



**COLLEGE OF ENGINEERING, SCIENCE
& TECHNOLOGY**

SCHOOL OF BUILDING & CIVIL ENGINEERING

CERTIFICATE IV IN PLUMBING AND SHEETMETAL

**Programme Document
&
Unit Descriptors**

2014

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**College of Engineering, Science and Technology
School of Building & Civil Engineering
Certificate IV in Plumbing and Sheet Metal**

1.0 Background Information

In 2010, the Fiji government mandated to merge Fiji Institute of Technology with existing five colleges in Fiji. The merger of the six colleges brings to the birth of the Fiji National University (FNU). Among the colleges of said university are the College of Engineering, Science and Technology (CEST). The Certificate IV in Plumbing and Sheet Metal is offered in CEST, which is to be approved by the Industry Advisory Council and FNU Senate.

The realignment of the whole Certificate IV in Plumbing and Sheet Metal is now presented in this document.

1.1 Rationale

FNU has a responsibility to the Nation, the student and to industry. The student and industry in their turn have a responsibility to their chosen profession. In these days of ever widening access to tertiary education Certificate IV is rapidly becoming the minimum qualification for gaining entry to professional employment. It is therefore seen as being of vital importance to all parties to enable each student to reach the highest level of education of which he or she is capable. In practice this means that the best students should aspire to degree.

The curriculum documents have also been prepared to comply with the requirements of The General Academic Statute of the Fiji Institute of Technology and more recently the University Academic and Student Regulations (UASR) of the Fiji National University (FNU).

1.2 Aims and Objectives

To educate students in the field of Plumbing in order to prepare them for careers in the construction industry, professional tradesman, entrepreneurs, and enable them to become a leader in their field of plumbing. The objectives of the programme are to;

- a) Provide a thorough foundation in the basic physical knowledge of construction in Fiji.
- b) To teach students basic scientific principles of solving technological problems in plumbing by providing them instructions in analysis, development, design and practical work in the various types of construction.

- c) To train the students to acquire the capability for meaningful result oriented research in the construction sector.
- d) To acquire advance knowledge through conduct of basic, applied and adaptive research.
- e) To be capable of addressing issues of ethics, safety, professionalism, cultural diversity, globalization, environmental impact and social and economic impact in engineering practice.
- f) To create construction solutions (and products) with socio-economic impact that can create wealth to the nation.
- g) To attract potential investors to the country because of highly educated work force and imply minimal costs to the operation.

1.3 Graduate Profile

The profile for student graduating in Certificate IV in Plumbing and SheetMetal is to produce competent Tradesman that will become the "*leading lights*" of the industry. A successful candidate who completed said field of study should have and be able to have:

- a) Sufficiency of theoretical knowledge in the types of footings used in Construction.
- b) Estimate and build residential buildings.
- c) Liaise with government and local government organizations and generally facilitate the process of satisfying many legal requirements to which the construction industry is obliged to conform.
- d) Act as an effective channel of communication between the construction team and the labour force.

1.4 Program Philosophy

Throughout the programme the emphasis is on personal development, through project/investigative work or through more traditional teaching methods. Courses provide theory and practice to develop the intellectual and practical skills of the student which are vital to the practicing tradesman.

2.0 Programme Regulations

2.1 Admission Requirements

The minimum entry requirement for admission to Certificate IV, is to complete form 6 level of education.

The students are admitted directly in first stage of the Certificate IV programme. Enrolment in the programme is done after duly verifying all the documents including transcripts, birth certificate, identification etc. Final enrolment is confirmed only after he or she paid the full fees or made alternative arrangements with the finance department in writing.

2.2 Award of the Certificate

To be considered for the award of the Certificate IV in Plumbing and Sheet Metal, the candidate must have:

- a) Completed all the prescribed units and 150 credit points.
- b) Industrial attachment work in a reputable and legally recognized Construction/Plumbing company or firm in Fiji and overseas for a period of 6 months.

3.0 Programme Structure

3.1 General

The duration of the programme is one year consisting of three trimesters. The student will be expected to undergo 6 months construction work attachments to complete the programme. The programme consists of 20 units drawn from stages 1 to 3. The duration of the program is one and a half year in which the student will graduate and awarded with a Certificate.

3.2 Compulsory Units

All units are compulsory.

3.3 Delivery Mode

The programme is 15 weeks full-time per trimester for three consecutive trimesters.

3.4 Order of Delivery

Units are tabled according to the year/trimester in the Unit Descriptors (Tables 1&2). Unit content instruction should be delivered chronologically as itemized in the Unit Descriptor

3.5 Duration of Programmed.

3.5.1 Full Time Student.

The program will run at a maximum of 2 years (3 trimesters and 6 months).

3.5.2 Part Time Student.

Students will study a maximum duration of at least 5 years.

Table 1. Programme Descriptor

Code: PBS		CERTIFICATE IV PLUMBING & SHEETMETAL	
Year 1			
Trimester 1 – Stage 1		Trimester 2 – Stage 2	
Unit Code	Unit Title	Unit Code	Unit Title
ETH301 MTH301 OHS403 CTP404 PBS401 PBS402 PBS403	Fundamental of Ethical Practice Mathematics for Trade Occupational Health and Safety Building Science Plumbing & Sheetmetal Drawing Water Supply Theory Water Supply Practice	COM301 PBS405 PBS406 PBS407 PBS408 PBS 412 CIN 302	Technical Communication Water Heating Theory Water Heating Practice Sheetmetal Fabrication Practice Sheetmetal Fabrication Theory Metal Fabrication Computer Skills
Year 1			
Trimester 3 – Stage 3			
Unit Code	Unit Title		
CTP414 CTP422 PBS409 PBS410 PBS411 PBS413	Computer Aided Drafting Introduction to Surveying Sewer and Drainage Theory Sewer and Drainage Practice Building Services Project Plumbing Calculation & Design		

Table 2 Programme Structure

Trimester 1									
Serial #	Unit Code	Unit Title	Lecture Hours	Tutorial Hours	Labs & Studio	Total Contact Hours	SDL hours	Total Learning Hours	Credit Points
1	ETH301	Fundamental of Ethical Practice	3	2		60	20	80	5
2	OHS403	Occupational Health and Safety		1	4	60	30	90	6
3	PBS402	Water Supply Theory	2	1		36	50	86	6
4	PBS403	Water Supply Practice			5	60	50	110	7
5	CTP404	Building Science	4	2		72	60	132	9
6	PBS401	Plumbing & Sheetmetal Drawing		1	4	60	60	120	8
7	MTH301	Mathematics for Trade	4	2		72	60	132	9
		Total	13	9	13	420	330	750	50
Trimester 2									
Serial #	Unit Code	Unit Title	Lecture Hours	Tutorial Hours	Labs & Studio	Total Contact Hours	SDL hours	Total Learning Hours	Credit Points
1	COM301	Technical Communication	2	3		60	10	70	5
2	PBS405	Water Heating Theory	4	1		60	60	120	8
3	PBS406	Water Heating Practice			5	60	60	120	8
4	PBS407	Sheetmetal Fabrication Practice			5	60	60	120	8
5	PBS408	Sheetmetal Fabrication Theory	4	1		60	50	110	7
6	PBS 412	Metal Fabrication			5	60	60	120	8
7	CIN 302	Computer Application		1	4	60	30	90	6
		Total	10	6	19	420	330	750	50
Trimester 3									
Serial #	Unit Code	Unit Title	Lecture Hours	Tutorial Hours	Labs & Studio	Total Contact Hours	SDL hours	Total Learning Hours	Credit Points
1	CTP414	Computer Aided Drafting		1	5	72	60	132	9
2	CTP422	Introduction to Surveying	2		4	72	50	122	8
3	PBS409	Sewer and Drainage Theory	4	1		60	50	110	7
4	PBS410	Sewer and Drainage Practice			6	72	60	132	9
5	PBS411	Building Services Project			6	72	60	132	9
6	PBS413	Plumbing Calculation & Design	4	2		72	50	122	8
		Total	10	4	21	420	330	750	50

Industrial Attachment 6 months in a Plumbing/Construction Company

Table 3 Pre-requisite for every unit

Unit Code	Unit Title	Pre – requisite
Year 1, Trimester 1		
ETH301	Fundamental of Ethical Practice	Form 6 Pass
MTH301	Mathematics for Trade	Form 6 Pass
OHS403	Occupational Health and Safety	Form 6 Pass
CTP404	Building Science	Form 6 Pass
PBS401	Plumbing & Sheetmetal Drawing	Form 6 Pass
PBS402	Water Supply Theory	Form 6 Pass
PBS403	Water Supply Practice	Form 6 Pass
Year 1, Trimester 2		
COM301	Technical Communication	Form 6 Pass
PBS405	Water Heating Theory	PBS402/ PBS403
PBS406	Water Heating Practice	PBS402/ PBS403
PBS407	Sheetmetal Fabrication Practice	PBS401
PBS408	Sheetmetal Fabrication Theory	PBS401
PBS 412	Metal Fabrication	PBS401
CIN 302	Computer Skills	Form 6 Pass
Year 1, Trimester 3		
CTP414	Computer Aided Drafting	CIN 302
CTP422	Introduction to Surveying	MTH301
PBS409	Sewer and Drainage Theory	PBS405/ PBS406
PBS410	Sewer and Drainage Practice	PBS405/ PBS406
PBS411	Building Services Project	CTP404
PBS413	Plumbing Calculation & Design	MTH301

There is a considerable degree of flexibility tolerated for students who wish to break their studies, have to resit examinations or repeat units. The only stipulation being

- Prerequisites must be satisfied before proceeding to advanced units and
- Supplementary assessment and repeat can only be done when the unit is next offered.

The final outcome for graduation must be the accumulation of 20 appropriate units plus the mandatory 6 months industrial attachment. The student should submit the Work Experience Record Book to the school duly signed by the employer.

4.0 Assessment

4.1 Assessment Philosophy

Assessment is broken down into formative and summative components. Details are expanded below.

4.2 Methods of Assessment

The aim of summative assessment is to provide the examination board with evidence on which to base its recommendations regarding the award of grades. The primary tool for

summative assessment is by final examination. These will normally be of either two or three hours duration as appropriate to the subject matter. An additional ten minutes reading time will be allowed. In preparing examination papers, consideration will be given to the level of attainment of the candidates. The aim being to move the candidates progressively from closed type problem solving towards a more open ended style of examination question.

The aim of formative assessment is to guide and encourage the student to meet the performance criteria set out in each of the unit descriptors. Its primary purpose is therefore educational. The primary tool for formative assessment is the assignment. Assignments are used to develop the students' problem solving skills and to provide guidance as to the level of attainment expected. Marks for assignment work reflect the degree to which the student has met the performance criteria. Comments on the student's submission indicate how the work could be improved to better meet those criteria. Assignments also form the basis of the tutorial programme where the emphasis is on active rather than passive learning. Classroom exercises are an essential part of the assessment procedure. They are assessed on the basis of a report of the work carried out and the conclusions drawn. As part of the exercise, the student is expected to conduct a literature search and review.

4.3 Criteria for Assessment

All units require that a student obtain a total mark of 50%. In units with final examinations the student must also obtain the stated minimum mark in the examination. Assignments must be completed to an acceptable standard. Attendance during class tests is compulsory.

5.0 Teaching and Learning Methods

5.1 Introduction

A variety of teaching methods will be used to facilitate the achievement of the aims and objectives of the programme. In the initial stage of the process of intellectual development the student will be guided towards the achievement of a successful outcome to each activity. In later stages however, this guidance will be reduced so as to encourage the student to become a self-motivated independent learner.

5.2 Methods

Teaching will be by a mixture of formal lectures, laboratory sessions and the solution of both closed and open-ended problems in engineering design and construction. Classroom-based activities will emphasise active participation in the learning process. In the early stage students will participate in tradition problem solving activities. Students will be expected to supply reasoned arguments in support of their approaches to solving assignment problems. Later on and as a pre-requisite to solving more open-ended problems, students will be encouraged to extend their knowledge base through directed

study of externally available resource material. In the final semester the students will be required to carry out a design project based on civil engineering practice. The project will be directed towards an actual engineering problem in Fiji and will require integration of knowledge from different parts of the programme syllabus.

6.0 Monitoring, Evaluating and Reviewing of Programme

6.1 College Academic Board

The College Academic Board composition as detailed in the UASR, review, discuss and amend programmed curricula.

6.2 Examination Board

The Examination Board composition as detailed in the UASR sits to discuss, amend and recommend individual results at the end of each trimester for approval.

6.3 Ongoing Monitoring

The College Academic Board has to review programme curricula and make amendments according to the following:

- a) new technologies
- b) new industrial practices legislation
- c) new educational developments
- d) changes to staff responsibilities
- e) employers and the Industry Advisory Committee
- f) School Academic Board
- g) student representative participating in the programme
- h) staff training roster
- i) review by external consultants etc.

The monitoring process is implemented by the application of Quality Management System procedures which ensure timely scheduling and recording of various meetings, regular calls to employer groups, launching and recording questionnaires, setting of internal and external reviews and maintaining close liaisons with industries, governments and educational bodies locally and abroad.

6.4 External Moderation

Final stage papers are externally moderated by experts in appropriate fields.

6.5 Industry Advisory Committee (IAC)

Composition of the IAC:

Chairman: Representative from the Industry
Secretary: Head of School (TVET/Technical), Building & Civil Engineering
Members: Representatives from:

Ministry of Public Works
Fiji Institute of Engineers
Fiji Builders Association
Private Companies
Fiji Sugar Corporation

7.0 UNIT INFORMATION

MTH 301 Mathematics for Trade

The unit is concerned with practical application of mathematics as a basis for efficient and economic Trade Practice. Upon the completion of this unit the student will be able to apply the law of indices to simply algebraic equations, use logarithms with products, quotients and powers, apply formulae to calculate the area, volume and surface area of regular and irregular shapes, solve quadratic equations by different methods, solve simultaneous equations by different methods, and use trigonometric functions to solve industry practical problems. More Calculation on directly related construction aspects of practical application is an impact to the Unit.

CTP 404 Building Science

Experiments both in the laboratory and in the external environment are fundamental to this unit. Upon the completion, students will be able to demonstrate through experiments a basic knowledge of chemical terms, graphically and using calculations, illustrate through calculations and graphical means the effects of acceleration, energy transfer and friction, measure fluid pressure including atmospheric pressure, measure temperature and illustrate through graphical and numeric methods, and solve simple problems associated with the application of electricity in tools and instruments.

PBS 401 Plumbing and Sheet Metal Drawings

The unit is practical. Learning is based on a series of assignments to progress the accuracy and drawing technique of the student. Upon the completion of this unit the student will be able to identify techniques of preparation and maintenance, produce them free hand and describe them. Produce two and three dimensional drawings, industrial standard drawings, measure elements and components to produce lists and schedules.

PBS 302 Water Supply Theory

This unit aims to provide the supporting theory to workshop practice, Upon completion of this unit the student will be able to prepare annotated sketches and calculations to describe alternate methods of supplying domestic water, prepare cold water instillation, produce schedule for cold water installation, describe preparation of materials, storage, site, operations, fixing and commissioning, compile checklists to install cold water system to ensure standards.

PBS 303 Water Supply Practice

This unit aims to provide the supporting theory to workshop practice. Upon completion of this unit the student will be able to demonstrate methods of bending, cutting, forming, fixing and joining, construct simulated domestic cold water installation, carry out connection from main connection to domestic water meter, test workmanship and materials above and below ground installation.

PBS 407 Sheet Metal Fabrication Practice

The unit enables the student to gain in skills in basic procedures and craftsmanship in sheet metal work. Upon the completion of this unit the student will be able to inspect, prepare and operate sheet metal machines, mark out, cut, drill and join a variety of common materials and alloys, produce detailed information of various simple shapes in sheet metal.

PSM 408 Sheet Metal Fabrication Theory

This unit brings together and extends the technology developed through earlier workshop practical exercises. Upon the completion of this unit, the student will be able to describe with suitable sketches and specification notes the covering of a domestic roof in sheet metal, schedule the components for a sheet metal roof, produce a schedule to describe the working process for the roof finishing, and compare, through testing and working characteristics, the use of variety of materials.

PBS 406 Water Heating Practice

This unit is concerned with hot water installations as currently carried out in Fiji. Students understand how to prepare drawings, construct, install components, arrange pipe-work and controls, and test examples of direct and indirect hot water systems; prepare drawings, develop patterns, manufacture hot water cylinder, and install as an electric hot water cylinder, including commissioning and testing construct a solar water heating system including solar panel, storage vessel and all pipe-work; and arrange commissions and installs.

PBS 405 Water Heating Theory

This unit aims to provide the supporting theory to workshop practice. Prepared annotated sketches to describe design and construction of the key components used in hot water installation, draw up a scheme for the hot water installation, produce schedules for a proposed hot water installation, and prepare work instruction to describe a hot water installation, compile a basic checklist to inspect a hot water installation

PBS 412 Metal Fabrication

This unit is concerned with welding and fabrication techniques applied in the construction industry. Upon the completion of this unit student will be able to operate standard types of welding equipment, describing safety, select filler rod and carries out welding of all types and be able to identify faults.

PBS 411 Building Services Project

Learning will be achieved through practical assignments. Upon completion of this unit the student should be able to design from mains supply to disposal system a complete plumbing/drainage system for a domestic dwelling, including all hot, cold and waste pipe work, inspect and test services, produce an electrical layout, using a checklist to inspect simple elements.

PBS 409 Sewers and Drainage Theory

This unit is concerned with standard installations and requirements in urban and country districts within Fiji. Upon completion of this unit the students will be able to prepare annotated sketches to fully describe the materials selected, produce drawings and specification notes fully describe the installation of sanitary fittings, and produce a working checklist to inspect the complete drainage installation.

PBS 410 Sewers and Drainage Practice

This unit should include a wide variety of materials and components currently in use in Fiji. Upon completion of this unit the students will be able to complete the construction of above ground installation and below ground installation, demonstrate working principles of a basic sewage treatment plant, test underground drainage, and select standard tests for above ground installations.

PBS 413 Plumbing Design and Calculation

In this unit the students describe and calculate speed, velocities, accelerations, force and pressure, fluid in motion relative discharging powers, pipe flow loss of heat due to friction, Thomas Formula, Chezy Formula and sizing of soak ways, heats loss through fabrics and ventilations, describe use of immersion heaters and gas heaters and solve problems relating to hot water and gas heaters.

CTP 414 Computer Aided Drafting

To develop the student drafting skills, by exploring the drawing room and observing the different drafting machine and equipment, stationary, engineer's scale and the measures for the care of drawing equipment and instrument, study of conventional method of representations of common construction materials, architectural fixtures and fittings, use of standard engineering symbols, scale drawing, normal scales. The syllabus also includes practical exercises of drawing locality plan, site plan, floor plan, elevations foundation plan, roof framing plan and structural plan of one storey or two storey residential building.

CTP 422 Introductions to Surveying

The unit introduces the elementary methods of conducting small scale land surveys and acquaint students with the surveying profession and its relationship with civil engineering. The syllabus includes: Correction in linear measurement due to sag, temperature, tension calibration, slope and curvature; Angular measurements using compass and Theodolite surveying instrument, angle distance and bearing calculations; levelling; setting out of vertical and horizontal control on the ground, principle of Tacheometry, use of planimeter; area and volume calculations; Theodolite traverse which lead to the plotting of topographic maps; Tacheometry to determine horizontal and vertical control of land survey, surveying calculations including area calculations and volume calculations of cut and fill; use of global positioning system (GPS) for control surveys, topographic surveys and staking out of control points on the ground.