



**COLLEGE OF ENGINEERING, SCIENCE  
& TECHNOLOGY**

**SCHOOL OF MECHANICAL ENGINEERING**

**Trade Diploma in Agricultural Engineering**

**Programme Details  
&  
Unit Descriptions**

**2014**

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**SCHOOL OF MECHANICAL ENGINEERING**

**Department of Agricultural Engineering**

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## **College of Engineering, Science and Technology**

### **School of Mechanical Engineering**

#### **Department of Agricultural Engineering**

#### **Trade Diploma in Agricultural Engineering**

### **1.0 INTRODUCTION**

The Agricultural engineering programme at FNU traces its beginnings with the then Fiji Institute of Technology (FIT). It used to offer a Trade Certificate and Diploma in Agricultural engineering programmes in the Ba and Samabula campuses respectively.

In 2010, with the conversion of the FIT into a Fiji National University, The College of Engineering, Science and Technology was established and through its School of Mechanical Engineering (SME) the Agricultural Engineering programmes were renamed Certificate IV in Agricultural Engineering for the Certificate Level and Trade Diploma in Agricultural Engineering for the Diploma Level. The school continues the training of human resources vital to the development of the nation's Agricultural Engineering sector.

Over the years, the graduates have been employed in various companies, government and private organizations, gained respect and recognition that must have emanated from their key management position at their place of work, their capacity to lead, initiate, and implement activities.

The challenge remains to the strengthened role of the agricultural engineering field to support the efforts to increase production and food supply, and address the poverty alleviation concerns, environmental issues of the country. All the sectors of the economy recognized that country needs has a critical mass for skilled professionals and technicians that will be able to support its growing demands for agricultural and food products as well as technological services that are deemed necessary to support other industries in the country.

Agricultural Engineering is the application of engineering principles to any process associate with producing agriculturally based goods and management of natural resources. This discipline is concern with the development of labour saving machines, farm buildings, irrigation and drainage systems, and processes for preserving and converting agricultural products to useful feed and fiber products and such allied activities as environment and natural resources.

Agriculture is no doubt the backbone of Fiji's society and economy. Hence, improving productivity and development for the country's farming sectors and Agri-based industries has always been the priorities of the different institutions working in the country from both the government and the private sectors, both local and international operating in the country. The diploma program was offered in 2006 in response to the growing need for technologies in Agricultural Engineering.

Technological developments and advancements in agricultural sciences and engineering professions coupled with the challenges and needs of the developing Fiji economy and industries in the country, particularly the agriculture sector, necessitate the upgrading and innovations also of the FNU's human resource development programmes including the agricultural engineering field to cope up with these challenges and demands from the different sectors of the economy.

Further, despite Fiji's abundant agriculture and natural resources, about 80% of the country's food supply is mainly imported from abroad draining much of the country's foreign reserves and negated much of the progress made by the its fast rising tourism industry. The productivity of the agriculture and natural resources sectors have been so stunted and limited contributing much of the poverty that is now experienced in much of the country's rural population. This situation forces rural people to seek refuge in urban centres to seek livelihood and job opportunities. In turn, this condition put a lot of pressures in these highly populated places and contributed much to the rising cost of living and occurrences of criminality as people struggled to survive and face poverty.

Specifically recognizing the role of the Agricultural Engineering field to support the efforts to increase production and food supply, and address the poverty concerns, all the sectors recognized that Fiji has a critical need for skilled professionals and technicians that will be able to support its growing demands for agricultural and food products as well as technological services that are also critical to support other industries in the country.

Currently, the agricultural engineering program is run at two tiered levels, the Certificate and the Trade Diploma levels.

The curriculum documents have 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).

### **1.1 Rationale**

The Trade Diploma in Agricultural Engineering is a technician's qualification; ie bridging the individual student's career between engineering tradesman and professional agricultural engineer vital to boost and sustain productivity in the agriculture and natural resources sectors, and contributing significantly to Fiji's growing economy.

Thus, by adequately equipping the graduates with basic knowledge and skills in engineering and sciences, economics and entrepreneurship, rural development and extension, and computer technology and information management for applications in agricultural machinery and appropriate mechanization systems development, agricultural infrastructures design and construction, Agri-industrial processing and manufacturing, agricultural resources management, and integrated agricultural systems analysis will result in helping the country to address the problems and constraints currently experienced by the agriculture and natural resources sectors and ensure sustainable productivity and development in the future.

### **1.2 Graduates profile:**

Graduates shall be employable in technical areas where renewable energy engineering decision making is required at a low to moderate levels. With some years of field experience behind these Graduates and leadership abilities they will be team leaders or line supervisors and may rise to middle management levels with associated delegations. A Diploma graduate may have the technician's role in employment, become a supervisor/middle manager or proceed to higher education studies to become a fully qualified professional and may work in following sectors:

- Government
- Agricultural machinery and Farm power industry
- Self-employment and entrepreneur developments
- Educational and academic institutions
- Research and development centers and organizations/institutes
- International organizations
- Private companies
- Agri based industries

- Irrigation and drainage companies
- Equipment manufacturing
- Landscaping companies

A Diploma graduate may have the technician's role in employment, become a supervisor/middle manager or proceed to higher education studies to become a fully qualified professional.

### **1.3 Program Philosophy**

The main philosophy of the programme is to educate school leavers with agricultural engineering science that will provide the graduates the adequate necessary skills and knowledge in improving and sustaining the farming communities' livelihood and productivity through employment in agri-industries, support the development of engineering-based farm businesses and enterprises, and the enhancement of farm environmental protection and resources management to support the country's tourism, food security and other priority sustainable development goals.

The programme also provides the enhancement of skills in fabrication, construction and manufacturing of appropriate technologies to ensure that these efforts will really address the needs and concerns of the various stakeholders in the farming sectors of the economy. Further, these acquired knowledge and skills form the basic foundations for the graduates to advance in higher degree of studies both locally and internationally.

### **1.4 Aims and Objectives:**

The Programme is basically designed to develop agricultural engineering graduates equipped with some basic knowledge and skills on enterprise development and management to contribute significantly in improving and sustaining production and productivity of the agriculture and natural resources sectors by (1) creating jobs and livelihood opportunities in the rural communities, thus, helping to solve the unemployment problem, and (2) adding value and opportunities to farmers and other agri-industry players and stakeholders that will redound to improved Fiji's socio-economic development and sound environment and resource management.

Thus, graduates of this Programme are expected to:

- Develop appropriate and affordable engineering technologies such as machineries, tools and equipment, farm structures, irrigation systems, resource engineering techniques for conservation and management, and appropriate mechanisation systems that will help in improving and sustaining farm productivity and production profitability.

- Develop adequate and sound fundamental knowledge and skills in agricultural engineering to provide technical support services and development to various allied industries such as the agribusiness manufacturing and food processing, renewable and biomass energy sectors, metals and machinery fabrications, and rural-based enterprises.
- Develop and use basic and essential knowledge and competencies for employment and for livelihood generation through agribusiness development and entrepreneurship with quality and standards at par worldwide.
- Use and apply agricultural engineering knowledge and skills in the conduct of applied research and participatory technology development to ensure effective technology transfer, dissemination and extension to farmers and other stakeholders in the agriculture and natural resources sectors particularly the fisheries and forestry groups.
- Become model farmers and agribusiness engineers that will showcase the productivity, profitability and prestige of farming as a means of livelihood to alleviate poverty and as an occupation.

## **2.0 PROGRAMME REGULATIONS**

### **2.1 Admission Requirements:**

~~(a) Fiji School Leaving Certificate or equivalent with good passes in Mathematics, English, Physics and any other Science or Technical related subjects. Part time students shall complete the course for a maximum duration of seven years.~~

~~or~~

(b) Successful completion of Certificate IV / Trade Certificate in Agriculture Engineering.

or

(c) Under exceptional circumstances mature applicants with exceptional academic records in certificate program and training and special commendation from their employer might be admitted.

### **2.2 Credit Value of Programme**

The total credit value for the units in this program is 250 credits.

### **2.3 Duration of Programme**

The program can be completed in two and half years, including the mandatory minimum of six-months industrial attachment normally attended between trimesters or after trimester three. The industrial experience requirement can be waived for students with

adequate industrial experience at enrollment. The maximum duration of the program is four years.

#### **2.4 Cross Crediting**

All units common to other School programs are fully cross-credited. Also some units from other relevant programmes can be cross-credited if deemed appropriate at the time of enrollment.

#### **2.5 Award of Diploma**

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

### **3.0 PROGRAMME STRUCTURE**

#### **3.1 General**

The five stages are interspersed with relevant industrial experience for school leavers. The student will be expected to maintain a diary of experience during the period of employment to demonstrate industrial application of the full range of core activities. The programme consists of 45 (including theoretical and practical) units drawn from Levels 4 to 6. Students will be expected to demonstrate their ability to organize and progress work as part of the underlying core skills required of a responsible employee.

#### **3.2 Compulsory Components**

All the units are compulsory.

#### **3.3 Optional Components**

No optional units are offered in this programme.

#### **3.4 Special Requirements**

Students must complete a minimum of 6 months industrial practice before or after the final stage.

### 3.5 Delivery Mode

The programme is full-time based on 16 weeks trimesters. Intakes are at the beginning of each academic year and students proceed from one trimester to another until trimester five.

### 3.6 Order of Delivery

Units are timetabled according to the chronological order of the Programme Descriptor Table 1. 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

- Prerequisites must be satisfied before proceeding to advanced units and
- 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 45 appropriate units plus the mandatory 6 months industrial experience with diary.

<b>Table 1. Programme Descriptor for Trade Diploma in Agricultural Engineering</b>				
Code: <b>AGE</b>	<b>Trade Diploma in Agricultural Engineering</b>			
Minimum entry requirements: Fiji Form Six Examination or equivalent with good passes in Mathematics, English, Physics and any other relevant subjects.				
<b>Year One, Trimester 1</b>				
<b>Unit Code</b>	<b>Unit Title</b>	<b>Pre-requisite</b>	<b>Credit Point</b>	<b>Examinable (E) / Non-Examinable (NE)</b>
COM401	Technical Communication	Form 6 Pass	5	E
MTH405	Engineering Mathematics I	Form 6 Pass	10	E
MEC450	Engineering Graphics	Form 6 Pass	4	E
PHY416 / CHM406	Engineering Physics / Engineering Chemistry	Form 6 Pass	8	E
CIN445 / EEE460	Introduction to Computer Programming / Introduction to Electrical and Electronics Engineering	Form 6 Pass	8	E
OHS402 / ETH401	Occupational Health and Safety / Introduction to Ethics Governance	Form 6 Pass	5	NE/E
MEC470	Engineering Graphics Laboratory	Form 6 Pass	6	NE
PHY470 / CHM470	Engineering Physics Laboratory / Engineering Chemistry Laboratory	Form 6 Pass	2	NE
CIN470/EEE 470	Introduction to Computer Programming Laboratory / Electrical and Electronics Engineering Laboratory	Form 6 Pass	2	NE

<b>Year One, Trimester 2</b>				
<b>Unit Code</b>	<b>Unit Title</b>	<b>Pre-requisite</b>	<b>Credit Point</b>	<b>Examinable (E) / Non-Examinable (NE)</b>
MEC451	Engineering Mechanics	Form 6 Pass	8	E
MTH504	Engineering Mathematics II	MTH 405	10	E
PHY416 / CHM406	Engineering Physics / Engineering Chemistry	Form 6 Pass	8	E
CIN445 / EEE460	Introduction to Computer Programming / Introduction to Electrical and Electronics Engineering	Form 6 Pass	8	E
OHS402 / ETH401	Occupational Health and Safety / Introduction to Ethics Governance	Form 6 Pass	5	NE/E
MEC452	Workshop Practice	MEC 450	5	E
MEC 472	Engineering Mechanics Laboratory	Form 6 Pass	2	NE
PHY470 /CHM 470	Engineering Physics Lab / Engineering Chemistry Laboratory	Form 6 Pass	2	NE
CIN470/ EEE470	Introduction to Computer Programming Laboratory / Electrical and Electronics Engineering Laboratory	Form 6 Pass	2	NE
<b>Year One, Trimester 3</b>				
<b>Unit Code</b>	<b>Unit Title</b>	<b>Pre-requisite</b>	<b>Credit Point</b>	<b>Examinable (E) / Non-Examinable (NE)</b>
AGE520	Agriculture for Engineers	MEC451	8	E
AGE521	Farm Surveying and Levelling	MTH405	8	E
MEC553	Fluid Mechanics and Machinery	PHY416	8	E
AGE523	Engineering Statistics	MTH504	6	E
AGE524	Manufacturing Technology	MEC452	6	E
AGE556	Materials Engineering	PHY416	8	E
AGE572	Materials Engineering Laboratory	PHY416	2	NE
AGE575	Manufacturing Technology Laboratory	MEC452	2	NE
MEC570	Fluid Mechanics and Machinery Laboratory	PHY416	2	NE
<b>Year Two, Trimester 1</b>				
<b>Unit Code</b>	<b>Unit Title</b>	<b>Pre-requisite</b>	<b>Credit Point</b>	<b>Examinable (E) / Non-Examinable (NE)</b>
AGE500	Agricultural Engineering Project I	AGE524	7	NE
AGE531	Agricultural Structures & Buildings	AGE524	7	E
AGE532	Soil & Water Resources Engineering	MEC553	8	E
AGE533	Agribusiness Management & Entrepreneurship	AGE523	7	E
AGE534	Farm Machinery & Power	AGE556	8	E
AGE535	Post Harvest Engineering	MEC553	7	E
AGE580	Soil & Water Resources Lab	MEC553	2	NE
AGE581	Post Harvest Engineering Lab	MEC553	2	NE
AGE582	Farm Machinery & Power Lab	AGE556	2	NE

Year Two, Trimester 2				
Unit Code	Unit Title	Pre-requisite	Credit Point	Examinable (E) / Non-Examinable (NE)
AGE610	Tractor Systems & Controls	AGE534	8	E
AGE620	Drainage and Irrigation Engineering	AGE532	6	E
AGE541	Rural Extension & Technology Transfer	AGE533	6	E
AGE542	Bio-Energy Engineering	AGE524	6	E
AGE543	Precision Agriculture	AGE534	6	E
AGE600	Agricultural Engineering Project II	AGE500	10	NE
AGE591	Tractor Maintenance and practice Lab	AGE534	4	NE
AGE592	Drainage and Irrigation Laboratory	AGE532	2	NE
AGE593	Bio-Energy Lab	AGE524	2	NE

## 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

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.

### 4.3 Criteria for Assessment

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

- Coursework                    50%
- Examination                    50%
- Attendance                    75%

#### **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 Examination Board prior to submission to the Academic Board.

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

### **5.0 TEACHING AND LEARNING METHODS**

#### **5.1 Introduction**

The teaching methods used will consist of a variety of techniques in order to achieve the specified learning outcomes. The teaching methods used will generate a learning environment whereby the practical skills and theoretical knowledge are integrated so that the students can meet the requirements of work situations.

The teaching methods will positively encourage the development of independent learning and the teaching strategies will accommodate the following:

- (a) the amount of classroom time, reference books and written resources.
- (b) use of data readers and measuring instrument to illustrate and demonstrate the systematic graphic representation of concepts.

- (c) graded projects will be used to facilitate the development of independent learning skills interpersonal skills, leadership and organizational skills.

Generally the summative and formative assessment will be an integral part of the teaching methods.

## **5.2 Student Centered Learning**

The emphasis would on training students in making working models related to the relevant topics and monitoring of learning outcome of the students during their industrial attachment.

## **5.3 Methods**

An appropriate blend of classroom instruction coupled with laboratory experimentation to develop hands-on skills. Drawing office practical to develop representational abilities. Tutorials for practicing problem solving and other analytical skills. Project work to develop initiative and teamwork. Research is to help them in systematic investigative process employed to increase or revise current knowledge by discovering new facts.

## **6.0 MONITORING, EVALUATING AND REVIEW OF PROGRAMME**

### **6.1 Board of Studies**

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 Board of Studies 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
- reviews by external consultants etc.

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 stage papers are externally moderated by experts in appropriate fields.