



**COLLEGE OF ENGINEERING, SCIENCE &  
TECHNOLOGY**

**SCHOOL OF MECHANICAL ENGINEERING**

**Certificate IV in Refrigeration and Air Conditioning**

**Programme Details  
&  
Units Descriptions**

**2013**

**College of Engineering, Science and Technology  
School of Mechanical Engineering  
Certificate IV in Refrigeration and Air Conditioning**

## **Background**

An articulation with both government and private industries was done regarding the make-up of the Refrigeration and Air Conditioning syllabus content and requirements. Furthermore, a committee was formed and named as the Industry Advisory Committee to scrutinize, authorize and also implement further new changes periodically as technology advanced both locally and globally.

Just this year, 2013, the Fitting and Machining syllabus and requirements had been aligned to the Fiji National Qualifications Framework (FNQF) to ensure standards are implemented, in place and followed accordingly. In aligning with the FNQF, it ensures that our graduates have more opportunities available to them both locally and globally regarding work commitments thus raising the profile of their marketability and also the genuine recognition of our courses that were both developed and conducted here in Fiji.

## **Rationale**

The refrigeration industry covers a broad spectrum of activity in Fiji. Especially, as a tropical country, refrigeration is primarily required for fresh food preservation and transportation. Typical employment opportunities range from supermarkets to fishing vessels. In addition there is a growing demand for cold beverages served from refrigerated cabinets and continuous flow coolers. Again, demand for employment can range from beverage manufacturers to hotel operators.

Air conditioning is a parallel industry requiring similarly skilled personnel familiar with small and large building installations, particularly for office blocks and hotel accommodation.

## **Graduate Profile**

A successful graduate will be able to make a contribution within a wide range of activities, both on site and in the workshops. Technical knowledge will allow graduates to:

- Break problems of some complexity, down into routines and standard procedures

- Solve problems within a limited range of predicable solutions which involve selection, basic comparison and routine decision making.
- Use well developed practical skills to perform a wide variety of tasks to meet specific standards and quality control requirements.
- To follow general instruction under minimal supervision, and take responsibility for other team members; and maintain and set up tools/equipment to perform a range of standard tasks in a safe and workmanlike manner.
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### **Program Philosophy**

The philosophy of the course is based on student outcomes and the production of a portfolio of work including both practical and theoretical assignments to demonstrate competencies. This portfolio will include examples of both institutional and industrial work.

The program offered provides a recognizable qualification and a sound base for mechanical engineering students intending to specialize trade practices in fitting & machining. The training develops student's skill and knowledge of the processes involved.

### **Aims and Objectives**

#### **Aims:**

- I. To provide a basic technical skills course for industry which forms the basis for employment as a tradesman in refrigeration and air conditioning work.
- II. To provide industry with adequate number of capable and trained personnel who have acquired a sound knowledge and understanding of the principles and processes of refrigeration and air conditioning trade skills.
- III. To provide a core of technical knowledge to students who may wish to extend their studies to higher qualifications and specialisation in refrigeration and air conditioning
- IV. To develop the craft skills of the student to enable them to make a positive contribution to the standards and quality of refrigeration and air conditioning work in their field of employment.

#### **Objectives:**

- I. To provide the course student with a sound core of skills based on a broad analysis of essential competencies for employment as refrigeration and air conditioning tradesmen within industry
- II. To provide the student with a sound core of skills based on a broad analysis of essential competencies for employment as a maintenance worker within industry. Particular attention being drawn to safety, good working practices, quality of workmanship, materials selection, numeracy and other skills such as drafting and measurement. Emphasis is also placed on quality control and the maintenance of standards.
- III. To further provide the student with the basic technical knowledge and competencies essential for employment within the refrigeration and air conditioning industry and related occupations.
- IV. To provide the theoretical input to balance the practical experience and development of the student engaged in related industrial activities.
- V. To support and cooperate with industry and relevant training agencies in the development of competent craft skills to meet employment needs.

## 2. PROGRAMME REGULATIONS

### 2.1 Admission Requirements:

(a) ~~Fiji School Leaving Certificate with 50% in Mathematics and a Physical Science subject and at least 35% in English. If one has failed FSLC, he/she is still eligible for admission provided the above units have been attempted.~~

(b) Matured applicants with less than the above requirements can be considered.

### 2.2 Credit Value of Program

**1 unit = 3 to 11 credits and 1 credit point = 15 working hours.**

The program has 19 units; therefore a student should achieve 150 credits to complete the program

### 2.3 Duration of Program

The program should be completed in two years, including the mandatory minimum of twelve-month industrial attachment normally attained before or after completing Trimester 3.

### 2.4 Cross-Crediting

All units common to other section programs in the School of Mechanical Engineering are fully cross-creditable.

No time or grading limitations other than pass apply at the current time.

### 2.5 Award of Certificate

The general requirements for award of the qualification are laid down in the latest issue of the University Academic and Student Regulation. Grades A+ to E are allocated according to the level of achievement.

### 3. PROGRAMME STRUCTURE

#### 3.1 General

The three stages are ideally interspersed with relevant industrial experience. The student will be expected to maintain a record of industrial experience during periods of employment to demonstrate industrial application of the full range of core skills.

The students will be completing Stages 1 to 3 in year 1, before going for industrial attachment in year 2. **They need to complete at least a minimum of 12 months industrial experience before sitting for a practical trade test and once successful will they then be eligible for graduation.**

The course consists of nineteen units drawn mainly from Level 3 to Level 4. The study time allocated to each unit differs. The total instruction time allocated will be 750 hours per Trimester. This time will be used both inside and outside the College on classroom/workshops, assignments, projects and industrial visits. Students will be expected to demonstrate their ability to organise and progress work as part of the underlying core skills required of a responsible employee.

#### Program Schedule

	Trimester 1	Trimester 2	Trimester 3		
Year1	Stage 1.	Stages 1 & 2.	Stages 1, 2 & 3.		
Year2	Industrial Attachment				
Year 3	Industrial Attachment			Submit WERB	April Graduation
				Submit WERB	December Graduation

Trimester 1 - Stages 1.  
 Trimester 2 - Stages 1 & 2.  
 Trimester 3 - Stages 1, 2 & 3.

	<a href="#"><u>Program Descriptor</u></a>				
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<b>Code</b>	<b>Unit name</b>	<b>Pre-requisite</b>	<b>Credit value</b>	<b>Timetable Hrs/week</b>	<b>Learning Hrs/Trimester</b>
<b>RAC 1</b>					
ACR 410	Domestic Refrigerators & Freezers		9	5	135
COM 301	Technical Communication		4	3	61
ACR 301	Refrigeration Fundamentals		8	6	120
ACR 312	Electrical Fundamentals		8	6	120
ACR 304	Refrigerants		8	5	120
PLM 304	Basic Machining Process & Practice		4	4	66
ACR 306	Refrigeration Operation		9	6	135
			<b>50</b>	<b>35</b>	<b>757</b>
<b>RAC 2</b>					
ACR 314	AC Principles	ACR 312	9	6	135
ACR 416	Appliance Motors & Circuits		9	6	135
ACR 408	Refrigeration System Control		10	7	150
ACR 402	Cool Room & Freezers	ACR 410	10	7	150
ACR 411	Introduction To Air Conditioning	ACR 306	9	7	135
OHS 401	OHS		3	2	48
			<b>50</b>	<b>35</b>	<b>753</b>
<b>F&amp;M 3</b>					
ACR 403	Installation		10	7	150
ACR 405	Fault Finding & Diagnostics	ACR 416	10	7	150
ACR 412	Cooling Towers		9	6	135
EVG 301	Ethics		3	2	48
ACR 420	Air Conditioning System	ACR 411	9	6	135
ACR 407	Air Conditioning Controls	ACR 408	9	7	135
			<b>50</b>	<b>35</b>	<b>753</b>
			<b>150</b>	<b>105</b>	<b>2263</b>

### 3.2 Compulsory Components

All units are compulsory. The Program might be changed from time to time to suit the requirements of industry.

### 3.3 Optional Components

Additional units might be offered as free choice options in the future.

### 3.4 Special Requirements

Students must complete a minimum of 12 months industrial practice **and pass a practical trade test** before they can be considered for the Trade Certificate / Certificate IV.

### 3.5 Delivery Mode

The program is sandwich-type full-time Trimester based on three 15-week stages. Students who are firm apprentices attend alternate Trimesters on release from industry. Therefore they normally attend one Trimester per year which is decided from their date of intake.

### 3.6 Order of Delivery

Units are timetabled according to the chronological order of the Programme Descriptor above. Content material instruction is delivered chronologically as itemized in the Unit Descriptors.

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 stipulations being

- (a) Prerequisites must be satisfied before proceeding to advanced units and
- (b) Re-sits and repeats can only be taken when the unit is next offered officially.

The final outcome for graduation must be the accumulation of 19 appropriate units plus the mandatory 6 - 12 months industrial experience.

## 4. ASSESSMENT

### 4.1 Assessment Philosophy

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

### 4.2 Methods of Assessment

Formative assessment takes the form of projects and assignments, classroom exercises and laboratory practical. Summative assessment takes the form of formal tests. Theoretical units also carry a final examination. Marking weightings for the various components are detailed in each Unit Descriptor.

In addition to assessments during the formal study program the student must also demonstrate appropriate industrial experience for the required duration by way of a suitably completed Work Experience Record Book (WERB). **Furthermore, on the completion of their industrial experience, a practical trade test would need to be completed and passed in order to be eligible for Certificate IV graduation**

### 4.3 Criteria for Assessment

Skills assessed are: cognitive, communication and motor through tests, assignments and practical work respectively. Projects are used as a gauge for planning and organisational skills as well as self/collective motivation.

For all Examinable units, a minimum of 75% attendance and 50% Coursework are to be attained by the student, to enable him/her to sit for the final examination. A student should pass the final examinations to pass the unit.

#### **4.4 Fairness, Validity and Reliability**

The programme contains mainly examinable units in order to provide fair assessment across a wide range of academic abilities. Examinable units provide a high degree of objectivity whereas the few non-examinable units provide a measure of non-quantifiable personality factors through a more subjective approach such as a student's conscientiousness, inter-relations with peers and superiors and general attitude towards work.

Each unit carries at least one summative test. Marks for these and other forms of course work are entered onto the program record spreadsheet which is submitted to the Examination Board for scrutiny. Examinable units have their papers moderated prior to sitting and afterwards, the marking is assessed. Results are scrutinized by the School Examination Board prior to submission to the College Academic Board.

Definitions of Boards and other quantifiable assessment criteria and validation are explained in full in the University Academic and Student Regulations.

### **5. TEACHING AND LEARNING METHODS**

#### **5.1 Introduction**

A variety of teaching and blended learning methods are used as detailed below to cater for different learning styles and to promote guidance to learning in both structured and unstructured situations.

#### **5.2 Student Centered Learning**

This is catered for in assigned tasks, researches and project work as well as gaining experience in their industrial attachment.

#### **5.3 Methods**

An appropriate blend of classroom instruction coupled with workshop instruction, demonstration, simulation videos' and practical's to develop hands-on skills. Drawing office practical's to develop representational abilities. Tutorials for practicing problem solving and other analytical skills. Project work to develop initiative and teamwork. In addition, occasional laboratory practical's are conducted for science units. Visiting large and small manufacturing industries is a must for all students to observe and keep them updated on the changes taking place in our industries.

### **6. MONITORING, EVALUATING AND REVIEW OF PROGRAMME**

#### **6.1 College Academic Board**

The Board of Studies composition as detailed in the University Academic and Student Regulations is assembled to review, discuss and amend programme curricula.

#### **6.2 Examination Board**



The Examination Board composition as detailed in the University Academic and Student Regulations sits to review, discuss and amend individual results by consensus at the end of every stage.

### 6.3 On-going Monitoring

The College Academic Board sits quarterly to review programme curricula and make adjustments according to various inputs including

- new technologies
- new industrial practices/legislation
- new educational developments
- changes to staff responsibilities
- employers and the IAC
- the Academic Board
- the student body
- staff training roster
- Accreditation Body.

The monitoring process is implemented by the application of TQM 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 Exam papers are externally moderated by experts in appropriate fields.

### 6.5 Industry Advisory Committee (IAC)

Composition at the time of publication:

Chairman: A Representative from the Industry  
 Secretary: Head of School of Mechanical Engineering  
 Members: Representatives from:

1	Fiji Institute of Engineers		
2	TPAF		
3	Mechanical Services		
4	USP		
5	Coca Cola		
6	J&W services		
7	J Kevi C Ltd		
8	Trade Air Engineering		
9	Rewa Dairy		
10	Sisters Air Cool Services		