COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY

SCHOOL OF ELECTRICAL & ELECTRONIC ENGINEERING

DEPARTMENT OF BIOMEDICAL ENGINEERING

PROGRAMME DOCUMENT

CERTIFICATE IV IN BIOMEDICAL TECHNOLOGY

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1. INTRODUCTION

1.1 PROGRAMME DETAILS

a. Title: Biomedical Technology Certificate IV.

b. Award: Certificate IV In Biomedical Technology

1.2 HISTORY AND DEVELOPMENT (RATIONALE)

In 2002 the Australian College of Surgeons with the support of AusAID and WHO for the Medical Equipment Maintenance in the Pacific (MEMP) program approached the FIT and particularly the School of Electrical and Electronics Engineering and the School of Mechanical Engineering for the mounting and staging of a Biomedical Technology programme at Certificate II level. This was targeted only for the Biomedical Technology mechanical technicians in the Pacific Regional Hospitals to address the needs in electrical and electronics principles, circuit appreciation and to acquire diagnostic and troubleshooting skills followed by corrective measures, maintenance and/or correction. There was also a need for the training in hydraulic and pneumatic concepts and how to trouble shoot the system and apply physical corrective measures to alleviate the problem and restore the machine to full functionality. The trainees (employees of regional hospitals) went through the programme that was normally conducted in the summer break (January/February) for two weeks while the rest of the year was spent on attachment in their hospital workshops for industrial experience and exposer. There were three stages in the programme but it was covered in two summer sessions (2005 and 2006). Eleven students took part of which three (3) were from Fiji.

In 2010 the Strengthening Specialized Clinical Services in the Pacific (SSCSIP) project was designed and funded by AusAID to address some of the challenges Pacific Island Countries (PICs) face with the delivery of Specialized Clinical Services (SCS) for their patients. Based at the College of Medicine, Nursing and Health Sciences (CMNHS) and governed by the PICs, SSCSiP works with 14 PICs and assist them to strengthen SCS including Biomedical Engineering services (BMES) in hospitals. During the SSCSiP governance meeting in Nadi (Fiji) in 2011, the Pacific Island Countries highlighted the shortage of trained biomedical technicians in their countries which also hindering the delivery of SCS of their patients. Though the gap has been filled by overseas expert under another AusAID-funded project, PICs requested for assistance in capacity and capability building of their own people to address this dire needs and its sustenance over time.

Thus one of the primary objectives SSCSiP is to work with the biomedical engineers in the Pacific to improve the quantity and quality of the technical manpower in the Biomedical Technology in Pacific Island Nations tertiary hospitals through the provision Biomedical Technicians Training Course. Since there is no course of this kind in the Pacific region, there is the intention of developing one tailored to the Pacific needs for graduates to be competent biomedical technicians with the ability to maintain, repair and manage a range of medical equipment. A Biomedical Technical Advisor group (TAG) comprising of Biomedical Engineers who had or are working in the PICs, was brought together by SSCSiP to discuss the structure and details of the proposed course. The Biomedical TAG proposed units of study and a structure based on their past experience in the Pacific from the medical Equipment Maintenance Program in the Pacific (MEMPP) project and feedback from engineers presently working in countries through PACTAM-BEMI or bilateral aid projects. TAG also recommends the level of the training program to be at Diploma level to meet the request of PICs. The programme has been agreed to be offered in Certificate IV in Biomedical Technology to match the outcomes of the course with those stated in the Australia/ New Zealand Qualification framework. Since then, the team has been working with Fiji National University (FNU) to assist in the area of curriculum development, which include:-

* establish a unified course structure
* adopt a modular system in curriculum design
* establish a curriculum and examination resource bank to satisfy the UASR of FNU and that the programme meets the requirements of the professional accreditation bodies like Engineers Australia.

Following agreement between SSCSIP and FNU in 2013, course duration and structures were finalized and curriculum documents prepared. The work on the curriculum started in early April 2013 and was submitted to the IAC in November, 2013.

These curriculums were submitted for discussion to the Biomedical Industry Advisory Committee in 14th November, 2013 for their approval and endorsement.

The curriculum documents, now being presented have been prepared to comply with the requirements of the University Academic and Students Regulation (UASR) of FNU.

1.3. GRADUATE PROFILE

In general, the graduate of the Certificate IV Biomedical Technology should possess the knowledge, skills and attributes and be able to perform the tasks and procedures, as specified for level four in UASR of FNU**.**

More specifically, the graduate should be able to

1.3.1 Apply a combination of highly developed technical skills and appropriate though limited manual skills in the analysis and solution of technical problems in a chosen area of specialization in Biomedical Engineering.

1.3.2 Apply skills in standard design, testing, commissioning, inspection, plant operation & maintenance, manufacturing or field work.

1.3.3 Utilise systematic and logical approaches to problem solving.

1.3.4 Convey and apply theoretical concepts and technical skills to a range of situations.

1.3.5 Relate the theoretical concepts and technical aspects of Biomedical Engineering Technology.

1.3.6 Perform well informed judgments to supervising and managing technical work, after appropriate experience and further information.

1.4. PHILOSOPHY

The Certificate IV in Biomedical Technology is an initial vocational programme which is intended to prepare persons for employment in Biomedical Technology occupations.

The four skilled groups, commonly identified in the modern engineering workforce, are listed below:

- Professional Engineer
- Engineering Technologist
- Technician
- Tradesperson

The Certificate IV Biomedical Technology is directed towards the tradesperson (Craftsman) category in the above list. In engineering, in general, a tradesperson undertakes predominantly manual and physical work, with some cognitive skills commensurate with trade tasks. Work at this level is

usually performed in accordance with well-established practices and procedures and known solutions are applied to predictable problems.

The nature of electrical technology requires a relatively extensive 'theoretical base' and rapidly changing equipment introduces an element of unpredictability and the need for the tradesperson to be able to adapt to change.

The total development of a tradesperson requires both a component of formal education and an extensive component of practical on-the-job training in industry. A limited formal component of work experience is provided within the Certificate program; but this must be supplemented by enterprise specific experience, both during and after graduation.

Much of the technology relevant to the biomedical engineering trade is concerned with invisible phenomena and relies heavily on relatively abstract models for explaining the operation and performance of circuits, systems and equipment. Instrument readings, used to quantify these phenomena, have to be interpreted in the context of these models, which in turn can only have any practical significance when parametric values have been determined through measurement.

The content and delivery of the Certificate IV in Biomedical Technology emphasizes the practical application of the conceptual components of Electro technology and Biomedical technology and avoids an inappropriate level of abstraction.

The Certificate IV in Biomedical Technology is also concerned with developing an integrated approach to 'theory' and 'practice' and to emphasize the interdependence of 'theoretical concepts' and practical skills, based on the use of instruments.

1.5. PROGRAMME AIMS AND OBJECTIVES

The main purpose of this programme is to prepare students for employment in trade level engineering occupations, requiring expertise in biomedical technology.

The general characteristics of the programme are outlined in an appropriate section of the UAS of FNU and, more specifically, the programme aims to provide a broad based, initial vocational programme for those performing trade level biomedical engineering work in hospitals or biomedical engineering technology industries.

In achieving this aim, the programme provides a set of units which will enable graduates to work in hospitals as technical support staff and in a range of biomedical engineering technology industries, requiring biomedical expertise, such as those concerned with:

a) the installation of equipment or devices for medical services

b) an introduction to anatomy and physiology, medical terminology, biomedical workshop practice

c) electrical and gas safety in hospitals

d) a range of units to enable specialisation in aspects of biomedical engineering technology such as:

(i) power systems circuits functionality, trouble shooting and diagnosis
(ii) electronic systems and technology
(iii) computer/microprocessor interface and application software
(iv) control systems and industrial electronics.
(v) pneumatics and hydraulics systems
(vi) correction, installation and/or maintenance of electronic component of biomedical equipment and devices.

On completion of this programme the student should

1.5.1 have acquired a base of knowledge and manual skills which will

a) facilitate the exercise of discretion and judgement in the selection and use of methods and equipment.

b) provide a basis for further study

c) be appropriate for trade level occupations in biomedical technology

1.5.2 have acquired and be able to apply systematic methods for the correction, installation and servicing of biomedical equipment.

1.5.3 demonstrate an integrated approach to the practical and theoretical aspects of trade level biomedical engineering work.

1.5.4 have acquired and be able to apply skills in the use of instruments and measurement techniques to facilitate the installation and maintenance of equipment and the diagnosis of faults.

1.5.5 have acquired and be able to apply skills in oral and written communication and in the retrieval and interpretation of information, with particular emphasis on:

a) the use of libraries and other resource centers to obtain information

b) the correct use and interpretation of engineering terminology

c) the interpretation and preparation of engineering documents, drawings and diagrams

1.5.6 have completed a component of formal work experience and have demonstrated an ability to transfer skills and knowledge to and from the workplace.

2. PROGRAMME STRUCTURE

2.1. AWARD OF CERTIFICATE

The Certificate IV in Biomedical Technology is a unit based programme, which is awarded at level 4 and requires the attainment of a total of 210 credits.

2.2. UNIT DETAILS

The units in the programme are listed below.

Trimester – 1

Serial No.	Unit Code	Unit Title	Lecture	Tutorial	Pract/Laboratory	Total Contact Hrs. per Trimester [12weeks]	Self-Directed Learning Hrs.	Total Learning Hrs.	Credit Points [15hrs=one credit point]
1	MTH304	Mathematics for Trade	4	1		60	75	135	9
2	EEE312	Electrical Principles	3	1	3	84	51	135	9
3	EEE313	Electrical, Electronics & Gas Safety w/shop	2		3	60	75	135	9
4	BMT342	Anatomy, Physiology & Infection Control	4	1	3	96	39	135	9
5	EEE315	Electrical Components & Measurements	2		3	60	75	135	9
6	COM301	Technical Communication	3		2	60	15	75	5
			18	3	14	420	330	750	50
Total Hours per Week					35				

Trimester - 2

Serial No.	Unit Code	Unit Title	Lecture	Tutorial	Pract/Laborator	Total Contact Hrs. per Trimester [12weeks]	Self-Directed Learning Hrs.	Total Learning Hrs.	Credit Points [15hrs=one credit point]
1	EEE450	Digital Electronics	3	1	2	72	63	135	9
2	EEE451	Analog Electronics	3	1	2	72	63	135	9
3	EEE452	Computer Application & Systems	1		4	60	75	135	9
4	BMT471	Biomedical Materials & Devices	3	1	3	84	51	135	9
5	MEC379	Pneumatics, Hydraulics & Refrigeration	3	1	3	84	51	135	9
6	OHS401	Occupational Health & Safety	3	1		48	27	75	5
			16	5	14	420	330	750	50
Total Hours per Week					35				

Trimester - 3

Serial No.	Unit Code	Unit Title	Lecture	Tutorial	Pract/Laboratory	Total Contact Hrs. per Trimester [12weeks]	Self-Directed Learning Hrs.	Total Learning Hrs.	Credit Points [15hrs=one credit point]
1	EEE456	Electronic Project	1		4	60	75	135	9
2	BMT474	Medical Imaging Systems	3	1	3	84	51	135	9
3	BMT451	Introduction to Bioinformatics	2		4	72	63	135	9
4	BMT472	Biomedical Instrumentation	3		3	72	63	135	9
5	EEE462	Microcontroller Applications	3	1	3	84	51	135	9
6	EVG301	Ethics, Values & Governance	3	1		48	27	75	5
			15	3	17	420	330	750	50
Total Hours per Week					35				

The industrial attachment (BMT480) shall be taken after completing the second trimester or after trimester 3 depending on whichever is preferable/or convenient.

Serial No.	Unit Code	Unit Title	Lecture	Tutorial	Pract/Laboratory	Total Contact Hrs. per Trimester [12weeks]	Self-Directed Learning Hrs.	Total Learning Hrs.	Credit Points [15hrs=one credit point]
1	BMT480	PRACTICAL EXPERIENCE IN BIOMEDICAL TECHNOLOGY & RELEVANT WORK EXPERIENCE					1800	1800	60
			0	0	0	0	1800	1800	60

2.3. DELIVERY MODES

2.3.1 Normal Full Time Attendance

For full time students, the normal pattern of attendance allows the programme to be completed over three trimesters. Students are recommended to obtain work experience between trimesters after completing the second trimester or after completing all the three trimesters. Sponsored students normally attend on a 'trimester release' basis and obtain work experience between trimesters.

The normal unit allocation for each block will be as follows:-

Trimester 1

NO.	UNIT CODE	UNIT NAME
1	MTH304	MATHEMATICS FOR TRADE
2	EEE312	ELECTRICAL PRINCIPLES
3	EEE313	ELECTRICAL,ELECTRONICS & GAS SAFETY WORKSHOP
4	BMT342	ANATOMY, PHYSIOLOGY & INFECTION CONTROL
5	EEE315	ELECTRICAL COMPONENTS & MEASUREMENTS
6	COM301	TECHNICAL COMMUNICATIONS

Trimester 2

NO.	UNIT CODE	UNIT NAME
1	EEE450	ANALOG ELECTRONICS
2	EEE451	DIGITAL ELECTRONICS
3	EEE452	COMPUTER APPLICATION & SYSTEMS
4	BMT471	BIOMEDICAL MATERIALS & DEVICES
5	MEC379	PNUEMATICS, HYDRAULICS & REFRIGERATION
6	OHS401	OCCUPATIONAL HEALTH & SAFETY

Trimester 3

No.	UNIT CODE	UNIT NAME
1	EEE456	ELECTRONIC PROJECT
2	EEE462	MICROCONTROLLER APPLICATIONS
3	BMT474	MEDICAL IMAGING SYSTEMS
4	BMT451	INTRODUCTION TO BIOINFORMATICS
5	BMT472	BIOMEDICAL INSTRUMENTATION
6	EVG301	ETHICS, VALUES & GOVERNANCE

2.3.2 Alternative Mode

This programme can also be run in the evening classes for working people if sufficient numbers of students are enrolled. Other patterns of attendance are possible, subject to student demand, staff availability and compliance with specified pre-requisites.

2.4 PRE-REQUISTE TABLE

2.4.1 GENERAL GUIDELINES

The order of delivery is governed by the Table of Pre-requisites shown in Table 1.

Table 1: Pre-requisites

Unit No.	Unit Code	Name of the unit	Level	Pre-requisite	Class Room Contact Hours	Self-directed Learning Hours	CP
1	MTH304	MATHEMATICS FOR TRADE	3	MER as per program document	60	75	9
2	EEE312	ELECTRICAL PRINCIPLES	3	MER as per program document	84	51	9
3	EEE313	ELECTRICAL & ELECTRONICS & GAS SAFETY WORKSHOP	3	MER as per program document	60	75	9
4	BMT342	ANATOMY, PHYSIOLOGY & INFECTION CONTROL	3	MER as per program document	96	39	9
5	EEE315	ELECTRICAL COMPONENTS & MEASUREMENTS	3	MER as per program document	60	75	9
6	COM301	TECHNICAL COMMUNICATIONS	3	MER as per program document	60	15	5
7	OHS401	OCCUPATIONAL HEALTH & SAFETY	4	MER as per program document	48	27	5
8	EEE451	ANALOG ELECTRONICS	4	Pass EEE312, EEE315	72	63	9
9	EEE450	DIGITAL ELECTRONICS	4	Pass EEE312, EEE315	72	63	9
10	EEE452	COMPUTER APPLICATION AND SYSTEMS	4	Pass EEE312, EEE315	60	75	9
11	BMT471	BIOMEDICAL MATERIALS & DEVICES	4	Pass in BMT342 Unit	84	51	9
12	MEC379	PNEUMATICS, HYDRAULICS & REFRIGERATION	4	Pass EEE313,EEE315 Units	84	51	9
13	EEE456	ELECTRONIC PROJECT	4	Pass EEE450,EEE451, Units	60	75	9
14	BMT474	MEDICAL IMAGING SYSTEMS	4	Pass BMT471 Units	84	51	9
15	BMT451	INTRO TO BIOINFORMATICS	4	Pass BMT471, MEC379 Units	72	63	9
16	BMT472	BIOMEDICAL INSTRUMENTATION	4	Pass BMT471, MEC379 Units	84	51	9
17	EEE462	MICROCONTROLLER APPLICATION	4	Pass EEE452, BMT471, Units	84	51	9
18	EVG301	ETHICS, VALUES & GOVERNANCE	3	MER as per program document	48	27	5
PRACTICUM							
19	BMT480	PRACTICAL EXPERIENCE IN BIOMEDICAL TECH RELEVANT EXPERIENCE	4	Completion of Trimester 1 and Trimester 2 units	-	1800 (30 SDL hours = 1Credit Point)	60
TOTAL CP							210

3. PROGRAMME REGULATIONS

3.1 ADMISSION REQUIREMENTS

Minimum Entry Requirements (MER) are:

3.1.1 (a) Minimum entry requirement (MER) for the program shall be successful completion of studies up to Fiji's Sixth Form (12 years of continuous progression), or its equivalent.

(or)

(b) Applicants who may not meet the 12 years of continuous progression requirement, but who are able to demonstrate their ability to succeed in programmes at these levels on the basis of maturity, work experience, or prior learning may also be admitted to the program. The Dean may require such candidates to sit for any specific or general examination.

3.2 CREDIT VALUE

The Certificate IV in Biomedical Technology is awarded at level 4 and requires the attainment of a total of **210 credits**.

3.3 PROGRAMME DURATION

The minimum duration of the programme is two (2) years when delivered on a fulltime trimester basis and the maximum duration is four (4) years. The maximum duration for part time students is five (5) years.

3.4 CROSS CREDITING

Credit Transfer and Recognition of Prior Learning Credits are governed by UASR of FNU and by regulations and procedures established by the College.

3.5 PROGRESSION REQUIREMENTS

In general, progression within the programme is governed by UASR of FNU and by regulations and procedures established by the College. In particular, progression must be consistent with specified pre-requisites.

4. ORGANISATION OF CONTENT

4.1 PROGRAMME COMPONENTS

The programme comprises 18 compulsory FNU based units and 1 industrial attachment unit.

4.2 PURPOSE OF COMPONENTS

4.2.1 COMPULSORY UNITS

All units are compulsory to get this Certificate IV in Bio-medical Technology.

4.2.2 INDUSTRIAL ATTACHMENT - GENERAL REQUIREMENTS

Industrial attachment requires a formal contract between student, employers and FNU; so that the attachment has stated learning outcomes related to the application of principles and skills to the workplace.

All attachments require a written report, which is to describe the work undertaken and provide evidence that specified objectives have been achieved.

In particular the reports should demonstrate:

a) a clear understanding of the nature, structure and dynamics of the workplace

b) a clear understanding of the relative roles of the different levels of technical personnel in an engineering environment.

c) an ability to perform engineering work at the appropriate level.

4.2.3 MID PROGRAMME INDUSTRIAL ATTACHMENT

Students may proceed beyond level 3 units without the completion of relevant work experience and the satisfactory completion of an 'Industrial Training Report'. Those students who are interested to take the industrial training are encouraged to undergo the training in between the trimesters.

4.2.4 FINAL INDUSTRIAL ATTACHMENT

Students must complete at least the first two trimester units before commencing the final industrial attachment.

5. STUDENT ASSESSMENT

5.1 PURPOSES OF ASSESSMENT

Although all student assessment is characterized by the evaluation of learning outcomes; this evaluation is used for a number of distinct purposes, which can be broadly classified in two ways.

5.1.1 Summative assessment

Summative Assessment is used to identify those assessment events which affect the granting of credits for a unit. In summative assessment, the extent to which specified learning outcomes have been achieved is measured and the results of this measurement are compared with the criteria specified in the assessment policy for each unit.

5.1.2 Formative assessment

Formative Assessment is used to aid decisions related to instructional processes. It facilitates effective teaching and learning, by providing feedback to lecturers and students about the extent to which learning outcomes are being achieved.

It is not directed towards assessing a student's suitability for the award of credits.

5.2 ASSESSMENT PHILOSOPHY

5.2.1 FORMATIVE ASSESSMENT

The planning and implementation of formative assessment is a major professional responsibility of the lecturer who must take into account his/her unique teaching style and the specific differences of each group of students.

For this reason formative assessment requirements are not prescribed in unit syllabus documents.

Formative assessment is not restricted to a quantitative measurement of learning outcomes and will generally include various forms of qualitative evaluation.

5.2.2 SUMMATIVE ASSESSMENT

In this programme, summative assessment is not restricted to testing at the end of the unit; but involves continuous assessment, which means that a representative sampling of student achievement takes place at regular intervals and in ways which are valid, reliable and fair.

Because of the need for consistency in the granting of credits, summative assessment requirements are specified in unit syllabus documents.

The diversity of learning outcomes in the programme requires a range of assessment instruments, the use of which is governed by the nature of the outcomes being measured.

5.3 METHODS OF ASSESSMENT

The following assessment methods will be used.

5.3.1 ASSIGNMENTS

The term, assignment, is used in this context to refer to work which is done by students, outside of normal class time, and which will normally be presented on paper, in graphical and/or written form.

Assignments are used to measure a wide range of outcomes.

However, they will concentrate on those tasks which cannot be assessed adequately within the constraints imposed by a supervised written test or exam.

These include detailed analysis and problem solving and those time consuming activities which are not feasible in the limited time available for a test.

5.3.2 CLASS EXERCISES

This term is used to describe assessed work which is done in normal class time under the control of and with the possible assistance of the lecturer.

In some units, class exercises will involve short tasks, which assess outcomes similar to those in 5.3.1; but, because of time limits, coverage is less detailed and extensive than is possible with assignments.

In others, such as workshop and drawing units, tasks will be more extensive and this method of assessment is specified because of the need for access to facilities, which are not available to students outside of FNU.

5.3.3 CLASS TESTS

These are supervised tests, which are conducted progressively throughout the period of instruction, in normal class time.

They sample those outcomes which can be evaluated, validly and reliably, by a written test and each test is restricted to a specific range of topics.

Class Tests are different from those tests which may be used for formative purposes and will not be set until students have been given adequate time to develop the relevant competencies.

Collectively, class tests enable individuals to be evaluated, under 'exam' conditions with a broader sampling of outcomes than is possible in a final examination.

5.3.4 FINAL EXAMINATION

When a final examination is specified, it will be of two hours duration, with ten minutes reading time and held after classroom tuition for the unit is finished.

Final examinations cover a sample of those outcomes which can be assessed by a written test.

Examination questions will be limited in type and extent to those which can be validly, reliably and fairly asked in the time available.

Because class attendance is most cases related to the achievement of learning outcomes, eligibility to sit for a final examination and final assessment of non-examinable units will be dependent on achievement at least 75% or over in Attendance and the minimum Coursework of 50%.

5.3.5 LABORATORY ASSIGNMENTS

These assess outcomes which require the direct 'hands-on' use of laboratory based equipment (e.g. instruments, computers, equipment etc.).

In many units, they will involve the use of instruments and measurement techniques to evaluate the performance of systems, circuits and components.

Laboratory assignments used for summative assessment are different from laboratory exercises which are used in the teaching and formative assessment of skills related to the use of equipment.

Students will be given the opportunity to learn and practice skills before being assessed through laboratory assignments.

Because they are time consuming and require the use of special equipment, laboratory assignments should not be used for outcomes which can be effectively measured in other ways.

5.3.6 PRACTICAL TESTS

In many cases, equipment limitations require laboratory assignments to be performed by groups of students.

Therefore, in some units, practical tests are specified and, in these, individual students demonstrate the achievement of outcomes of the type covered by laboratory assignments.

When equipment limitations and/or the effective supervision of such tests require a low student/lecturer ratio, coverage will be restricted and will concentrate on key skills, e.g. the use of instruments and basic testing methods.

Practical tests are also specified for Drawing, Workshop & Computing units and, in these, students are required to use tools/equipment; so that 'practical' skills can be evaluated on an individual basis and under test conditions.

In such units, these tests may also include the evaluation of outcomes of the type covered by class tests.

5.3.7 PROJECTS

The term, project, is used in this context to describe an activity through which the student is expected to demonstrate independent learning and the ability to source information.

Project requirements vary considerably in breadth and depth and are governed by the level of the unit in which they are used. These requirements range from some form of investigation with results presented in a written form to more extensive tasks, such as the construction and testing of a circuit or system, with a report of circuit/system performance. In higher level units, projects involve the integration of a number of topic areas and require the student to demonstrate the ability to plan and prioritize. In many cases, specific project requirements will be determined by negotiation between students and staff.

5.4 CRITERIA FOR ASSESSMENT

5.4.1 REQUIREMENT FOR PASSING OF AN UNIT

a) Minimum Requirements

In all examinable units, at least 50% is required independently in the course work and in the final examination for a student to be considered as pass and naturally the average must be 50%. In a non-examinable unit, the students should score 50 % in course work to be considered as pass. The passing grade will be given in each unit descriptor and the students should refer the UASR from time to time to note down the various process of re-evaluation, re-sit and supplementary assessment examinations.

5.4.2 ASSESSMENT PROCEDURES AND REGULATIONS

All assessment will be performed and results processed in accordance with the relevant sections of the UASR of FNU and with other procedures and regulations specified by relevant bodies, such as the Senate from time to time.

5.5 FAIRNESS, VALIDITY AND RELIABILITY

5.5.1 ***Validity*** refers to the accuracy of a specific prediction or interpretation which has been made from the results of an assessment event. That is, it is concerned with the extent to which a measurement of learning outcomes serves the purpose for which it is intended.

Content validity requires an assessment event to sample those learning outcomes, which are within the scope of the unit or section of the unit being assessed. The determination of content validity requires a thorough examination of the items being used and an evaluation of the extent to which these are consistent with the learning outcomes and performance criteria specified in the unit descriptors.

Predictive validity is concerned with determining the extent to which assessment event results accurately predict performance in a following unit and/or success of graduates in the workplace. The determination of predictive validity requires the correlation of results between dependent units and a review of graduate performance 'on-the-job'.

5.5.2 ***Reliability*** refers to the extent to which the results of an assessment event are consistent and the degree of confidence which can be placed in the results.

Reliability is necessary but not sufficient condition for validity.

Reliability is essentially a statistical concept and can be expressed by means of a Reliability Coefficient or through the Standard Error of Measurement.

5.5.3 ***Fairness*** refers to a number of factors which influence the quality of assessment.

Fairness requires that students be given appropriate time and circumstances to demonstrate the achievement of learning outcomes.

Fairness requires that test questions avoid areas of the unit which have not been taught.

Fairness requires that questions have an appropriate level of difficulty and the precise wording of instructions and questions.

5.5.4 ***Fairness, validity and reliability*** will be promoted as follows:

a) The Board of Studies will organize and monitor the progressive development of validated item banks and marking guides for class tests and final examinations.

b) The Board of Studies will organize and monitor the progressive development of non-test items such as laboratory assignments and project specifications.

c) All final examinations will be moderated, by both an internal or external moderator, who will check the suitability of the exam before it is printed and check that student's exam scripts are accurately and consistently marked.

d) External examiners and moderators will be appointed in accordance with the requirements of UASR of FNU.

e) The Academic Board will organize the analysis of items used in class tests and exams evaluate the results of this analysis and determine if items need to be changed.

f) The Academic Board will facilitate the maintenance of assessment standards by monitoring and evaluating the performance of students in both test and non-test assessment events.

6. MONITORING, EVALUATION and REVIEW

6.1 ACADEMIC BOARD

The membership and responsibilities of the Academic Board will be in accordance UASR of FNU.

The Academic Board will meet at least once per trimester.

6.2 EXAMINATION BOARD

The membership and responsibilities of the Examination Board will be in accordance with the UASR of FNU. The Examination Board will meet after every trimester examination to approve the results.

6.3 MONITORING

Programme review and monitoring will be undertaken in accordance with t*he* UASR of FNU.

6.4 EXTERNAL MODERATION

6.4.1 External examiners and moderators will be appointed and perform duties in accordance with the UASR of FNU.

6.4.2 The Industry Advisory Committee will be appointed and perform duties in accordance with the UASR of FNU.

7. TEACHING AND LEARNING METHODS

7.1 INTRODUCTION

A variety of teaching methods will be used to facilitate the achievement of specified learning outcomes. Recently the biomedical engineering is characterized by frequent changes in technology and students can be exposed to only a limited range of circuits, systems and equipment during the course of the Certificate programme.

Teaching methods will therefore reflect the need to develop generic skills which can be applied to a range of situations and facilitate adaptation to changing methods and technologies.

This will require the teaching of technical principles and analytical techniques at an appropriate but limited level of generality, which provides an appreciation of their universality, while ensuring that students develop skills in applying these to typical practical situations.

Teaching methods will of necessity depend on the learning skills of students and the availability of resources. Although the Certificate program will encourage students to work independently, the current lack of self- directed learning skills in students entering the programme will require a structured didactic approach in the lower level units.

The current lack of learning materials and basic educational technology still requires a large amount of classroom contact time to be used for the conveying of information.

To facilitate effective learning, the following general principles will be progressively adopted:

7.1.1 The amount of classroom time devoted to the relaying of basic factual information will be minimized

7.1.2 The amount of classroom time devoted to information processing, the development of comprehension, the application of knowledge and problem solving will be increased

7.1.3 The availability of texts, references and other written resource material will be increased.

7.1.4 Overhead projectors and computers will be used to display circuit diagrams and other graphical information, copies of which will be given to students to enable them to concentrate on understanding rather than transcribing material

7.1.5 Formative and summative assessment will concentrate on the testing of comprehension, application and problem solving and will not be based on rote learning and the memorization of verbal stereotypes.

7.1.6 Graded Projects will be used to facilitate the development of learning skills and the ability to source information.

7.1.7 Students will be expected to write and speak accurately, logically and precisely.

7.1.8 Computer based simulations and other analytical tools will be used to remove much of the computational burden, which previously imposed major constraints on the problem solving process and required significant amounts of energy to obtain solutions.

These simulations will enable students to concentrate on the often ignored aspects of problem formulation and interpretation and also facilitate student directed learning by enabling them to readily observe the effects of changing circuit/system parameters.

7.1.9 Time based delivery methods will be reduced; so that emphasis is placed equal learning outcomes rather than equal instruction times.

7.2 TEACHING STRATEGIES

The main specific teaching strategies will be:-

7.2.1 CLASSROOM BASED MODIFIED LECTURE

This will be teacher managed and supported by written and visual learning resources.

The amount of time used to relay basic factual information will be minimized.

The teacher will concentrate on developing and evaluating understanding, application and analytical and problem solving skills.

Students will be expected to be active participants; rather than passive listeners as is usual in a 'traditional' lecture. This will be achieved through guided questions and interactive class exercises.

Educational technology will be used to enable students to concentrate on critical outcomes and to minimize time consuming computational and transcription processes.

7.2.2 CLASSROOM BASED TUTORIAL

This provides an opportunity for skills to be practiced and for difficulties to be discussed and resolved.

7.2.3 LABORATORY BASED SESSIONS

These are used for teaching and assessing those learning outcomes which require the direct 'hands-on' use of laboratory based equipment.

In many units, these outcomes are concerned with the use of instruments and measurement techniques to evaluate the performance of systems, circuits and components.

In these sessions, the essential linkage between measurement, analysis and diagnosis will be emphasized and activities will be structured to ensure that no dichotomy develops between laboratory and theory based skills.

Where appropriate, computer based simulations will be used to analyse circuits and systems; so as to provide a basis of comparison with measured results.

7.2.4 WORKSHOP BASED SESSIONS

These are used for teaching and assessing those learning outcomes which require the direct 'hands-on' use of hand and machine tools and which are concerned with the development of psychomotor skills related to electrical installations and the construction and maintenance of electrical equipment.

7.2.5 FIELD VISIT

This involves a visit to an off-campus site to investigate the operation of equipment relevant to particular units.