsory course
(ii) Has GPA or CGPA of less than 2.0

19.3 Stay Put

A student who fails more than a half of the total number of courses in a semester will be required to stay on that semester until the failed courses are cleared. .

19.4 Re-taking.

A student shall retake any course when it is offered next, to pass or to improve performance. A student shall retake in a course only two times.

19.5 Discontinuation

That a student is discontinued when he or she has:

I. Received three (3) consecutive probations on the same core or compulsory course.
II. Received a CGPA of less than 2.0 for three consecutive probations.
III. Failed to present him/her-self for final examinations without giving sufficient reasons.
IV. Over stayed on the programme for a period of more than four years

20.0 FINAL EXAMINATION PAPER FORMAT

20.1 YEAR I SEMESTER I

PAPER NAME AND CODE	EXAMINATION FORMAT
CP 1101 Workshop Practice I CP 1102 Water Supply I CP 1103 Drainage & Sanitation I CP 1104 Mathematics I CP 1106 Basic Com. Skills	Each paper will consist of seven questions and the candidate will be required to answer **at least five**. All questions carry equal marks. The Students should be assessed on memory, understanding, application, analysis, synthesis and evaluation. The duration of the examination will be three hours
CP 1105 Technical Drawing I	This paper will consist of four questions and the candidate will be required to answer them all. The duration of the examination shall be six hours
CP 1107 Computer Applications I	The paper will consist of three exercises and the candidate will be required to answer all. The total duration of the examination will be two hours.
CP 1108 Plumbing Project I	This paper will consist of continuous assessment marks. African College of Commerce will always invite an external field practicing expert to verify the authenticity of the awarded marks from the completed projects on the ground and by making candidates participation through presentations of the projects completed in the respective semester. The duration of the examination will be during 15 weeks of teaching

20.2 YEAR I SEMESTER II

PAPER NAME AND CODE	EXAMINATION FORMAT
CP 1201Workshop Practice II CP 1202 Water Supply II CP 1203 Drainage & Sanitation II CP 1204 Tools & Materials	Each paper will consist of seven questions and the candidate will be required to answer **at least five**. All questions carry equal marks. The Students should be assessed on memory, understanding, application, analysis, synthesis and evaluation. The duration of the examination will be three hours
CP 1206 Computer Applications II	The paper will consist of three exercises and the candidate will be required to answer all. The total duration of the examination will be two hours.
CP 1205 Technical Drawing II	This paper will consist of four questions and the candidate will be required to answer them all. The duration of the examination will be six hours
CP 1208 Plumbing Project II	This paper will consist of continuous assessment marks. African College of Commerce will always invite an external field practicing expert to verify the authenticity of the awarded marks from the completed projects on the ground and by making candidates participation through presentations of the projects completed in the respective semester. The duration of the examination will be during 15 weeks of teaching.

20.3 YEAR II SEMESTER I

PAPER NAME AND CODE	EXAMINATION FORMAT
CP 2101 Workshop Practice III CP 2102 Craft Science & Calculations I CP 2103 Foremanship	Each paper will consist of seven questions and the candidate will be required to answer **at least five**. All questions carry equal marks. The Students should be assessed on memory, understanding, application, analysis, synthesis and evaluation. The duration of the examination will be three hours
CP 2104 Engineering Software	This paper will consist of one practical section. It will consist of two practical questions and a candidate will be required to answer at least one questions. Section B will consist of three practical questions and a candidate will be required to answer at least two questions. The duration of the this practical examination shall be five hours
CP 2105 Plumbing Project III	This paper will consist of continuous assessment marks. African College of Commerce will always invite an external field practicing expert to verify the authenticity of the awarded marks from the completed projects on the ground and by making candidates participation through presentations of the projects completed in the respective semester The duration of the examination will be during 15 weeks of teaching.

20.4 YEAR II SEMESTER II

PAPER NAME AND CODE	EXAMINATION FORMAT
CP 2201 Water Supply IV CP 2202 Mathematics II CP 2206 Craft Science & Calculations II CP 2104 Hydraulics CP 2205 Entrepreneurship Skills	Each paper will consist of **eight** questions and the candidate shall be required to answer **at least five**. All questions carry equal marks. The Students should be assessed on memory, understanding, application, analysis, synthesis and evaluation. The duration of the examination will be three hours
CP 2206 Plumbing Project IV	This paper will consist of continuous assessment marks. African College of Commerce will always invite an external field practicing expert to verify the authenticity of the awarded marks from the completed projects on the ground and by making candidates participation through presentations of the projects completed in the respective semester The duration of the examination will be during 15 weeks of teaching.

21.0 ASSESSMENTS AND GRADING

21.1 Theory Assessment

21.1.1	Continuous Course Work	
	21.1.1.1 Course work 1	10%
	21.1.1.2 Course work 2	10%
	21.1.1.3 Course work 3	10%
	Total	**30%**
21.1.2	End of Semester Examination	**70%**
	Total	**100%**

21.2 Project Work

21.2.1	Project Assessment 1	20%
21.2.2	Project Assessment 2	20%
21.2.3	Student's Personal Innovation	20%
21.2.4	Project Assessment 4	40%
	Total	**100%**

21.3 Field Work

21.3.1	Industrial Training	70%
21.3.1	Field Tours	30%
	Total	**100%**

21.4 Assessment Training Packages (ATPs)

Each student will be assigned an Assessment Training Package. This will record the student's academic progression. This will include assessment areas, grades obtained from course works, project work, field work and final examination.

21.5 Grading courses

Each course unit will be graded out of a maximum of one hundred (100) marks and assigned grade point as follows

MARKS (%)	GRADE POINTS
80-100	5.00
75-79	4.50
70-74	4.00
65-69	3.50
60-64	3.00
55-59	2.50
50-54	2.00
Below 50	0.00

The course pass mark is 50% which is Grade Point 2.0.
No credit unit will be awarded for any course in which a student fails.

21.6 Scaling

All the grades will be scaled down to 100%

22.0 AWARDS AND CLASSIFICATION

22.1 Awards

A successful candidate will be awarded the Certificate in Plumbing of African College of Commerce (ACC)

22.2 Grade Point Average (GPA)

A grade point average is mark calculated to determine the final award. To arrive at a grade point average, the following steps are taken.

a. Multiply the Grade Point by the Credit Unit to get a Weighted Score of a Course;
b. Add together the weighted scores for all courses taken up to that time to get **total weighted score(TW);**
c. Add the Credit Units for each course to get the **Total Credit Units (TCUs);**
d. Divide the total weighed scores by the total number of credit units taken up to that time to get **grade point average (GPA). TWs/TCUs =GPA.**

The letter grades shall be used for Grade Point Averages (GPAs) as follows:

A	B+	B	C	D
5	4	3	2	1

22.3 Cumulative Grade Point Average (CGPA)

This is determined by dividing total accumulated weighted scores (TWs) by the total accumulated credit units (TCUs) up to a particular time.

22.4 Classification of Final Awards

CLASS	**FINAL CGPA**	**LETTER GRADE**
First Class	4.4 – 5.0	A
Second Class Upper Division	4.0 – 4.3	B+
Second Class Lower Division	3.0 – 3.9	B
Pass	2.0 – 2.9	C
Fail	1 - 1.9	D

PART B: DETAILED COURSE CONTENT

23.0 YEAR ONE SEMESTER ONE

23.1 WORKSHOP PRACTICE I

Course Code **CP 1101**

Credit Unit **5**

Contact Hours **75**

COURSE DESCRIPTION
This course introduces students to the bench work activities like measuring, marking, sewing, chiseling, drilling and gas welding

LEARNING OUTCOMES
By the end of this course Students should be able to use different types of tape measures to measure distance around the timber, use different types of chisels and use well gas welding.

OBJECTIVES
By the end of this course the learner should be able to:
1. Use different types of tape measures
2. Use different types of drilling and chiseling machines
3. Use the gas welding.

COURSE CONTENT

CHAPTER ONE
1.0 Bench work
1.1 Measuring
1.2 Marking
1.3 Centre Punching
1.4 Sewing
1.5 Punching
1.6 Chiseling
1.7 Filing
1.8 Drilling

CHAPTER TWO
Gas Welding
Welding techniques (left ward/rightward)
Assembling
Horizontal/vertical
Butt well.
Fillet joint weld

MODE OF DELIVERY
The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE
This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES
1. Plumbing by F.HALL

23.2 WATER SUPPLY I

Course Code **CP 1102**

Credit Unit **5**

Contact Hours **75**

COURSE DESCRIPTION
This course introduces students to the different sources of water, processes involved in water treatment and different systems of cold water.

LEARNING OUTCOMES
Students should be able to classify different sources of water, qualities of good water and learn how to treat water

OBJECTIVES
By the end of this course the learner should be able to:
1. Classify different sources of water
2. State the qualities of good water supply
3. Identify the processes involved in water treatment
4. Differentiate different systems of cold water

COURSE CONTENT

CHAPTER ONE
1.0 Introduction to plumbing
1.1 Trades
1.2 Qualities

CHAPTER TWO
2.0 Origin of Water
2.1 Water cycle – formation of rain
2.2 Sources of water
2.2.1 Rain
2.2.2 Surface water – lakes, rivers etc
2.2.3 Ground water – willow, deep, and artesian wells
2.3 Wells
2.3.1 Driven wells
2.3.2 Drilled wells
2.4 Qualities of water

CHAPTER THREE
3.0 Ph Value
3.1 Soft water
3.2 Hard Water
3.3 Hardness of Water
3.3.1 Temporary
3.3.2 Permanent
3.3.3 Water softener
3.3.4 Base exchange process

CHAPTER FOUR

4.0 Water Treatment

4.1 Definition
4.2 Impurities
4.3. Gas
4.4 Organic
4.5 Inorganic
4.6 Stage /processes of water treatment
4.7 Screening
4.8 Sedimentation
4.9 Filtration
4.10 Chlorination / sterilization

CHAPTER FIVE

5.0 Water Mains

5.1 Definition
5.2 Pumping mains
5.3 Truck mains
5.4 Reservoirs
5.5 Tapping water mains (under pressure)
5.6 Safety involved
5.7 Sources of Water Supply
5.8 Surface water
5.9 Underground water
5.10 Properties of water from each source

CHAPTER SIX

6.0 Rain Water Harvesting

6.1 Calculation of surface area of materials required for
6.2.1 Storage cisterns.
6.2.2 Rain water gutters.
6.2.3 Rain water channels/heads.
6.2.4 Rain water down pipes.
6.3 Storage Cistern
6.3.1 Sitting.
6.3.2 Connections (pipe lines).
6.3.3 Support/protection.
6.3.4 Ventilation.
6.3.5 Head in metres.
6.3.6 Capacities (nominal/actual).

CHAPTER SEVEN

7.0 Cold water supplies

7.1 Indirect cold supply to sanitary appliances.
7.2 Why Uganda recommends the indirect system.
7.3 Provision of control valves.
7.3.1 Hot Water Supply
7.3.2 Indirect system (using solid fuel).
7.3.3 Reasons for use.
7.3.4 Calorifier types.
7.3.5 Threads used on cylinders and pipes.
7.3.6 Supply leads (storage and feed cisterns)

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.

There will be the final examination in the last two weeks of the semester.

REFERENCES

2. Plumbing by F.HALL
3. Waste water Engineering by Dr. B C Punmia, Arun Kumar Jain, Ashok Kumar Jain
4. Plumbing by Town Send
5. Plumbing Practical Motivate I and II
6. Shaw, E.M, Hydrology in practice, Chapman and Hall, 1994,London, Uk
7. Hornberger et,al. Elements of physical hydrology, The John Hopkins University press, 1998

23.3 DRAINAGE AND SANITATION I

COURSE CODE **CP 1103**

CREDIT UNITS **5**

CONTACT HOURS **75**

COURSE DESCRIPTION:
This course covers all the issues related drainage for rural and urban populations, water treatment and solid waste management

LEARNING OUTCOMES
By the end of this course, students should be able to design the public and domestic excreta systems.

OBJECTIVES OF THE COURSE
By the end of this course, students should be able to:
1) Design the public and domestic excreta systems
2) Construct public and domestic excreta systems
3) Educate the public on the good health practices

COURSE CONTENT

CHAPTER ONE
1.0 Health Issues and Microbiology:
1.1 Public Health Concerns,
1.2 Sanitation related Illnesses and diseases; such as cholera, typhoid fever, dysentery, infant diarrheas, hookworm, ascariasis, bilharziasis, transmission of disease and prevention methods
1.3 Micro-organisms Present in Water Including Classification and Effects: Microbes, Plants and Animals. Protozoa, Algae. Bacteria, fungi.

CHAPTER TWO

2.0 Rural/ Urban Sanitation and Drainage:
2.1 Excreta Disposal Methods, Design Considerations, Construction, Operation and Maintenance, of pit latrines, Ecosan toilets, VIP latrines, bucket latrines, water seal latrines, Cesspool, septic tank, soak pits, leaching fields,
2.2 Household Sanitation, wash water sumps, soak pit, soakage trench)
2.3 Solid Waste Management (Generation, sorting, collection, transportation, disposal, recycling, composting)
2.4 Types of Sewage/Drainage Systems separate, combined or partial
2.5 Storm Drainage Systems: hydrological consideration, design flow, procedures for estimating runoff, storm water inlets, pipes and materials, system layout.

CHAPTER THREE
3.0 Waste water Collection
3.1 Building connections,
3.2 Collecting and intercepting sewers,
3.3 Pipes and materials,
3.4 System layout,

3.5 Sewer maintenance,
3.6 Protection of sewerage system against flood waters, Inverted siphons,
3.7 Wastewater pumping stations location of treatment plants

CHAPTER FOUR

4.0 Waste Water Quality Characteristics and treatment:
4.1 Dissolved oxygen,
4.2 Biochemical oxygen demand,
4.3 Relative stability,
4.4 Chemical oxygen demand
4.5 Chlorine demand,
4.6 Grease, & volatile acids,
4.7 Suspended solids,
4.8 Micro organisms,
4.9 Typical domestic waste characteristics
4.10 Reasons for treatment,
4.11 Biological and physical treatment,
4.12 Waste water quality standards
4.13 Conventional treatment plant methods: including screening, grit removal, sedimentation,
4.14 Sludge disposal
4.15 Design, Construction, operation and maintenance of stabilization ponds, and septic tanks

CHAPTER FIVE

5.0 Solid waste Management

5.1 Generation, Sorting and separation
5.2 Collection and transportation,
5.3 Treatment,
5.4 Recycling and disposal
5.5 Treatment of leachates,

CHAPTER SIX

6.0 Treatment of industrial wastes

6.1 Characteristics of industrial wastes and their effects on water bodies
6.2 Characteristics of agricultural wastes and their effect on water bodies
6.3 Dilution purification
6.4 Pretreatment of industrial wastes

CHAPTER SEVEN

7.0 Special Problems:
7.1 Low-Lying Water / Logged Areas, (wetlands) destruction and pollution
7.2 Poor Urban Areas; slums and their sanitation problems
7.3 Pollution by polythene bags, plastic bottles and their control
7.4 Sanitation and water supply on islands

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Dr. B. C. Runmia (1988), Waste Water Engineering
2. Environmental Biotechnology: Advancement in Water and Wastewater Application, edited by Z. Ujang, IWA Proceedings, Malaysia (2003) Ehlers, Victor (1943). Municipal and rural sanitation. New York: McGraw-Hill book company, Inc.
3. Heller, Léo, and José Esteban Castro. Water and Sanitation Services: Public Policy and Management. n.p.: Earthscan, 2009. EBook Collection (EBSCOhost). Web. 14 Nov. 2012.
4. Stewart, Amy, and Tim Gray. Governance of Water and Sanitation in Africa: Achieving Sustainable Development through Partnerships. n.p.: I.B. Tauris, 2009. EBook Collection (EBSCOhost). Web. 14 Nov. 2012.

23.4 MATHEMATICS I

COURSE CODE **CP 1104**

CREDIT UNITS **4**

CONTACT HOURS **60**

COURSE DESCRIPTION
This course introduces students to the areas and volumes of regular and irregular objects, Pythagoras theorem and its application, simultaneous equations (simple) Quadratic equations and arithmetic.

OBJECTIVES
By the end of this course the learner should be able to:
1. Calculate area and volume of regular and irregular objects
2. Transpose a formula
3. Solve equations
4. Differentiate trigonometrical ratios
5. Appreciate the importance of Pythagoras theorem and its application

COURSE CONTENT

CHAPTER ONE
1.0 Arithmetic
1.1 Decimals
1.2 Fractions
1.3 Squares
1.4 Percentages
1.5 Ratios
1.6 Proportions & square roots

CHAPTER TWO
2.0 Number systems
2.1 Decimal
2.3 Binary
2.4 Octal
2.5 Hexadecimal
2.6 Standard forms & surds

CHAPTER THREE
3.0 Equations
3.1 Solution of linear equations
3.2 Quadratic equations
3.3 Simultaneous equations (simple)
3.4 Transposition of formula & evaluation

CHAPTER FOUR
4.0 Mensuration
4.1 Areas
4.2 Volumes
4.3 Perimeters

4.4 Trapezoidal rule
4.5 Mid ordinate rule
4.6 Simpson's rule

CHAPTER FIVE
5.0 Indices & Logarithms
5.1 Laws of indices
5.2 Rules of logarithms
5.3 Change of base
5.4 Logarithmic equations (exponential)
5.5 Use of Mathematical tables

CHAPTER SIX
6.0 Trignometrical ratios
6.1.1 Sine,
6.1.2 cosine,
6.1.3 tangent
6.2 Area of a triangle given the three sides
6.3 Trignometrical reciprocals
6.3.1 Cosecant
6.3.2 secant
6.3.3 cotangent

CHAPTER SEVEN

7.0 **Circular Measurements**:
7.1 Angles and their notations, radius, degrees and revolutions.
7.2 Conversion from linear to circular
7.3 Measurements and vice versa
7.4 Angular and linear
7.5 Velocities
7.6 Length of an arc, Length of a chord, area of a sector, area of a segment

CHAPTER EIGTH
8.0 Sequences & series
8.1 n^{th} term and sum to n terms of an Arithmetic Progression and Geometric Progression

CHAPTER NINE
9.0 Polynomial
9.1 Evaluation by nesting
9.2 multiplication and division of algebraic expression
9.2.1 Factorization of polynomials with linear factors
9.2.2 The remainder theorem.

CHAPTER TEN
10.0 **Graphics of Equations**
10.1 Introduction to Cartesian coordinate system
10.2 Drawing the graph of a linear equation using ordered pairs
10.3 Determination of gradients/slope of a straight line
10.4 The relation between two gradients of two perpendicular lines
10.5 Equation of a straight line, $y = mx + c$ e.g .Y =2x + 3
10.6 Drawing the graph of a linear equation given
10.6.1 The gradient and y - intercept.

10.6.2 The gradient and one set of coordinates at a point.
10.7 Curve sketching of a graph of any equation e.g. $y = x^2$. The gradient of a curved graph [approximate Method]

MODE OF DELIVERY
The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE
This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES
1. Mathematics for Technicians by Taylor Level II
2. Pure mathematics Back-house I

23.5 TECHNICAL DRAWING I

COURSE CODE: **CP 1105**

CREDIT UNITS: **3**

CONTACT HOURS: **45**

OBJECTIVES

By the end of the semester, learners will be able to:

1. Bisect a line
2. Draw different types of lines
3. Construct a circle & indicate all its parts

CHAPTER ONE

1. Introduction to drawing

CHAPTER TWO

2. Setting out and lettering

CHAPTER THREE

3. Use of scale rule and drawing scales

CHAPTER FOUR

16.1 Basic geometrical construction
16.2 Construction of lines
16.3 Angles
16.4 Bisection of lines and angles
16.5 Division of lines (parallels and perpendiculars) and chords, arcs.

CHAPTER FIVE

5. Construction of regular polygons

CHAPTER SIX

6. Tangents to circles (external/internal) and parallel curves

CHAPTER SEVEN

7. Construction of circles and ellipses

CHAPTER EIGHT

8.0 Introduction to Isometric projection guidelines and principles
8.1 Dimensioning.

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Technical Drawing Advanced Level 1st Edition by Erick Isanga
2. Carpentry & Joinery by Peter Blett Level II
3. Architectural graphics by Francis D.K Ching
4. Basic engineering drawing by R.S.Rhodes and L.B Cook

23.6 BASIC COMMUNICATION SKILLS

Course code **CP 1106**

Credit units **04**

Contact hours **60**

COURSE DESCRIPTION
This course introduces students to the different forms of communication; oral, written and non-verbal, enabling students to develop skills of business letter writing, report writing, handling meetings and management of interviews.

LEARNERNING OUTCOMES
This course will impart students with listening, speaking, reading and writing skills

OBJECTIVES OF THE COURSE
By the end of this course, students should be able to:
1. Demonstrate the ability to communicate efficiently and effectively;
2. Understand the meaning of communication and how it relates to other management functions;
3. Acquire writing skills of business letters, memos and minutes of a meeting;
4. Deal with correspondences and other writings at a supervisory level.

COURSE CONTENT
CHAPTER ONE
1. Grammar and vocabulary
1.0 Parts of speech
1.1 Tenses
1.2 Simple and Compound Sentences
1.3 Punctuation
1.4 Direct and Indirect Speech
1.5 Prefixes and suffixes
1.6 Correction of grammatical errors

CHAPTER TWO
2. Comprehension
2.0 Summary writing
2.1 Written and oral deduction of summons from given prose passage
2.2 Diction
2.3 Answering questions about the passage

CHAPTER THREE
3.0 Overview of Communication
3.1 Meaning of communication
3.2 Objectives of communication
3.3 Communication process model
3.4 Types of communication/categories of communication
3.5 Barriers to communication
3.6 Remedies to barriers

CHAPTER FOUR
4.0 Written communication
4.1 Definition
4.2 Advantages and disadvantages
4.3 Business letter writing, types
4.4 Formats
4.5 Parts of the business letter
4.6 Memo writing

CHAPTER FIVE
5.0 Non verbal communication
5.1 Meaning
5.2 Facial expression
5.3 Gestures
5.4 Voice
5.5 Eye contact
5.6 Difference between verbal and non verbal communication
5.7 Problems involved in non verbal communication

CHAPTER SIX
5.0 Oral communication
5.1 Definition
5.2 Forms of oral communication
5.3 Advantages and disadvantages of oral communication
5.4 Listening
5.5 Meaning of listening
5.6 Importance of listening
5.7 Causes / Reasons for not listening
5.8 Suggestions for good listening skills

CHAPTER SEVEN
7.0 Reports
7.1 Definition of reports, types and uses
7.2 Formatting report writing, problems with reports in any given organization
7.3 Mitigation measures of report writing

CHAPTER EIGHT
8.0 Meetings
8.1 Meaning, types of meetings, preparation of meetings, notice, agenda & facilities
8.2 Writing, minutes of a meeting
8.3 Check list for organizing successful meetings

CHAPTER NINE
9.0 Practical Exercises
9.1 oral presentations, letter writing, interviews, etc

MODE OF DELIVERY
The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Shirley Taylor (1998) Communication for business
2. Wolcott. L A Mastering business communication
3. Ogundipe Engilsh Language
4 Komunda Mabel Birungi, Business communication skills
5. J. A. Bright, English Composition and Grammer
6. Little P. 1996 Communication in business Pitman Publishing. London

23.7 COMPUTER APPLICATIONS I

Course code **CP 1107**

Credit units **03**

Contact hours **45**

COURSE DESCRIPTION
The course introduces students to the computer applications through practical skills in information technology software to enable them compete favorably in the dynamic technology-based world.

LEARNING OUTCOMES
By the end of this course, Students should l be able to use the common Microsoft Office applications of word processing, spreadsheets, graphics, presentations and databases.

OBJECTIVES
By the end of this course learners should be able to:
1. Identify the different Applications within an Office environment
2. Acquire skills in basic computer software applications and apply them in various business situations in order to facilitate the information management function.
3. Appreciate computer applications in business through hands on
4. Demonstrate the ability to use the common software applications of Microsoft Word, and Microsoft Excel
5. Produce business documents and data analysis and models applicable to business environment

COURSE CONTENT

CHAPTER ONE
1.1 Basic concepts and startup procedures
1.2 Introduction to practical computing
1.3 Connecting computer parts (CPU, Monitor, Mouse, Key board)
1.3 Windows Operating Systems Commands
1.4 Booting the computer
1.5 Using the mouse
1.6 Managing the user interface
1.7 Introduction to Windows programmes

CHAPER TWO
2.0 Word Processing (Document production with MS word)
2.1 Starting Ms Word
2.2 Creating documents
2.3 Looking at and using tool bars
2.4 Entering data
2.5 texts formatting
2.6 page formatting
2.7 Document formatting
2.8 Creating tables
2.9 Sorting and filtering data (plain text and tabulated text)
2.10 Graphics

2.11 printing
2.12 practice assignments

CHAPTER THREE

3.0 Spreadsheets (Microsoft Excel)

3.1 Starting Ms Excel
3.2 Excel tool bars
3.4 Managing workbooks and worksheets
3.5 Entering data and its formatting
3.6 Performing formulae, errors and their corrections
3.7 Calculating using functions
3.8 Sorting and filtering data
3.9 Using Graphs
3.10 Printing
3.11 Practice assignments

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Kathy Ivens and Thomas Barich(1997), How to use Microsoft Office' 97, Ziff-Davis press
2. Whitecomb A and Brown B, Key boarding and Document production, Stanley Thornes, **Chem.: emam**
3. E.S. Waburoko(200), An introduction to information technology, Department to Distance Learning, Edsoft Computer Institute
4. Teach yourself Microsoft Excel 97 in 24 Hours by Linda Jones and Reul L. Hernadez by S: MS
5. Hernandez cy SAW Publishing
6. Keneth C. and Laudon J.P: Essentials of Management Information Systems; 3rd Edition Prentice Hall, New Jersey, 1999
7. Elliot G. and Starkings:Business Information Technology, Theory and Practice; Addison Wesley, Longman, London and New York, 1998
8. Olive and Chapman; Data Processing and Information Technology, DP Publications
9. Christopher Barnatt (1996): Management Strategy; ND Information Technology; International Thomson Business Press.
10. Clifton H.D. and A.G. (1994); Business Information Systems; 5th Edition.

23.8 PLUMBING PROJECT I

COURSE CODE: **CP 1108**

CREDIT UNITS: **5**

CONTACT HOURS: **75**

PROJECT DESCRIPTION
This course introduces students to the properties of plumbing materials, different materials used and skill of making gutters and joints.

PROJECT OUTPUT
Students should be able to identify different materials used, know the importance of protective clothes in plumbing workshop and the general properties of plumbing materials.

PROJECT OBJECTIVES
By the end of the semester, learners will be able to:
1. Identify different materials used
2. State general properties of plumbing materials
3. Appreciate the importance of protective clothes in plumbing workshop
4. Demonstrate the skill of making gutters and joints

PROJECT ACTIVITIES

CHAPTER ONE
1.0 Sheet Metal
1.1 Materials used (G.I, copper, Aluminium or zinc)
1.2 Application of each material
1.3 Types of joints (seams or locks), batter rolls, riveted, bolted, brazed of welded, flanged
1.4 Gutters
1.5 Types and where fixed
1.6 Chimney aprons and where used
1.7 Back gutter, raking flashings and soakers
1.8 Roofing terms; roof decking, under lays and their purposes
1.9 Preventing the building against the effects weather moisture

CHAPTER TWO
2.0 **Bench Work** (Measuring,Marking,Centre Punching)
2.1 Sewing
2.2 Chiselling
2.3 Filing
2.4 Drilling

CHAPTER THREE
3.0 Gas welding
3.1 welding techniques (left ward and right ward**)**
3.2 Assembling (Horizontal/ vertical)
3.3 Butt weld, Fillet weld

CHAPTER FOUR
4.0 Arc welding
4.1 Striking the arc.
4.2 Blind bids
4.3 Corner joints
4.4 Forging
4.5 Get familiar with anvil & forge tools
4.6 Application

CHAPTER FIVE
5.0 Sheet metal
5.1 Round cutting
5.2 Straight cut
5.3 Curved cut
5.4 Seams/welds
5.5 Dogs ears

CHAPTER SIX
6.0 Soldering
6.1 Brazing/bronze welding
6.2 Grooving
6.3 Flanging
6.4 Riveting
6.5 Folding

CHAPTER SEVEN
7.0 Sanitary/ Installation
7.1 Fixing of sanitary fittings (appliances, sinks, wash hand basin, wc's etc)
7.2 Fixing siphons, traps, flush pipes, rubber connectors, waste pipes to gully traps

CHAPTER8:
INNOVATION Student's self initiated project related to the programme

MODE OF DELIVERY
The mode of delivery will include; demonstration, group discussions, project work and presentation

ASSESSMENT OF THE COURSE
This course unit will be assessed on 100 marks as follows:

Project Assessment 1	20%
Project Assessment 2	20%
Student's Personal Innovation	20%
Project Assessment 4	40%
Total	**100%**

The marks will be converted into Grade points.

24.0 YEAR ONE SEMESTER TWO

24.1 WORKSHOP PRACTICE II

COURSE CODE **CP1201**

CREDIT UNITS **5**

CONTACT HOURS **75**

COURSE DESCRIPTION
This course introduces students to the bench work activities like measuring, marking, sewing, chiseling, drilling and arc welding

LEARNING OUTCOMES
By the end of this course Students should be able to use different types of forging, use different types of ater services and use well arc welding.

OBJECTIVES
By the end of this course the learner should be able to:
1. Use different types of ater services
2. Use different types of drilling and chiseling machines
3. Use the arc welding.
3. do service repairs

CHAPTER ONE
1.0 ARC WELDING
1.1 Striking the arc
1.2 Blind bids
1.3 Corner joints

CHAPTER TWO
2.0 FORGING
2.1 Get familiar with anvil and forge tools
2.2 Application

CHAPTER THREE
3.0 ATER SERVICE (TAPS AND VALVE)
3.1 Show the inside parts of taps and valves
3.2 Do service/repairs

MODE OF DELIVERY
The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE
This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES
8. Plumbing by F.HALL

24.2 WATER SUPPLY II

COURSE CODE **CP1202**

CREDIT UNITS **5**

CONTACT HOURS **75**

COURSE DESCRIPTION
This introduces students to the classify sources of water supply, basic skills in rain water harvesting, connections of (pipe lines), underground water and how to treat water.

LEARNING OUTCOMES
Students should be able to acquire basic skills in rain water harvesting, know systems of water supply and knowing properties of water from each source

OBJECTIVES
By the end of this course students should be able to:
1. Classify sources of water
2. State systems of water supply
3. Acquire skills in rain water harvesting
4. Appreciate the importance of water treatment

COURSE CONTENT

CHAPTER ONE
1.0 Water Mains
1.1 Definition
1.2 Pumping mains
1.3 Truck mains
1.4 Reservoirs
1.5 Tapping water mains (under pressure)
1.6 Safety involved
1.7 Sources of Water Supply
1.8 Surface water
1.9 Underground water
1.10 Properties of water from each source

CHAPTER TWO
2.0 Rain Water Harvesting
2.1 Calculation of surface area of materials required for
2.2.1 Storage cisterns.
2.2.2 Rain water gutters.
2.2.3 Rain water channels/heads.
2.2.4 Rain water down pipes.
2.2 Storage Cistern
2.3.1 Sitting.
2.3.2 Connections (pipe lines).
2.3.3 Support/protection.
2.3.4 Ventilation.
2.3.5 Head in metres.
2.3.6 Capacities (nominal/actual).

CHAPTER THREE

3.0 Cold water supplies

3.1 Indirect cold supply to sanitary appliances.
3.2 Why Uganda recommends the indirect system.
3.3 Provision of control valves.
3.3.1 Hot Water Supply
3.3.2 Indirect system (using solid fuel).
3.3.3 Reasons for use.
3.3.4 Calorifier types.
3.3.5 Threads used on cylinders and pipes.
3.3.6 Supply leads (storage and feed cisterns)

CHAPTER FOUR

4.0 Taps & Valves

4.1 Applications
4.2 Taps
4.3 Cocks and Valves Used in Plumbing
4.4 Where and why each is applied
4.5 Working principles
4.6 Ball Valves Purpose/Function
4.7 Classifications
4.8 Types
4.9 Faults and their remedies
4.10 Materials for Water Supply (Steel, copper, plastic, other non metals)
4.11 Methods of jointing
4.12 Jointing compound used
4.13 Classification

CHAPTER FIVE

5.0 **Soil layer (Pervious and impervious)**
5.1 Construction/Formation of Wells and Springs Willow, Deep Artesian (well or spring)
5.2 Land spring
5.3 Bore (or drilled) hole
5.4 Driven wells
5.5 Protection from pollution
5.6 Classification of Cold Water
5.7 Soft water
5.8 Hard water (temporary or permanent)
5.9 Effects of above water on metals Prevention/remedies of these effects
5.10 Principles of Siphonage
5.11 Application siphonage
5.12 Difference in pressures
5.13 Advantages and disadvantages
5.14 Use of siphonage in plumbing (flushing curtains)
5.15 Flush pipe connection

CHAPTER SIX

6.0 Water Heaters

61 Gas Water Heaters Types
6.2 Application
6.3 Faults/remedies
6.4 Safety

6.5 Electrical immersion heater
6.6 Types

CHAPTER SEVEN
7.0 Pumps (Types of pumps)
7.1 Reciprocating (or displacement).
7.2 Semi rotary.
7.3 Rotary.
7.4 Centrifugal.
7.5 Use of air vessel on pumps
7.6 Hydraulic rams
7.7 Single acting
7.8 Double acting
7.9 Determining factors of which to apply
7.10 Water hammer usage

CHAPTER EIGHT
8.0 Components of hot water supply
8.1 The boiler
8.2 Hot water storage cylinder
8.3 Cold feed cistern
8.4 Storage capacities
8.5 Actual capacity
8.6 Nominal capacity

CHAPTER NINE
9.0 Hot water regulations
9.1 Limit of length
9.2 Limit of depletion
9.3 Dead leg
9.4 Secondary circulation
9.5 Systems of hot water supply
9.6 Direct system
9.7 Indirect system

CHAPTER TEN
10. 0 Common faults in hot water supply
10.1 Reserve circulation
10.2 Parasitic circulation
10.3 Air lock
10.4 Insufficient flow
10.5 Noises
10.6 Poor flow of hot water

CHAPTER ELEVEN
11.0 Boiler mountings
11.1 Safety valves
11.2 Drain corks
11.3 Thermostats
11.4 Thermometers
11.5 Low pressure systems / central heating
11.6 One pipe drop
11.7 One pipe ring

11.8 One pipe ladder
11.9 Two pipe drop
11.10 Two pipe ring
11.11 Two pipe ladder

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Plumbing by Town Send
2. Mathematics for technicians by Taylor Level II
3. Building science by W.G Adams Vol. I & II

24.3 DRAINAGE & SANITATION II

COURSE CODE: **CP 1203**

CREDIT UNITS: **5**

CONTACT HOURS: **75**

COURSE DESCRIPTION
This course introduces students to the different types of lagoons, Septic tanks/cesspools, Inspection chamber (manholes), and Lighting (Natural/artificial).

LEARNING OUTCOMES
Students should be able to know methods of sewage disposal, types (willow, deep,, intermediate interception, samples) and urban area sludge lagoon sewers.

OBJECTIVES
By the end of the semester students should be able to:
1. Differentiate different types of lagoons
2. Appreciate the importance of a septic tank
3. Appreciate the importance of inspection chambers & their applications

COURSE CONTENT

CHAPTER ONE
1.0 **Access/Cleaning Drains**
1.1 Inspection chamber (manholes).
1.2 Types (willow, deep,, intermediate interception, samples).
1.3 Sizes of covers
1.4 Spacing between chambers
1.5 Functions

CHAPTER TWO
2.0 Basic methods of sewage disposal
2.1 Rural areas
2.2 Septic tanks/cesspools.
2.3 Soak away pits.
2.4 Urban area sludge lagoon sewers.

CHAPTER THREE
3.0 **Sanitary Accommodation**
3.1 Lighting (Natural/artificial).
3.2 Ventilation.
3.3 Room sizes and openings.

CHAPTER FOUR
4.0 Under (Below) Ground Drainage
4.1 Fundamental factors for a good drainage system.
4.2 Types of systems
4.2.1 Combined
4.2.2 Separate
4.2.3 Partially separate

4.3 Falls (mechanism)
4.4 Materials used; fittings e.g. gullies, bends.
4.5 Various joints
4.6 Foundation
4.7 Supports.

CHAPTER FIVE
5.0 Connections to drains and sewers
5.1 Saddle junctions.
5.2 Pipe junctions.
5.3 Existing man holes.

CHAPTER SIX
6.0 Ventilation of Drains
6.1 Lowest point of drains (FAI).
6.2 Highest points of drains (FAO)
6.3 With or without interceptions

CHAPTER SEVEN
7.0 **Access/Cleaning Drains**
7.1 Inspection chamber (manholes).
7.2 Types (willow, deep,, intermediate interception, samples).
7.3 Sizes of covers
7.4 Spacing between chambers
7.5 Functions

CHAPTER EIGHT
8.0 Basic methods of sewage disposal
8.1 Rural areas
8.2 Septic tanks/cesspools.
8.3 Soak away pits.
8.4 Urban area sludge lagoon sewers.

CHAPTER NINE
9.0 **Sanitary Accommodation**
9.1 Lighting (Natural/artificial).
9.2 Ventilation.
9.3 Room sizes and openings.

CHAPTER TEN
10.0 **Access/Cleaning Drains**
10.1 Inspection chamber (manholes).
10.2 Types (willow, deep,, intermediate interception, samples).
10.3 Sizes of covers
10.4 Spacing between chambers
10.5 Functions

CHAPTER ELEVEN
11.0 Basic methods of sewage disposal
11.1 Rural areas
11.2 Septic tanks/cesspools.
11.3 Soak away pits.
11.4 Urban area sludge lagoon sewers.

CHAPTER TWELVE

12.0 **Sanitary Accommodation**
12.1 Lighting (Natural/artificial).
12.2 Ventilation.
12.3 Room sizes and openings.

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Dr. B. C. Runmia (1988), Waste Water Engineering
2. Environmental Biotechnology: Advancement in Water and Wastewater Application, edited by Z. Ujang, IWA Proceedings, Malaysia (2003) Ehlers, Victor (1943). Municipal and rural sanitation. New York: McGraw-Hill book company, Inc.
3. Heller, Léo, and José Esteban Castro. Water and Sanitation Services: Public Policy and Management. n.p.: Earthscan, 2009. EBook Collection (EBSCOhost). Web. 14 Nov. 2012.
4. Stewart, Amy, and Tim Gray. Governance of Water and Sanitation in Africa: Achieving Sustainable Development through Partnerships. n.p.: I.B. Tauris, 2009. EBook Collection (EBSCOhost). Web. 14 Nov. 2012.

24.4 TOOLS AND MATERIALS

COURSE CODE: CP1204

CREDIT UNITS 3

CONTACT HOURS 45

COURSE DESCRIPTION
This course introduces students to the different workshop tools & equipment, causes of accidents, classification of first aid methods and health and safety on site and in the workshops.

LEARNING OUTCOMES
Students should be able to classify different plumbing materials, importance of first aid and safety precautions.

OBJECTIVES
By the end of this course the learner should be able to:
1. Appreciate the importance of first aid
2. Classify first aid methods
3. Identify different workshop tools & equipment
4. Classify different plumbing materials

COURSE CONTENT

CHAPTER ONE
1.0 Health and safety on site and in the work shops
1.1 Health
1.2 Safety precautions

CHAPTER TWO
2.0 Accidents and injuries
2.1 Causes of accidents
2.1.1 Carelessness
2.1.2 Ignorance factor
2.2 Prevention of accidents

CHAPTER THREE
3.0 Electric shock
3.1 Artificial respiration
3.2 Holger Nielsen method
3.3 Mouth to mouth (kiss of life)

CHAPTER FOUR
4.0 First aid
4.1 Emergency services
4.2 Reporting accidents and injuries
4.3 First aid boxes

CHAPTER FIVE
5.0 Ladders
5.1 Protection and safety precautions

5.2 Correct positioning and securing a ladder
5.3 Distance
5.4 Inspection and maintenance
5.5 Correct methods ie climbing and descending

CHAPTER SIX

6.0 Required tools and equipment
6.1 Hack saws
6.2 Pipe vices
6.3 Wrenches
6.4 Engineering vices
6.5 Pipe cutters
6.7 Parallel vices
6.8 Screw drivers
6.9 Trowel
6.10 Hammer
6.11 Tape measures
6.12 Die stocks (manual & electrical)
6.13 Spirit level
6.14 Spanners
6.15 Pliers
6.16 Summary for tools
6.17 Measuring tools
6.18 Setting tools
6.19 Leveling tools
6.20 Cutting tools
6.21 Gripping tools
6.22 Forming tools
6.23 Joining tools
6.24 Digging and laying tools
6.25 Percussive and driving tools
6.26 Applications, Purposes and their specifications

CHAPTER SEVEN

7.0 Materials
7.1 Materials for water supply
7.2 Copper
7.3 Mild steel (G.I)
7.4 Cast iron
7.5 Polythene
7.6 Advantages and disadvantage of the materials
7.7 Diagrams or sketches joints on materials
7.8 Jointing compounds and jointing methods
7.9 Materials for roofing
7.10 Thatched grass
7.11 Tiles
7.12 Copper (Cu)
7.13 Aluminum (Al)
7.18 Lead
7.19 G.I
7.20 Zinc (Zn)
7.21 Neurites

MODE OF DELIVERY
The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE
This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

24.5 TECHNICAL DRAWING II

COURSE CODE: **CP 1205**

CREDIT UNITS: **3**

CONTACT HOURS: **45**

OBJECTIVES

By the end of the semester, learners will be able to:

1. Draw solid figures on isometric & orthographic projections
2. State methods of representation
3. Appreciate the importance of estimating & costing in plumbing projects

CHAPTER ONE

1.1 Isometric views of cisterns
1.2 Introduction to Orthographic projection
1.3 Pipe line
1.4 Cylinders in isometric views.
1.5 Orthographic views.
1.6 Views and layouts of cylinders and pipe lines (Isometric/orthographic)
1.7 Development of surfaces – cylinders, curves.

CHAPTER TWO

2.0 Sketches of the above ground sanitary pipe work and drainage joints of various materials.
2.1 Development of bend (square, segmental).
2.2 Pipe intersections.
2.3 Sketches of drain ventilation
2.4 Simple taking off of quantity (materials required) and symbols
2.5 Development of rain water down pipes
2.6 Gutter outlets (soldering and seaming)
2.7 Drawing to scale of sanitary accommodation.
2.8 Introduction to oblique projection principles and guidelines
2.9 Sketches of system layouts
2.10 La**y**out sketches and Isometric projection.
2.11 Isometric views of plumbing services.
2.12 Simple sketches of silver soldered joints, Bronze welded joints and other related copper capillary joints

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Technical Drawing Advanced Level 1st Edition by Erick Isanga
2. Carpentry & Joinery by Peter Blett Level II
3. Architectural graphics by Francis D.K Ching
4. Basic engineering drawing by R.S.Rhodes and L.B Cook

24.6 COMPUTER APPLICATIONS II

COURSE CODE: **CP 1206**

CREDIT UNITS: **5**

CONTACT HOURS: **75**

COURSE DESCRIPTION
The course introduces students to the computer applications through practical skills in information technology software to enable them compete favorably in the dynamic technology-based world.

LEARNING OUTCOMES
By the end of this course, Students should l be able to use the common Microsoft Office applications of word processing, spreadsheets, graphics, presentations and databases.

OBJECTIVES
By the end of this course learners should be able to:
1. Identify the different Applications within an Office environment
2. Acquire skills in basic computer software applications and apply them in various business situations in order to facilitate the information management function.
3. Appreciate computer applications in business through hands on
4. Demonstrate the ability to use the common software applications of Microsoft Word, and Microsoft Excel
5. Produce business documents and data analysis and models applicable to business environment

COURSE CONTENT

CHAPTER ONE
1.0 Database Management (Microsoft Access)
1.1 Starting MS Access
1.2 Creating data bases
1.3 Crating data tables; Using design view, table wizard, by entering data
1.4 Creating relationships between tables
1.5 Creating forms; using form wizard
1.6 Creating queries; using design view, using query wizard
1.7 Sorting and filtering data
1.8 Formatting data in different objects
1.9 Generating reports using report wizard
1.10 printing
1.11 Practice assignments

CHAPTER TWO
2.0 Presentation management (Microsoft point)
2.1 Starting MS Power Point
2.2 Starting a slide presentation and selecting the slides of desire
2.3 Formatting slides in the slide sorter
2.4 Adding coloring to slides
2.5 Graphing in the slides
2.6 Formatting slide show for different slide designs, layouts and animation schemes

2.7 Viewing a slide show
2.8 Saving and printing the slide presentation
2.9 Practice assignments

CHAPTER THREE
3.0 Internet/Intranet
3.1 Internet definition
3.2 History of Internet
3.3 Uses of Internet
3.4 ISP (Internet Service Providers)
3.5 DNS (Domain Name Systems)
3.6 www (World Wide Web)
3.7 Internet Browsers and Search Engines; Google Chrome, Internet Explorer, Mozira Firefox, OPERA
3.8 URL(Uniform Resource Locator)
3.9 Web Portals
3.10 Navigator/Bookmarks/links
3.11 Uploading and Downloading
3.12 Webmail (Electronic Mails); Thunderbird, Outlook.
3.13 Working with news groups
3.14 Printing and Saving Documents
3.15 Social Networking Web: Facebook, Twiter, Google, Yahoo messenger (chart room),
3.16 http: (hypertext Transfer Protocal)
3.16 Creating a homepage
3.17 Internet Security; Virus Infection, Firewalls, Open source programmes (Thunderbird, Outlook Google Chrome, Internet Explorer, Mozira Firefox, OPERA)

MODE OF DELIVERY
The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE
This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Kathy Ivens and Thomas Barich(1997), How to use Microsoft Office' 97, Ziff-Davis press
2. Whitecomb A and Brown B, Key boarding and Document production, Stanley Thornes, **Chem.: emam**
3. E.S. Waburoko(200), An introduction to information technology, Department to Distance Learning, Edsoft Computer Institute
4. Teach yourself Microsoft Excel 97 in 24 Hours by Linda Jones and Reul L. Hernadez by S: MS
5. Hernandez cy SAW Publishing
6. Keneth C. and Laudon J.P: Essentials of Management Information Systems; 3rd Edition Prentice Hall, New Jersey, 1999
7. Elliot G. and Starkings:Business Information Technology, Theory and Practice; Addison Wesley, Longman, London and New York, 1998
8. Olive and Chapman; Data Processing and Information Technology, DP Publications
9. Christopher Barnatt (1996): Management Strategy; ND Information Technology; International Thomson Business Press.
10. Clifton H.D. and A.G. (1994); Business Information Systems; 5th Edition.
11. Raymond McLeod J (1995): Management Information Systems; 6th Edition; Prentice Hall International Editions.

24.7 PLUMBING PROJECT II

COURSE CODE: **CP 1207**

CREDIT UNITS: **5**

CONTACT HOURS: **75**

PROJECT DESCRIPTION
This course introduces students to the basic skills in pipe laying, identifying pipe measuring & cutting, screws fitting pipes and fittings to dimensions.

PROJECT OUTPUTS
Students should be able to identify different methods f bending pipes, half round and other rain water gulleys involving welding/soldering.

PROJECT OBJECTIVES
By the end of the semester, learners will be able to:
1 Appreciate the importance of template
2. Identify different methods of bending pipes
3. Determine the gradient/fall of pipe laying
4. Acquire practical skills in pipe laying

PROJECT ACTIVITIES

CHAPTER ONE
1.0 Pipe Fitting
1.1 Identifying pipe measuring & cutting
1.2 Reaming, threading, (normal/long screw)
1.3 Applying lubricants
1.4 Screws fitting pipes and fittings to dimensions
1.5 Soldering
1.6 Lap, butt, etc

CHAPTER TWO
2.0 Sheet metal
2.1 Formation of cylinders at 90^{o}
2.2. Offsets
2.3 Half round and other rain water gulleys involving welding / soldering
2.4 Development and formation of funnels, dust bins, water cans, etc

CHAPTER THREE
3.0 Bending
3.1 Bending Methods of different pipe materials (cold and forge)
3.2 Temperate formation on ground (floor)
3.3 Cutting, threading and assembling to dimensions and shape

CHAPTER FOUR
4.0 Solvent
4.1 Solvent cementing
4.2. Fusion joints / ring joint
4.3 Compression copper joint and capillary joint

CHAPTER FIVE

5.0 Drainage
5.1 Identify drainage pipes and fittings
5.2 Practice joining of drainage pipes
5.3 Excavate trenches set out correct gradient
5.4 Construction of simple inspection chambers, ventilators & support of drain pipes
5.5 Fitting & jointing gullies,, interceptors & saddle pieces
5.6 Laying drainage systems
5.7 Repairing drains

CHAPTER SIX

6.0 Sanitary installations
6.1 Fitting & connecting showers, bidets bath, Wash Hand Basin, Sinks, WC's etc
6.2 Setting out & erecting soil, waste & ventilating pipes
6.3 Two pipe system
6.4 One pipe system
6.5 Single stack system
6.6 Connect disharge pipes from sanitaryappliances to underground drainager system
6.7. Serving sanitary installation

CHAPTER SEVEN

7.0 Water services

7.1 Laying and protecting water service pipe.
7.2 Installing cold water storage cisterns.
7.3 Installing ball valves, gate valves stop cocks, drains and other related valves to the plumbing goods.
7.4 Sitting and installing hot water apparatus and components (cylinders, boilers And pipes lines).

CHAPTER EIGHT

8.0 Arc welding

8.1 Preparing and bronze welding copper tube by forming bells, butt, branch joint etc
8.2 Brazing steel tubes.
8.3 Bronze welding G.I and cast iron pipes.
8.4 Prepare and weld branch and flanged joints on mild steel pipes.
8.5 Cutting mild steel plate using Oxy-acetylene gas flame.
8.6 Welding mild steel plates up to 6mm thick

CHAPTER 7:
INNOVATION Student's self initiated project related to the programme

MODE OF DELIVERY

This course will be taught through demonstrations, illustrations, site visits, guided discussion, practical work, report writing and presentations

MODE OF DELIVERY

The mode of delivery include; demonstration, group discussions, project work and presentation

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows:

Project Assessment 1	20%
Project Assessment 2	20%
Student's Personal Innovation	20%
Project Assessment 4	40%
Total	**100%**

The marks will be converted into Grade points.

24.8 FIELD WORK

Course code CP 1208

Credit units 05

Contact hours 75

FIELD WORK DESCRIPTION
This course introduces students to the practical application of skills and concepts learnt during the time of training at the institution.

OBJECTIVES
By the end of this course the learners should be able to:

1. Fit in work place environment
2. Translate the theory learnt in class into real life situation
3. Acquire more job competences
4. Market themselves to prospective employers by demonstrating practical skills related to their programmes of study.

Industrial Training Content

1. Intern orientation at the work place
2. Prepare a work plan for industrial training
3. Prepare daily schedule of the performed activities
4. Record achievements and challenges
5. Make recommendations
6. Write a report

MODE OF TRAINING

The mode of training will be as follows:
1.1 Working under the guidance of the Industrial supervisor
2.0 Supervise the Intern on the set tasks
3.0 Conferencing by the college supervisor with the intern

ASSESSMENT OF THE INDUSTRIAL TRAINING

Training institution supervisor	10%
Workplace supervisor's assessment	30%
Intern's report	30%
Total	**70%**

STUDY TOURS CONTENT
Identify areas within the academic content that need study tour
1. Identify the appropriate areas for the study tours
2. Make a study tour proposal by the staff facilitator
3. Conduct the study tour
4. Prepare reports: the staff facilitator and the individual students

ASSESSMENT OF THE STUDY TOURS

Report by the student	20%
Student's conduct and participation	10%
Study Tours	**30%**
Grand Total for field study	**100%**

25.0 YEAR TWO SEMESTER ONE

25.1 WORKSHOP PRACTICE III

COURSE CODE **CEI 2101**

CREDIT UNITS **5**

CONTACT HOURS **75**

COURSE DESCRIPTION
This course introduces students to practical training in sanitary installations like fixing of appliances, sinks, siphons, taps flush pipes and pipe fitting

LEARNING OUTCOMES
By the end of this course student will be able install sinks, siphons, taps flush pipes and pipe fitting.

OBJECTIVES
By the end of this course students should be able to:
1. Install a sink,
2. Fix siphons and taps
3. Fit and solder the pipes

COURSE CONTENT

CHAPTER ONE
1.0 SANITARY/INSTALLATION
1.1 Fixing of sanitary fittings (appliances) (sinks, WHB), WCs) etc.)
1.2 Fixing siphons, traps, flush pipes rubber connectors, waste pipes to guilty traps

CHAPTER ONE
2.0 PIPE FITTING
2.1 Identifying pipes
2.2 Measuring an cutting
2.3 Reaming, threading (normal/long screw)
2.4 Applying lubricants
2.5 Screw fitting pipes and fittings to dimensions
2.6 SOLDERING Lap, Butt, etc

MODE OF DELIVERY
The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE
This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points. There will be the final examination in the last two weeks of the semester.

REFERENCES
1. Plumbing by Town Send

25.2 CRAFT SCIENCE & CALCULATIONS I

COURSE CODE **CP 2102**

CREDIT UNITS **4**

CONTACT HOURS **60**

COURSE DESCRIPTION
This course introduces students to the physical properties of metal used in plumbing, different types of protective coatings, acidic or activated fluxes and fluxes used

LEARNING OUTCOMES
Students should be able to classify alloys, types of fluxes, properties and applications to plumbing, metal solvency and types of soldering

OBJECTIVES
By the end of this course the learner should be able to:
1. Define the terms used
2. Classify alloys
3. Differentiate types of corrosion
4. Identify different types of protective coatings

COURSE CONTENT

CHAPTER ONE
1.0 Physical properties of metals used in plumbing
1.1 Ductility
1.2 Elasticity
1.3 Plasticity
1.4 Conductivity
1.5 Brittle
1.6 Malleability
1.7 Tenacity
1.8 Creep
1.9 Fusibility
1.10 Metal solvency
1.11 Temper
1.12 Metal fatigue
1.13 Patina etc
1.14 Properties and applications to plumbing aluminum
Brass - Non ferrous
Copper - Pure non ferrous
Lead - Pure non ferrous
Iron – Pure ferrous
Bronze – non ferrous

CHAPTER TWO
2.0 **Alloys**
2.1 Definition
2.2 Common alloys
2.3 Compositions of alloys

CHAPTER THREE

3.0 **Soldering**
3.1 Definition
3.2 Fluxes used
3.3 Purposes of fluxes
3.4 Types of fluxes
3.4.1 Acidic or activated fluxes
3.4.2 Non acidic or non activated fluxes
3.5 Successful soldering
3.6 Types of soldering
3.6.1 Soft soldering
3.6.2 Hard soldering
3.7 Preparation of zinc chloride (Zncl2)

CHAPTER FOUR

4.0 Corrosion
4.1 Definition
4.2 Types / kinds of corrosion
4.2.1 Atmospheric
4.2.2 Bacterial
4.2.3 Electrolysis
4.2.4 Electrolytic action
4.2.5 Cathodic protection
4.2.6 Anodic attack
4.2.7 Dezincification
4.3 Different metals have different reactivity series

CHAPTER FIVE

5.0 Coatings
5.1 Protective and decorative
5.2 Definitions
5.3 Oxidation as a destructive agent
5.4 Oxidation as a protective agent
5.5 Types of protective coatings
5.6.1 Painting
5.6.2 Plastic sheathing
5.6.3 Wrapping
5.6.4 Galvaninsing
5.6.5 Bower burffing
5.7 Most common decorative coatings
5.8.1 Electro- plating
5.8.2 Painting
5.9 Processes of protective coatings
5.10.1 Metallic process
5.10.2 Galvanizing
5.10.3 Shearadizing
5.10.4 Electro- plating
5.10.5 Spraying
5.11 Non metallic process
5.12.1 Painting
5.12.2 Dipping in bitumen
5.12.3 Bower buffing

CHAPTER SIX

6.0 Density
6.1 Definition
6.2 Formula and symbol
6.3 Some calculations
6.4 Relative density
6.4.1 Definition
6.4.2 Formula
6.4.3 Calculations

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

2. Plumbing by Town Send
3. Mathematics for technicians by Taylor Level II
4. Building science by W.G Adams Vol. I & II

25.3 FOREMANSHIP

COURSE CODE: **CP 2103**

CREDIT UNITS: **3**

CONTACT HOURS: **45**

COURSE DESCRIPTION
This course introduces students to the parties involved in building industry, such as Architect, Structure service engineer, safety and precautions of the materials at site, and skills in preparing bills of quantities.

LEARNING OUTCOMES
Students should be able to acquire skills in preparation of bills of quantities Safety and precautions of the materials at sites, know parties involved in building industry, safety and precautions of the materials at site

OBJECTIVES
By the end of the semester, learners will be able to:
1. Define the terms involved
2. State the duties/roles of each party in building industry
3. Acquire skills in preparation of bills of quantities

COURSE CONTENT

CHAPTER ONE
1.0 Parties involved in the building industry
1.1 Clients
1.2 Architect
1.3 Clerk of words
1.4 Structure service engineer
1.5 Quantity surveyor
1.6 Local authority building control officer
1.7 Builder
1.8 Nominated sub constructor
1.9 Sub contractor supplies
1.10 Nominated supplier
1.11 Supplier

CHAPTER TWO
2.0 Job planning and organization
2.1 Organization of the work
2.2 Safety and precautions of the materials at site

CHAPTER THREE
3.0 Customer and public relations
3.1 Relationship between customer and technician
3.2 Discipline
3.3 General rules and principles to bear in mind when disciplining any one

CHAPTER FOUR

4.0 Leadership
4.1 Self confidence
4.2 Temperament
4.3 Respect
4.4 Tact
4.5 Energy
4.6 Technical skills
4.7 Team spirit
4.8 Motivation

CHAPTER FIVE

5.0 Tendering arrangements
5.1 Process of tendering
5.2 Types of tendering
5.3 Estimation and quantities
5.4 Methods of preparation of bills of quantities

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. W. F. Chen and J. Y. Richard Liew, ed. (2002). *The Civil Engineering Handbook*. CRC Press.
2. Jonathan T. Ricketts, M. Kent Loftin, Frederick S. Merritt, ed. (2004). *Standard handbook for civil engineers* (5 Ed.). McGraw Hill.

25.4 ENGINEERING SOFTWARE

COURSE CODE **CP 2104**

CREDIT UNITS 03

CONTACT HOURS 45

COURSE DESCRIPTION
This course introduces students the design of building structures using the computer programmes of Auto and Arch CAD.

LEARNING OUTCOMES
By the end of the course, students will be able to use a computer for designing and drawing building structures and facilities.

OBJECTIVES OF THE COURSE
By the end of this course, students should be able to;
1. Use a computer for designing and drawing building structures and facilities
2. Use AutoCAD and ArchiCAD in designing buildings, road sections and other facilities

CHAPTER ONE
1.0 File Management
1.1 Create new files, save a file, Open a file,
1.2 Export, Publish, Recover
1.3 Send, Publish

CHAPTER TWO
2.0 Drawing
2.1 Creation of layers
2.2 Line ray, construction line, multi line
2.3 Polyline, 3D polyline, polygon, Rectangle
2.4 Arch Circle Donut, Ellipse, Spline
2.5 Block, Point
2.6 Hatch, Boundary, Region, Cloud

CHAPTER THREE
3.0 Methods for Viewing Drawing
3.1 Regenerate
3.2 Redraw
3.3 Zoom
3.4 Pan
3.4 Hide, Shade and Render
3.5 Dimension

CHAPTER FOUR
4.0 Dimensioning
4.1 Linear, Aligned, Ordinate
4.2 Radius Diameter Angular
4.3 Baseline, Text, Dimension styles

CHAPTER FIVE

5.0 Modifying a Drawing

5.1 Match Properties, Object, Clip
5.2 Erase, Copy, Offset, Array
5.3 Move Rotate, Scale, Stretch, and Lengthen
5.4 Trim, Extend, Break, Chamfer, Fillet
5.5 3D Operation, Solid Edit,
5.6 Explode

CHAPTER SIX

6.0 Production of Architectural Drawing

6.1 Review of drawing layout: Title block, Notes, Paper sizes,
6.2 Considerations of site orientation, economy, aesthetics, facilities for disabled, fire safety,
6.3 Block plan, Site Plan, Ground plan
6.4 Sections and Elevations
6.5 Details
6.6 Plotting and printing drawing on plain sheets, tracing and ammonia paper

CHAPTER SEVEN

7.0 Facilities details

7.1 Production of Plumbing & drainage drawings details
7.2 Electrical wiring network to lights and circuits

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Narayan, K. Lalit (2008). *Computer Aided Design and Manufacturing*. New Delhi: Prentice Hall of India. p. 3. ISBN 812033342X.
2. Narayan, K. Lalit (2008). *Computer Aided Design and Manufacturing*. New Delhi: Prentice Hall of India. p. 4. ISBN 812033342X.
3. Madsen, David A. (2012). *Engineering Drawing & Design*. Clifton Park, NY: Delmar. p. 10. ISBN 1111309574.
4. Farin, Gerald; Hoschek, Josef and Kim, Myung-Soo (2002). *Handbook of computer aided geometric design [electronic resource]*. Elsevier. ISBN 978-0-444-51104-1.
5. Ross, Douglas T. (17 March 1961). Computer-Aided Design: A Statement of Objectives. MIT USAF 8436-TM-4.

25.5 PLUMBING PROJECT III

COURSE CODE: **CP 2107**

CREDIT UNITS: **5**

CONTACT HOURS: **75**

PROJECT DESCRIPTION
This course introduces students to the drainage systems, different methods of joining pipes, types of drainage systems and Eaves gutters, (types and shapes).

PROJECT OUTPUT
Students should be able to differentiate different methods of joining pipes, comparison between wash down and siphonic WCs and automatic flushing cisterns

OBJECTIVES
By the end of the semester, students should be able to know the methods of joining pipes:
1. Differentiate different methods of joining pipes
2. Appreciate the importance of flushing cistern
3. Differentiate types of drainage systems

PROJECT ACTIVITIES

CHAPTER ONE
1.0 sheet metal
1.1 Gutter (sizes, lengths)
1.2 Eaves gutters, (types and shapes).
1.3 Supports/lengths.
1.4 Materials.
1.5 Down pipes
1.6 Materials.
1.7 Joints.
1.8 Requirements.

CHAPTER TWO
2.0 Automatic flushing cisterns
2.1 Where fixed.
2.2 Capacities.
2.3 Operation.

CHAPTER THREE
3.0 Urinals
3.1 Types.
3.2 Use.
3.3 Application.

CHAPTER FOUR
4.0 Siphonic Wc's
4.1 Types.
4.2 Functions.
4.3 Operation.
4.4 Comparison between wash down and siphonic WCs.

CHAPTER FIVE

5.0 Under (below) ground drainage

5.1 Fundamental factors for a good drainage system.
5.2 Types of systems
5.3 Combined.
5.4 Separate.
5.5 Partially separate.
5.6 Falls (mechanism).
5.7 Materials used; fittings e.g. gullies, bends.
5.8 Various joints.
5.9 Foundation.
5.10 Supports.

CHAPTER 6:
INNOVATION Student's self initiated project related to the programme

MODE OF DELIVERY

The methods of instruction shall include; demonstration, group discussions, project work and presentation

ASSESSMENT OF THE COURSE

This course unit will be assessed on 100 marks as follows:

Project Assessment 1	20%
Project Assessment 2	20%
Student's Personal Innovation	20%
Project Assessment 4	40%
Total	**100%**

The marks will be converted into Grade points.

26.0 YEAR TWO SEMESTER TWO

26.1 WORKSHOP PRACTICE IV

COURSE CODE **CP 2201**

CREDIT UNITS **5**

CONTACT HOURS **75**

COURSE DESCRIPTION
This course introduces students to the sheet metal fabrication for formation of cylinders at 90^o and pipe fitting methods.

LEARNING OUTCOMES
By the end of this course students will be able to do metal fabrication to produce different types of products for plumbing and use different types of pipe fitting.

OBJECTIVES
By the end of this course students should be able to:
1. Fabricate different materials and tools to be used in plumbing
2. Fit different type of pipes

COURSE CONTENT

CHAPTER ONE
1.0 SHEET METAL
1.1 Formation of cylinders at 90^o
1.2 Offsets
1.3 Half round and other rain water goods involving welting/soldering
1.4 Development and formation of funnels, dust bins, watering cans etc

CHAPTER TWO
PIPE FITTING
2.0 Methods of bending different pipes materials (cold and forge)
2.1 Template formation on the ground (floor)
2.2 Cutting, threading and assembling to dimension and shape
2.3 Types (shallow, deep, intermediate interception samples
2.4 Sizes of covers
2.5 Spacing between chambers.

CHAPTER EIGHT
8.0 **Introduction to partial Fractions**
8.1 Rules of partial fractions-linear factors and repeated factors only.

MODE OF DELIVERY
The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Building science by W.G Adams Vol. I & II
2. Plumbing by Town Send

26.2 MATHEMATICS II

COURSE CODE CP 2202

CREDIT UNITS 4

CONTACT HOURS 60

COURSE DESCRIPTION
This course introduces students to the methods of solving equations using matrices, matrix, transpose and cofactors of matrices, integrate and differentiate trigonometric functions

LEARNING OUTCOMES
Students should be able to apply factorization in solving equations, differentiate product and quotient of functions and know addition, subtraction and multiplication of matrices.

OBJECTIVES
By the end of this course the learner should be able to:
1. Apply different methods of solving equations using matrices
2. Differentiate product and quotient of functions
3. Apply factorization in solving equations
4. Integrate and differentiate trigonometric functions
5. Appreciate the importance of pascal's Triangle

COURSE CONTENT

CHAPTER ONE
1.**0 Matrices**
1.1 Addition, subtraction and multiplication of
1.2 Matrices, determination of a 2 x 2 and 3 x3
1.3 Matrix, transpose and cofactors of matrices,
1.4 Inverse matrices by adjoint method.
1.5 Introduction to Differentiation

CHAPTER TWO
2.0 **Differentiating with respect to x from first Principles**
2.1 Principles of y =x and y =x2; alternative notation
2.2 For first derivative; application of formulae for
2.3 Differentiation of products and quotients of functions; the chain rule; differentiation, algebraic, trigonometric functions and natural Logarithms.

CHAPTER THREE
3.0 Introduction to Integration
3.1 Integration as the reverse of differentiation,
3.2 functions of a linear function of x;
3.3 integration of trigonometric functions (sin x,cos and tan x);
3.4 Integration of polynomial function.

CHAPTER FOUR

4.0 Permutations and combinations;

4.1 The factorial notation, Pascal`s triangle,

4.2 General binomial expansion of $(1+x)^n$

CHAPTER FIVE

5.0 The Circle

5.1 Equation, $x^2+y^2+2fy+c=0$; the questions of tangents to the circle

CHAPTER SIX

6.0 Trigonometric identities

6.1 Proof of simple trigonometric identities;

6.2 Application of the formular for sin (A+ B), cos (A + B) and tan (A+ B) in solving trigonometric Ratios e.g determining sin 75^0, cos 120^0, etc Without using calculators or tables

CHAPTER SEVEN

7.0 **Statistics**

7.1 Discrete and continuous data;

7.2 frequency and histograms

7.3 central tendency-mean mode and

7.4 medium. Dispersion –variance and standard deviation.

CHAPTER EIGHT

8.0 **Introduction to partial Fractions**

8.1 Rules of partial fractions-linear factors and repeated factors only.

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.

There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Mathematics for Technicians by Taylor Level II

2. Pure mathematics Back-house I

26.3 CRAFT SCIENCE & CALCULATIONS II

COURSE CODE **CP 2203**

CREDIT UNITS **4**

CONTACT HOURS **60**

COURSE DESCRIPTION
This course introduces students to the Corrosion, types / kinds of corrosion, protective coatings & their applications and processes of protective coatings

LEARNING OUTCOMES
Students should be able to differentiate types of corrosion, identify the electrolytic action, and most common decorative coatings

OBJECTIVES
By the end of this course, students should be able to:
1. Differentiate types of corrosion
2. Appreciate the importance of protective coatings & their applications
3. Calculate relative density

COURSE CONTENT

CHAPTER ONE
1.0 Corrosion
1.1 Definition
1.2 Types / kinds of corrosion
1.2.1 Atmospheric
1.2.2 Bacterial
1.2.3 Electrolysis
1.2.4 Electrolytic action
1.2.5 Cathodic protection
1.2.6 Anodic attack
1.2.7 Dezincification
1.3 Different metals have different reactivity series

CHAPTER TWO
2.0 Coatings
2.1 Protective and decorative
2.2 Definitions
2.3 Oxidation as a destructive agent
2.4 Oxidation as a protective agent
2.5 Types of protective coatings
2.6.1 Painting
2.6.2 Plastic sheathing
2.6.3 Wrapping
2.6.4 Galvaninsing
2.6.5 Bower burffing
2.7 Most common decorative coatings
2.8.1 Electro- plating
2.8.2 Painting

2.9 Processes of protective coatings
2.10.1 Metallic process
2.10.2 Galvanizing
2.10.3 Shearadizing
2.10.4 Electro- plating
2.10.5 Spraying
2.11 Non metallic process
2.12.1 Painting
2.12.2 Dipping in bitumen
2.12.3 Bower buffing

CHAPTER THREE
3.0 Density
3.1 Definition
3.2 Formula and symbol
3.3 Some calculations
3.4 Relative density
3.4.1 Definition
3.4.2 Formula
3.4.3 Calculations

CHAPTER FOUR
4.0 Mass and weight
4.1 Definitions
4.2 Differences
4.3 Scalar quantity
4.4 Vector quantity
4.5 Physical and chemical exchanges
4.6 Definitions
4.7 Common differences

CHAPTER FIVE
5.0 Capillarity
5.1 Definition
5.2 Advantages and disadvantages
5.3 Anti – capillary groove
5.4 Wetability
5.5 Porosity
5.6 Osmosis
5.7 Meniscus
5.8 Adhesive (liquids)
5.9 Cohesive (mercury)

CHAPTER SIX
6.0 Work done or mechanical advantages
6.1 Definition
6.2 Formula
6.3 Joule
6.4 Calculations
6.5 Calculate nominal and actual capacities
6.6 Volumes (m3).
6.7 Area of materials (surface)

CHAPTER SEVEN

7.0 Matter

7.1 Definition
7.2 Three state of matter
7.3 Solids
7.4 Liquids
7.5 Gases
7.6 Cohesion and adhesion forces
7.7 Changes of states of matter
7.8 Condensation
7.9 Evaporation
7.10 Solidifying
7.11 Liquidifying
7.12 Sublimation

CHAPTER EIGHT

8.0 Acceleration due to gravity

8.1 Definition
8.2 SI Units
8.3 Newton and force
8. 4 Calculations
8.5 Heat calculations
8.6 Heat calculations (linear, cubical, and superficial).
8.7 Boiler capacities
8.8 Cylinder volumes
8.9 Calculate the capacities of

CHAPTER NINE

9.0 Stall.
9.1 Slabs.
9.2 Length required.
9.3 Inclination and flowing pipes by Chezy,Macquire's rule
9.4 Hydraulic mean depth
9.5 Transposition of formula.
9.6 Introduction to Trigonometry, ratios
9.7 Application of trigonometry in plumbing.
9.8 Calculation of materials and costs required.
9.9 Introduction to simple pumps/discharge calculations.
9.10 Calculations for frictional resistance due to fittings, angles and distances.
9.11 Calculation for pressures due to given heads.
9.12 Quadratic equations related to plumbing work.

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Plumbing by Town Send
2. Mathematics for technicians by Taylor Level II
3. Building science by W.G Adams Vol. I & II

26.4 HYDRAULICS

COURSE CODE: **CP 2204**

CREDIT UNITS: **05**

CONTACT HOURS: **75**

COURSE DESCRIPTION
This course introduces students to the motion of fluids in a pipe or channel, velocity, diameter and discharging capacities of channels and pipes.

LEARNING OUTCOMES
Students should be able to determine elative discharging power of pipes, know the Pipe flow formula and the relative discharging power of pipes

OBJECTIVES
By the end of the semester, learners will be able to:
1. Demonstrate the motion of fluids in a pipe or channel.
2. Determine the velocity, diameter and discharging capacities of channels and pipes

COURSE CONTENT

CHAPTER ONE
1.0 Introduction
1.1 Definition of hydraulics
1.2 Relative discharging power of pipes
1.3 Relative capacities of pipes

CHAPTER TWO
2.0 Types of flow
2.1 Streamline flow
2.2 Turbulent flow

CHAPTER THREE
3.0 Pipe flow formula
3.1 Darcy's formula
3.2 Exercise formula

CHAPTER FOUR
4.0 Thomas box formula
4.1 Factors that affect discharge rate, Exercise

CHAPTER FIVE
5.0 Flow in drains, open channels and sewage disposal
5.1 Drains and channels (chezy formula)
5.2 Crimp and brudges formula
5.3 Exercise

CHAPTER SIX

6.0 Resistance of fittings
6.1 The Bernoulli theorem
6.2 Resistance expressed as equivalent length of pipe

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.
There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Prasuhn, Alan L. *Fundamentals of Hydraulic Engineering*. Holt, Rinehart, and Winston: New York, 1987.
2. Prasuhn, Alan L. *Fundamentals of Hydraulic Engineering*. Holt, Rinehart, and Winston: New York, 1987.
3. Cassidy, John J., Chaudhry, M. Hanif, and Roberson, John A. "Hydraulic Engineering", John Wiley & Sons, 1998
4. E. John Finnemore, Joseph Franzini "Fluid Mechanics with Engineering Applications",McGraw-Hill,2002
5. Hans Hasen (Eds), *Davis' Handbook of Applied Hydraulics*, Mcgraw-Hill, 4th Edition (1992), ISBN 0070730024, at Amazon.com Classification of Organics in Secondary Effluents. M. Rebhun, J. Manka. Environmental Science and Technology, 5, pp. 606–610, (1971). 25.

26.5 ENTREPRENEUERSHIP SKILLS

COURSE CODE CP 2205

CREDIT UNITS 04

CONTACT HOURS 60

COURSE DESCRIPTION
This course introduces students to identify business opportunities, basic concepts to Entrepreneurship and develop a business plan.

LEARNING OUTCOMES
Students should be able to generate new ideas for starting up a business, importance of entrepreneurship education, challenges facing entrepreneurs and how to develop an organization that supports Entrepreneurship

OBJECTIVES
By the end of this course, the learner should be able to;
1. Identify business opportunities
2. Generate new ideas for starting up a business
3. Develop a business plan

COURSE CONTENT

CHAPTER ONE
1.0 Introduction
1.1 Introduction to entrepreneurship
1.2 Basic concepts to Entrepreneurship
1.3 Importance of Entrepreneurship education
1.3 Characteristics and qualities of a good entrepreneur
1.4 Classification of entrepreneurs
1.5 The entrepreneurial process

CHAPTER TWO
2.0 Creativity
2.0 Definition of creativity
2.3 Steps of creativity
2.4 Challenges facing entrepreneurs
2.5 Solutions of barriers to entrepreneurship

CHAPTER THREE
3.0 Innovation
3.1 Definition of innovation
3.2 Attributes of a good innovator

CHAPTER FOUR
4.0 Business planning and development
4.1 Sources of business opportunities
4.2 Sources of Capital for a Business
4.3 Small scale businesses Vs Entrepreneur ventures
4.4 Business plan

CHAPTER FIVE

5.0 Entrepreneurship

5.1 Definition

5.2 Importance of Entrepreneurship

5.3 How to develop an organization that supports Entrepreneurship

CHAPTER SIX

6.0 **Concept development**

6.1 Forms of Business start up

6.2 Practically developing an enterprise

6.3 Life after start-up

MODE OF DELIVERY

The mode of delivery will include: lecture, hands-on, demonstration, group discussions and presentation.

ASSESSMENT OF THE COURSE

This course unit will be assessed out of 100 marks as follows;

Course work by continuous assessment	30%
Final examination	70%
Total	**100%**

The marks will be converted into Grade points.

There will be the final examination in the last two weeks of the semester.

REFERENCES

1. Drucker, F.P 1985 innovation and entrepreneurship. Sultan Chand and sons, New Delphi
2. Gupta, CB 1995 Entrepreneurship Development 3rd edition. Sultan Chand and sons, New Delphi
3. Apegu, J.N 2005. How to create a sustainable Business. Longman, London
4. Gupta, C.B. and Srimivasan, N.P. (1996) Entrepreneurial development. Sultan, Chard and Sons Publishers
5. Kao, John; (1989) Entrepreneurship, creativity and organizations. Prentice Hall International
6. Clifford Pinchott III 1985; Intrapreneuring, Harper and Row Publishers, New York
7. Khandwalla N. Pradip 1995, Four the Eye ; Excellence Through Creativiy. Wheeler Publishing

26.6 PLUMBING PROJECT IV

COURSE CODE CP 2206

CREDIT UNITS 5

CONTACT HOURS 75

PROJECT DESCRIPTION:
This project expresses the hands on training of all the areas covered in the theoretical classes.

PROJECT OUTCOMES
Students should be able to Development of surfaces – cylinders, curves, development of rain water down pipes and make layout sketches and Isometric projection

OBJECTIVES OF THE PROJECT
By the end of this course, the student should be able to;
1) Set out and construct a surfaces – cylinders, curves
2) development of rain water down pipes
3) make layout sketches of Isometric projection

PROJECT ACTIVITIES
1.1 Isometric views of cisterns
1.2 Introduction to Orthographic projection
1.3 Pipe line
1.4 Cylinders in isometric views.
1.5 Orthographic views.
1.6 Views and layouts of cylinders and pipe lines (Isometric/orthographic)
1.7 Development of surfaces – cylinders, curves.

CHAPTER TWO
2.0 Sketches of the above ground sanitary pipe work and drainage joints of various materials.
2.1 Development of bend (square, segmental).
2.2 Pipe intersections.
2.3 Sketches of drain ventilation
2.4 Simple taking off of quantity (materials required) and symbols
2.5 Development of rain water down pipes
2.6 Gutter outlets (soldering and seaming)
2.7 Drawing to scale of sanitary accommodation.
2.8 Introduction to oblique projection principles and guidelines
2.9 Sketches of system layouts
2.10 La**y**out sketches and Isometric projection.
2.11 Isometric views of plumbing services.

CHAPTER THREE:
INNOVATION Student's self initiated project related to the programme

MODE OF DELIVERY

This course will be taught through demonstrations, illustrations, site visits, guided discussion, practical work, report writing and presentations

ASSESSMENT OF THE COURSE

This course unit will be assessed on 100 marks as follows:

Project Assessment 1	20%
Project Assessment 2	20%
Student's Personal Innovation	20%
Project Assessment 4	40%
Total	**100%**

The marks will be converted into Grade points.

27.0 LIST OF LECTURERS AND TECHNICAL STAFF IN THE FACULTY OF ENGINEERING AND TECHNOLOGY

S/N	NAME	QUALIFICATIONS	EXPERIENCE
1	Akankwasa Phionah	B. VOC. STUD. IN TECH. EDUC (KYU)	3 Years
2	Byamukama Denis	B. VOC. STUD. IN TECH. EDUC (KYU)	3 Years
3	Ingabire Charity	B.VOC. STUD. IN TECH. EDUC (KYU)	3 Years
4	Mwanja Grace Charles	B. Sc Engineering (MUK)	28 Years
5	Kinconco Keneth Muhumuza	ODEE (UNEB), Bsc. Educ. KYU	8 Years
6	Twine Usito Bakesigaki	B. Tech. Teacher Educ. (Mech), KYU	3 Years
7	Nyanzi baker	ODEE (UBTEB) (UTC)	2 Years
8	Twinomujuni Naume	DWE, UNEB (UTC)	3 Years
9	Mugerwa Ashirafu	ODME, UBTEB (UTC)	2 Years
10	Muhumuza Merable	ODCE, UNEB (UTC)	3 Years
11	Niwagaba Edwin	ODIP CERAMICS (UNEB)	2 Years
12	Nabasa Philip	CRAFT I & II, CERT. IN PLUMB (UNEB), DWE	4 Years
13	Mbabazi Alex	ODEE (UNEB) CRAFT I & II ELECT INST (UNEB)	9 Years
14	Tugume Vicent	Craft I & II Carpent & Joinery UNEB, CTTE KYU, DCE Kabale Univ	13 Years
15	Arinda Sam	DME UNEB, HDEE City Guilds of London Institutes	4 Years
16	Niwamanya Paison	ODME (UNEB)	2 Years
17	Narinda Ivan	B. Voc Studies in Tech Educ KYU	2 Years
18	Akampurira Keneth	HDME, ODME (UNEB), B. Sc in Computer Science MUK	17 Years
19	Ashaba Nickolas	ODWE (UNEB)	3 Years
20	Wanjori Paul	B. Sc Electrical Engineering (MUK)	3 Years